

PROMOTING NURSES' BEHAVIOUR  
CHANGE IN NUTRITIONAL CARE



Debbie ten Cate

# **Promoting nurses' behaviour change in nutritional care**

Debbie ten Cate

**Promoting nurses' behaviour change in nutritional care**

ISBN: 978-90-832951-9-0

Cover design and lay-out: proefschriftenprinten.nl

Printed by: proefschriftenprinten.nl

©2023, Debbie ten Cate

All rights reserved. No part of this thesis may be reproduced or transmitted in any form or by any means without permission of the author.

This thesis has been printed on Balance Pure 100% recycled paper.

# **Promoting nurses' behaviour change in nutritional care**

**Het bevorderen van gedragsverandering bij verpleegkundigen  
in de voedingszorg**  
(met een samenvatting in het Nederlands)

## **Proefschrift**

ter verkrijging van de graad van doctor aan de Universiteit Utrecht  
op gezag van de rector magnificus, prof. dr. H.R.B.M. Kummeling,  
ingevolge het besluit van het college voor promoties  
in het openbaar te verdedigen op  
dinsdag 7 februari 2023 des middags te 4.15 uur

door

**Debbie ten Cate**

geboren op 18 mei 1977  
te Beetgumermolen

**Promotoren:**

Prof. dr. L. Schoonhoven

Prof. dr. M.J. Schuurmans

**Copromotor:**

Dr. R.G.A. Ettema

**Beoordelingscommissie:**

Prof. dr. N.J. de Wit

Prof. dr. S. Zwakhalen

Prof. dr. M.H. Emmelot-Vonk (voorzitter)

Prof. dr. M.F. van der Schaaf

Prof. dr. M. de van der Schueren

The studies in this thesis were financially supported by Utrecht University of Applied Sciences and the Netherlands Organization for Health Research and Development, ZonMw (grant numbers 520002003 and 633300029).

*I would say to the nurse, have a rule of thought about  
your patient's diet*

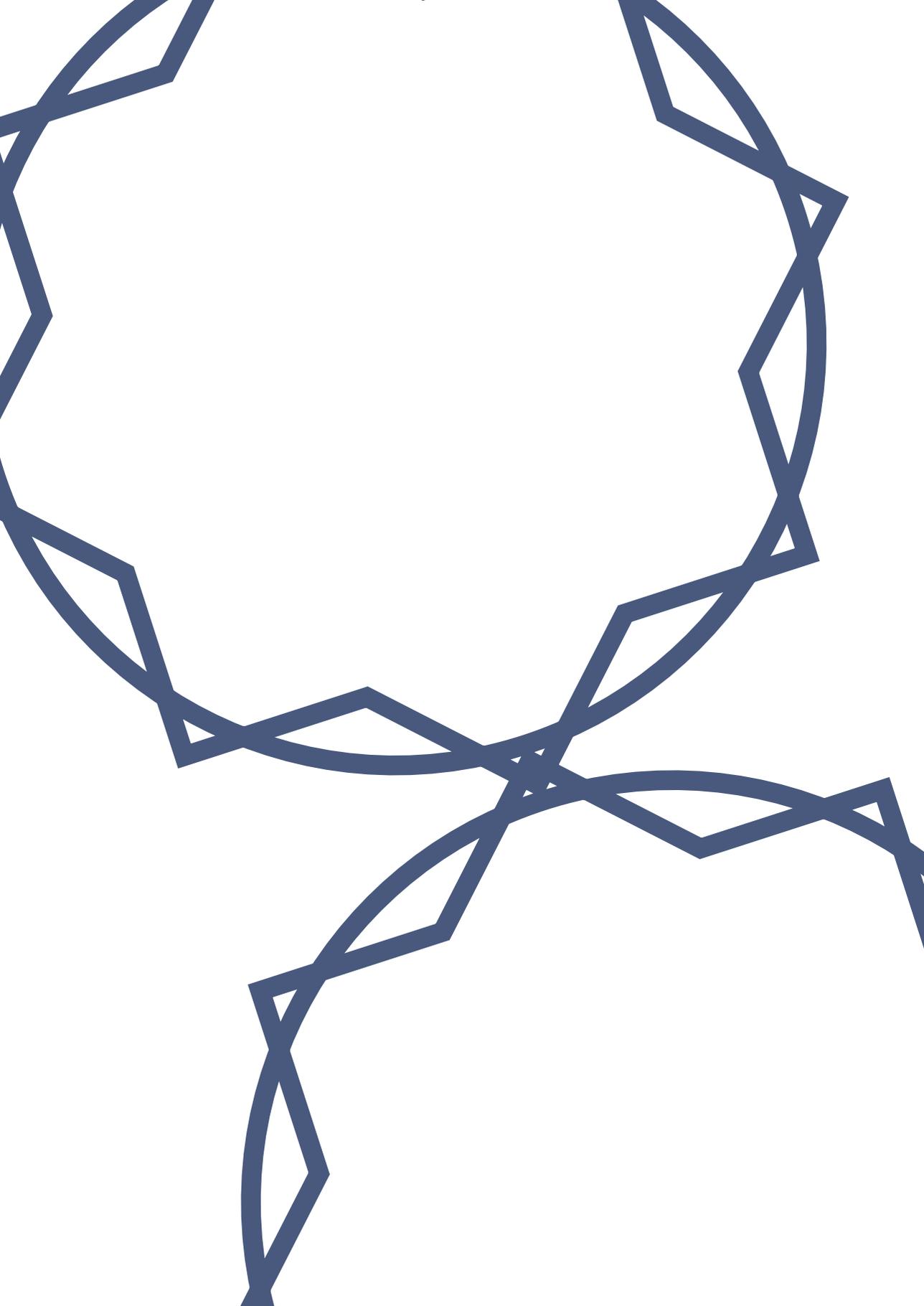
Florence Nightingale (Notes on Nursing, 1859)

Kijk hier Debbie's lekenpraatje



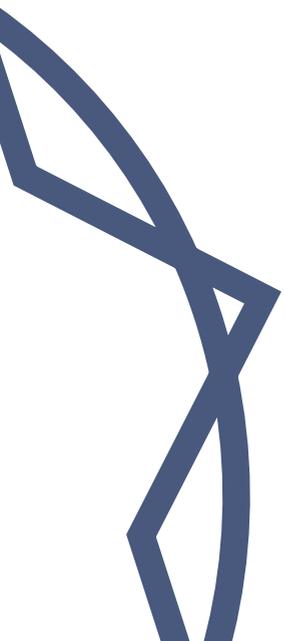
# Contents

<b>Chapter 1</b>	General Introduction	9
<b>PART 1</b>	<b>Current state of evidence in nursing nutritional care</b>	
<b>Chapter 2</b>	Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review	21
<b>Chapter 3</b>	Hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition: A cross-sectional study	81
<b>Chapter 4</b>	Older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization: A qualitative study	121
<b>Chapter 5</b>	Factors influencing nurses' behavior in nutritional care for community-dwelling older adults before, during, and after hospitalization: A Delphi study	151
<b>PART 2</b>	<b>An educational intervention</b>	
<b>Chapter 6</b>	Development of a microlearning intervention regarding nursing nutritional care for older adults: A multi-methods study	201
<b>Chapter 7</b>	Feasibility of a microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants: A mixed-methods study	241
<b>Chapter 8</b>	General Discussion	275
	Summary	293
	Samenvatting	301
	Dankwoord	309
	List of publications, presentations and courses obtained	319
	Curriculum Vitae	327



# I

## General Introduction



## Introduction

Nutritional care for older adults provided by hospital and home care nurses and nursing assistants is not always optimal. *In 2018, my father G., then 73 years old, was acutely admitted to hospital with symptoms of cholecystitis, i.e. an inflammation of the gallbladder (day 1). After a diagnostic procedure (day 2), he developed a gastric perforation and had an emergency surgery (day 3). G. spent these three days fasting. Then G. had a minimal dietary intake for five days (day 4 till 8) due to several reasons: he experienced nausea, he did not feel like eating, he perceived the offered food as distasteful and he had a total fasting regime (nil per os) for two days because the medical team suspected an ileus. From day 9, G. started eating again under the supervision of a dietitian, because he had developed malnutrition and risk of refeeding syndrome. At day 13, G. was discharged from hospital to home. Two weeks after discharge, he had a first consult with a dietitian for further treatment of malnutrition.*

*G. was screened for malnutrition risk with the Malnutrition Universal Screening Tool (MUST) on day 3 and scored  $\geq 2$ , indicating a high risk of malnutrition. This means a direct treatment by a multidisciplinary team was required. However, treatment by a dietitian only started at day 9 when she was consulted for the first time. According to the nurses, they wanted to wait to see how the situation of G. developed. As they said, it was normal that dietary intake was reduced after this kind of surgery. In addition, other nursing activities regarding nutritional care to prevent and treat malnutrition were not or partly conducted. A few examples: G.'s weight was not assessed, his nutritional status was not discussed with the physician, exercise was not stimulated, the informal caregivers were not involved in nutritional matters and dietary aftercare was not organised. Nutritional care provided by nurses was suboptimal possibly due to a lack of attention towards nutritional care.*

## Healthy ageing and nutritional status

Nowadays, there is a growing number of older adults with multiple care needs as a result of multimorbidity, which is associated with increasing age.<sup>1,2</sup> Due to their underlying health situation, a large number of older adults receive complex and ongoing care across the care continuum between home and hospital, between hospital and home and in the transition between these settings.<sup>1,3,4</sup> This results from changes in healthcare policies with focus on deinstitutionalisation with the consequence that older adults live in their homes in the community for a longer period of time.<sup>1,4,5</sup>

Older adults' health and well-being should be ensured by prevention and reduction of disease and health problems.<sup>6-8</sup> In this way, they maintain their functionality and independence in the community for as long as possible. Also, this reduces health care, economic and social burden in the short and long term.<sup>7-9</sup> To support healthy ageing and well-being, sufficient nutrition and good nutritional status are essential.<sup>10,11</sup> Therefore, it is important to prevent decline in nutritional status, which eventually would result in a risk of malnutrition or development of malnutrition.<sup>12-14</sup>

Yet, protein-energy malnutrition, often referred to as malnutrition, is a common and major health problem in community-dwelling older adults who receive care in hospital and at home.<sup>11,15</sup> Malnutrition refers to "a state resulting from lack of intake or uptake of nutrition that leads to altered body composition (decreased fat free mass) and body cell mass leading to diminished physical and mental function and impaired clinical outcome from disease".<sup>16</sup> For hospitalised and community-dwelling older adults with and without home care, the reported prevalence rates for malnutrition, defined according to the Global Leadership Initiative on Malnutrition (GLIM) criteria for diagnosing malnutrition,<sup>15</sup> range from 10.7% to 42.4% and for risk of malnutrition are approximately 15%.<sup>17-21</sup> The wide variation in prevalence estimates between studies is most likely due to heterogeneity of the older study population, differences in study methodology and use of different malnutrition screening and assessment tools.<sup>22</sup> Due to diversity in aetiology and a wide range of determinants,<sup>11</sup> malnutrition is related to age-related factors, a variety of acute and chronic diseases and syndromes such as sarcopenia, cachexia and frailty.<sup>11,15</sup> It is associated with poor health outcomes such as pain,<sup>23</sup> poor oral health,<sup>24</sup> poor appetite,<sup>25,26</sup> polypharmacy,<sup>25,26</sup> deterioration in mental function<sup>20,26,27</sup> and increased mortality.<sup>17,19,28</sup> In addition, malnutrition has a negative impact on quality of life,<sup>24</sup> functionality<sup>18,25,26</sup> and various social and economic factors.<sup>26,29</sup> As a consequence, malnutrition can result in more use of healthcare facilities and an increase of societal costs.<sup>30,31</sup>

## **The role of nurses and nursing assistants in nutritional care for older adults**

As nutritional care is an essential part of nursing care,<sup>32,33</sup> hospital and home care nurses and nursing assistants have a pivotal role and responsibility in attentively and routinely providing nutritional care to older adults. On a daily basis, of all healthcare professionals, nurses and nursing assistants spend most time with older adults, they take an advocacy role and contribute substantially to the continuity and coordination of nutritional care.<sup>11,34,35</sup> Here, they promote health and well-being, stimulate

adequate dietary intake and prevent impairment of nutritional status by early recognition of indicators of malnutrition and structural screening with validated screening tools. Furthermore, they carry out nutrition-related activities to identify and treat older adults who are malnourished.<sup>11,34-36</sup> Nurses and nursing assistants carry out these activities alongside dietitians who have the role to maintain optimal nutrition for care recipients.<sup>37</sup> Nursing activities include identification of nutritional problems, screening of nutritional status, development of nutritional care plans, provision of nutrition-related interventions and continued monitoring, and support and counselling of care recipients and informal caregivers.<sup>38</sup> In this way, nurses and nursing assistants substantially contribute to high-quality multidisciplinary nutritional care for older adults as recommended by national and international guidelines<sup>11,37,39</sup> and national policy.<sup>40</sup>

### **Current nursing nutritional care**

Nutritional care for older adults provided by hospital and home care nurses and nursing assistants, however, is still suboptimal.<sup>41-43</sup> As a consequence, it comprises a barrier for the quality and continuity of nutritional care and hence good nutritional status, health and well-being of older adults. The reason for this seems twofold.

On the one hand, there is a lack of evidence-based nursing activities regarding nutritional care.<sup>36,44</sup> Nutrition-related interventions that have been evaluated in previous studies<sup>45-47</sup> have not been translated into nursing care activities, and as a consequence, have not been incorporated into guidelines and nursing practice. Also, an explicit and clear perception on the role of nurses and nursing assistants in nutritional care is lacking.<sup>48</sup> In conclusion, evidence-based activities, which can be embedded into nursing care are missing.

On the other hand, previous studies have shown that suboptimal nursing nutritional care results from several factors, which influence nurses' and nursing assistants' current behaviour. Here, behaviour is defined as "any observable or measurable movement or activity of an individual. Behaviour can be verbal or nonverbal, overt or covert. Covert responses are private or unobservable events that can be cognitive, emotional, or physiological".<sup>49</sup> These factors that influence nurses' and nursing assistants' behaviour with regard to nutritional care include lack of knowledge, moderate awareness of the importance and neutral attitudes.<sup>41,43,50,51</sup> Consequently, nurses and nursing assistants give nutritional care lower priority, they value nutritional care less and lack to take their full responsibility.<sup>51-56</sup> This generates

hospital and home care nurses' and nursing assistants' poor attention towards nutritional care for older adults. Positively changing nurses' and nursing assistants' behaviour is key by focussing on these factors that influence current behaviour.<sup>57,58</sup> To our knowledge, information on how to change this behaviour is sparse due to the low number of studies, which were only conducted in the hospital setting resulting in limited evidence. This means that more studies are needed to provide a solid evidence base for the development of an educational intervention that increases the likelihood of successfully targeting the factors that influence current behaviour.<sup>57-59</sup> This is important to promote hospital and home care nurses' and nursing assistants' behavioural change in nutritional care for older adults and consequently potentially enhance this part of essential nursing care.

## Objectives of this thesis

As it is important to enhance nutritional care provided by hospital and home care nurses and nursing assistants to older adults by building the evidence base, the general objectives of this thesis are as follows:

- 1) To understand the current state of evidence regarding nutrition-related interventions and factors that influence current behaviour in nutritional care for older adults provided by hospital and home care nurses and nursing assistants to prevent and treat malnutrition.
- 2) To develop an educational intervention for hospital and home care nurses and nursing assistants to promote behaviour change by affecting factors that influence current behaviour in nutritional care for older adults and to describe the intervention development and feasibility.

To achieve these general objectives, we followed an iterative, theory-driven and evidence-based approach.<sup>59,60</sup> To efficiently and systematically explore and gain insight into the current state, we used several stages of the so-called "Utrecht model".<sup>60</sup> For development and feasibility of the educational intervention, these stages were enhanced with aspects of the development and feasibility/piloting phase of the Medical Research Council (MRC) framework for developing and evaluating complex interventions.<sup>59</sup>

### Outline of this thesis

The first part of this thesis sets out to explore current nursing nutritional care for older adults to prevent and treat malnutrition. In **chapter 2**, a systematic review of the literature is described, where interventions to prevent and treat malnutrition in hospitalised, institutionalised and community-dwelling older adults with different health conditions, which can be integrated in nursing care, are identified. Also, the reported effects of these interventions on outcomes related to malnutrition are evaluated. In **chapter 3**, we provide insight into hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition. In **chapter 4**, older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalisation are explored. In **chapter 5**, we present factors that influence behaviour of hospital and home care nurses, which are most relevant, modifiable and feasible to influence in order to optimise nutritional care of community-dwelling older adults in the periods before, during and after their hospitalisation. The results from the four studies in the first part of the thesis formed building blocks for developing an educational intervention.

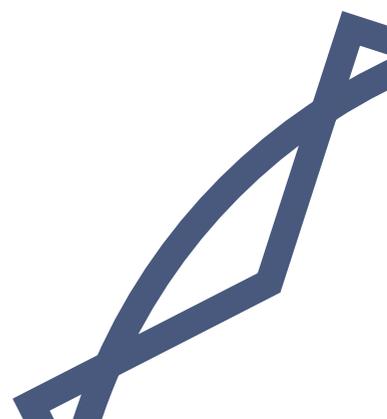
The second part of this thesis addresses the development and feasibility of an evidence-based educational intervention for hospital and home care nurses and nursing assistants. The intervention aims to promote nurses' and nursing assistants' behaviour change by affecting factors that influence their current behaviour in nutritional care for older adults. In **chapter 6**, the development process of this educational intervention for hospital and home care nurses and nursing assistants is described. In **chapter 7**, we present a feasibility study in which the educational intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants is tested. In **chapter 8**, the general discussion, the main findings of this thesis and the implications and recommendations for future research, healthcare practice and education are discussed.

## References

1. Rechel B, Grundy E, Robine JM, Cylus J, Mackenbach JP, Knai C, et al. Ageing in the European union. *Lancet*. 2013;381(9874):1312-1322.
2. World Health Organization. Multimorbidity: Technical series on safer primary care. Geneva: World Health Organization; 2016.
3. Lai F, Wong S, Yip B, Guthrie B, Mercer S, Chung R, et al. Multimorbidity in middle age predicts more subsequent hospital admissions than in older age: A nine-year retrospective cohort study of 121,188 discharged in-patients. *Eur J Intern Med*. 2019;61:103-111.
4. Rostgaard T, Glendinning C, Gori C, Kroger T, Osterle A, Szebehely M, et al. LIVINDHOME: Living independently at home: Reforms in home care in 9 European countries. Copenhagen: SFI – The Danish National Centre for Social Research; 2011.
5. World Health Organization. Home care in Europe: The solid facts. Geneva: World Health Organization; 2008.
6. Beard J, Officer A, de Carvalho I, Sadana R, Pot A, Michel J, et al. The World report on ageing and health: a policy framework for healthy ageing. *Lancet*. 2016;387(10033):2145-2154.
7. World Health Organization. Global strategy and action plan on ageing and health. Geneva: World Health Organization; 2017.
8. World Health Organization. Decade of healthy ageing 2020 – 2030. Geneva: World Health Organization; 2020.
9. Beswick A, Goberman – Hill R, Smith A, Wylde V, Ebrahim S. Maintaining independence in older people. *Rev Clin Gerontol*. 2010;20(2):128-153.
10. Kuczmarski MF, Weddle DO. Position paper of the American Dietetic Association: Nutrition across the spectrum of aging. *J Am Diet Assoc*. 2005;105(4):616-633.
11. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Hooper L, Kiesswetter E, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clin Nutr*. 2022;41(4):958-989.
12. Leslie W, Hankey C. Aging, nutritional status and health. *Healthcare (Basel)*. 2015;3(3):648-658.
13. Robinson SM. Improving nutrition to support healthy ageing: what are the opportunities for intervention? *Proc Nutr Soc*. 2018;77(3):257-264.
14. Shlisky J, Bloom DE, Beaudreault AR, Tucker KL, Keller HH, Freund – Levi Y, et al. Nutritional considerations for healthy aging and reduction in age-related chronic disease. *Adv Nutr*. 2017;8(1):17-26.
15. Jensen GJ, Cederholm T, Correia MITD, Gonzales MC, Fukushima R, Higashiguchi T, et al. GLIM criteria for the diagnosis of malnutrition: A consensus report from the global clinical nutrition community. *JPEN J Parenter Enteral Nutr*. 2019;43(1):32-40.
16. Sobotka LE. Basics in clinical nutrition. 5th ed. Prague: Galén; 2019.
17. Hirose S, Matsue Y, Kamiya K, Kagiya N, Hiki M, Dotare T, et al. Prevalence and prognostic implications of malnutrition as defined by GLIM criteria in elderly patients with heart failure. *Clin Nutr*. 2021;40(6):4334-4340.
18. Pourhassan M, Rommersbach N, Lueg G, Klimek C, Schnatmann M, Liermann D, et al. The impact of malnutrition on acute muscle wasting in frail older hospitalized patients. *Nutrients*. 2020;12(5):1387.
19. Rodríguez – Mañas L, Rodríguez – Sánchez B, Carnicero JA, Rueda R, García – García FJ, Pereira SL, et al. Impact of nutritional status according to GLIM criteria on the risk of incident frailty and mortality in community-dwelling older adults. *Clin Nutr*. 2021;40(3):1192-1198.
20. Sanchez – Rodríguez D, Locquet M, Reginster J, Cavalier E, Bruyère O, Beudart C. Mortality in malnourished older adults diagnosed by ESPEN and GLIM criteria in the SarcoPhAge study. *J Cachexia Sarcopenia Muscle*. 2020;11(5):1200-1211.
21. Yeung SSY, Chan RSM, Kwok T, Lee JSW, Woo J. Malnutrition according to GLIM criteria and adverse outcomes in community-dwelling Chinese older adults: A prospective analysis. *J Am Med Dir Assoc*. 2021;22(9):1953-1959.e4.

22. Cederholm T, Bosaeus I, Barazzoni R, Bauer J, Van Gossum A, Klek S, et al. Diagnostic criteria for malnutrition – an ESPEN consensus statement. *Clin Nutr.* 2015;34(3):335-340.
23. Bauer S, Hödl M, Eglseer D. Association between malnutrition risk and pain in older hospital patients. *Scand J Caring Sci.* 2021;35(3):945-951.
24. Bakker MH, Vissink A, Spoorenberg SL, Jager – Wittenaar H, Wynia K, Visser A. Are edentulousness, oral health problems and poor health-related quality of life associated with malnutrition in community-dwelling elderly (aged 75 years and over)? A cross-sectional study. *Nutrients.* 2018;10(12):1965.
25. Fávoro – Moreira NC, Krausch – Hofmann S, Matthys C, Vereecken C, Vanhauwaert E, Declercq A, et al. Risk factors for malnutrition in older adults: A systematic review of the literature based on longitudinal data. *Adv Nutr.* 2016;7(3):507-522.
26. Kiesswetter E, Hengeveld LM, Keijser BJF, Volkert D, Visser M. Oral health determinants of incident malnutrition in community-dwelling older adults. *J Dent.* 2019;85:73-80.
27. Chatindiara I, Allen J, Popman A, Patel D, Richter M, Kruger M, et al. Dysphagia risk, low muscle strength and poor cognition predict malnutrition risk in older adults at hospital admission. *BMC Geriatr.* 2018;18(1):78.
28. Söderström L, Rosenblad A, Adolffson ET, Bergkvist L. Malnutrition is associated with increased mortality in older adults regardless of the cause of death. *Br J Nutr.* 2017;117(4): 532-540.
29. Besora – Moreno M, Llauradó E, Tarro L, Solà R. Social and economic factors and malnutrition or the risk of malnutrition in the elderly: A systematic review and meta-analysis of observational studies. *Nutrients.* 2020;12(3):737.
30. Martínez – Reig M, Aranda – Reneo I, Peña – Longobardo LM, Oliva – Moreno J, Barcons – Vilardell N, Hoogendijk EO, et al. Use of health resources and healthcare costs associated with nutritional risk: The FRADEA study. *Clin Nutr.* 2018;37(4):1299-1305.
31. Rodríguez – Sánchez B, Sulo S, Carnicero JA, Rueda R, Rodríguez – Mañas L. Malnutrition prevalence and burden on healthcare resource use among Spanish community-living older adults: Results of a longitudinal analysis. *Clinicoecon Outcomes Res.* 2020;12:355-367.
32. Kitson A, Conroy T, Wengstrom Y, Profetto – McGrath J, Robertson – Malt S. Defining the fundamentals of care. *Int J Nurs Pract.* 2010;16:423-434.
33. Kitson AL, Conroy T, Kuluski K, Locock L, Lyons R. Reclaiming and redefining the Fundamentals of Care: Nursing's response to meeting patients' basic human needs. Adelaide: University of Adelaide; 2013.
34. Schuurmans M. Beroepsprofiel verpleegkundige. In: *Leren van de toekomst, Verpleegkundigen en verzorgenden 2020*. [Professional profile of nursing. In: Lambregts J, Grotendorst A, editors. Learning from the future, V&V 2020]. Houten: Bohn Stafleu van Loghum; 2012.
35. World Health Organization. Enhancing nursing and midwifery capacity to contribute to the prevention, treatment and management of noncommunicable diseases in practice: policy and advocacy, research and education. Geneva: World Health Organization; 2012.
36. Zwakhalen S, Hamers J, Metzvelthuis S, Ettema R, Heinen M, de Man – van Ginkel, J., et al. Basic nursing care: The most provided, the least evidence based – A discussion paper. *J Clin Nurs.* 2018;27(11-12):2496-2505.
37. The Dutch Malnutrition Steering Group. Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2019.
38. 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. *JPEN J Parenter Enteral Nutr.* 2013;37(4):482-497.
39. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr.* 2017;36(1):49-64.
40. Health and Youth Care Inspectorate. Basisset medisch specialistische zorg 2020 [Basic set specialist medical care 2020]. Health and Youth Care Inspectorate; 2019.

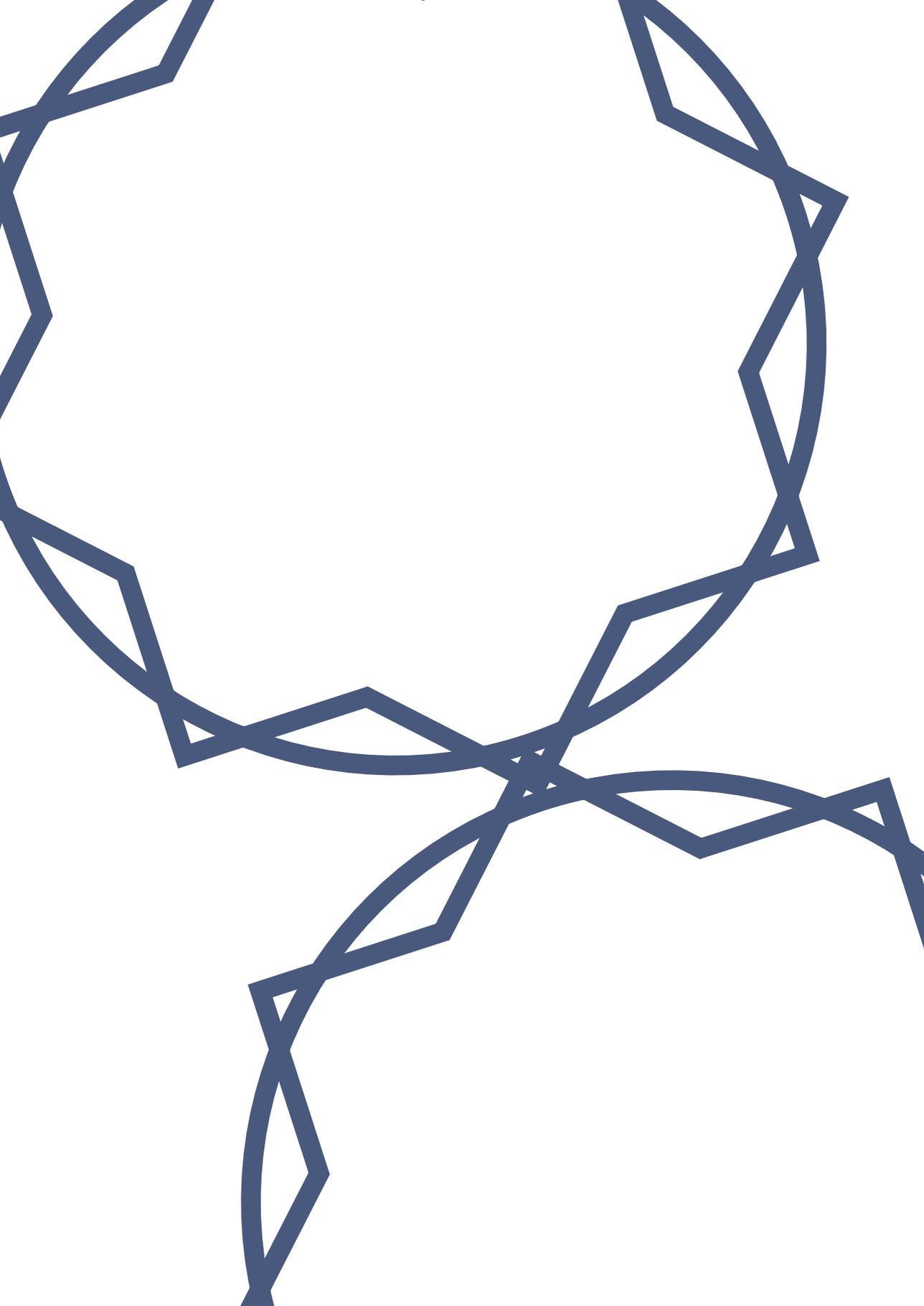
41. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci*. 2013;27(2):440-448.
42. Vanderwee K, Clays E, Bocquaert I, Verhaeghe S, Lardennois M, Gobert M, et al. Malnutrition and nutritional care practices in hospital wards for older people. *J Adv Nurs*. 2011;67(4):736-746.
43. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs*. 2015;24(5-6):696-706.
44. Richards DA, Borglin G. Complex interventions and nursing: Looking through a new lens at nursing research. *Int J Nurs Stud*. 2011;48(5):531-533.
45. Howson FFA, Sayer AA, Roberts HC. The impact of trained volunteer mealtime assistants on dietary intake and satisfaction with mealtime care in adult hospital inpatients: A systematic review. *J Nutr Health Aging*. 2017;21(9):1038-1049.
46. Munk T, Tolstrup U, Beck AM, Holst M, Rasmussen HH, Hovhannisyan K, et al. Individualised dietary counselling for nutritionally at-risk older patients following discharge from acute hospital to home: a systematic review and meta-analysis. *J Hum Nutr Diet*. 2016;29(2):196-208.
47. Rasmussen NML, Belqaid K, Lugnet K, Nielsen AL, Rasmussen HH, Beck AM. Effectiveness of multidisciplinary nutritional support in older hospitalised patients: A systematic review and meta-analyses. *Clin Nutr ESPEN*. 2018;27:44-52.
48. Jefferies D, Johnson M, Ravens J. Nurturing and nourishing: The nurses' role in nutritional care. *J Clin Nurs*. 2011;20(3-4):317-330.
49. Sundel M, Sundel SS. Behavior change in human services: Behavioral and cognitive principles and applications. 6th ed. Los Angeles: SAGE Publications Inc; 2018.
50. Bachrach – Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff working with older people towards nutritional nursing care. *J Clin Nurs*. 2007;16(11):2007-2014.
51. Boaz M, Rychani L, Barami K, Houry Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs*. 2013;44(8):357-364.
52. Bell J, Bauer J, Capra S, Pulle CR. Barriers to nutritional intake in patients with acute hip fracture: time to treat malnutrition as a disease and food as a medicine? *Can J Physiol Pharmacol*. 2013;91(6):489-495.
53. Lassen KO, Grinderslev E, Nyholm R. Effect of changed organisation of nutritional care of Danish medical inpatients. *BMC Health Serv Res*. 2008;8:168.
54. Robison J, Pilgrim AL, Rood G, Diaper N, Elia M, Jackson AA, et al. Can trained volunteers make a difference at mealtimes for older people in hospital? A qualitative study of the views and experience of nurses, patients, relatives and volunteers in the Southampton Mealtime Assistance Study. *Int J Older People Nurs*. 2015;10(2):136-145.
55. 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(1):41-46.
56. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs*. 2009;18(3):431-439.
57. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42.
58. Michie S, Atkins L, West R. The behaviour change wheel. A guide to designing interventions. Sutton: Silverback Publishing; 2014.
59. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M, et al. Developing and evaluating complex interventions: the new medical research council guidance. *BMJ*. 2008;337:979-983.
60. van Meijel B, Gamel C, van Swieten – Duijffes B, Grypdonck MHF. The development of evidence-based nursing interventions: methodological considerations. *J Adv Nurs*. 2004;48(1):84-92.





PART 1

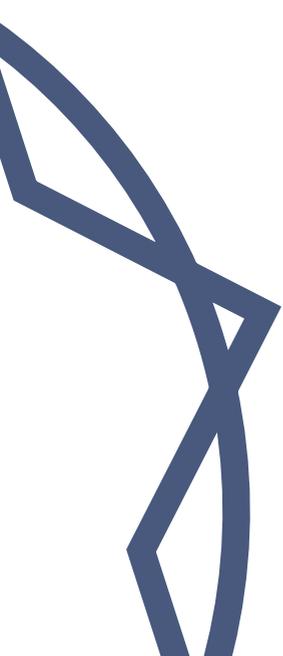
**Current state of evidence in  
nursing nutritional care**



# 2

## Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review

Debbie ten Cate, Roelof G.A. Ettema, Getty Huisman – de Waal, Jack J. Bell,  
Remco Verbrugge, Lisette Schoonhoven, Marieke J. Schuurmans, On behalf of the Basic Care  
Revisited Group (BCR)



## Abstract

**Aims and objectives:** To identify interventions to prevent and treat malnutrition in older adults, which can be integrated in nursing care, and to evaluate the effects of these interventions on outcomes related to malnutrition.

**Background:** Older adults are at great risk for malnutrition, which can lead to a number of serious health problems. Nurses have an essential role in nutritional care for older adults. Due to a lack of evidence for nursing interventions, adequate nursing nutritional care still lags behind.

**Design:** Systematic review.

**Method:** We searched for and included randomised controlled trials on interventions, which can be integrated in nursing care for older adults, to prevent and treat malnutrition. We assessed the risk of bias with the Cochrane tool and evidence for outcomes with the GRADE. The PRISMA statement was followed for reporting.

**Results:** We included 21 studies of which 14 studies had a high risk of bias. Identified interventions were oral nutritional supplements, food/fluid fortification or enrichment, dietary counselling and educational interventions. In evaluating the effects of these interventions on 11 outcomes related to malnutrition, significant and non-significant effects were found. We graded the certainty of evidence as very low to moderate.

**Conclusion:** Although slight effects were found in protein intake and body mass index, there is no convincing evidence about the effectiveness of the four identified interventions. There seems no harm in using these interventions, although it should be kept in mind that the evidence is sparse. Therefore, there is a need for high-quality research in building evidence for interventions in nursing nutritional care.

**Relevance to clinical practice:** Nurses can safely provide oral nutritional supplements and food/fluid fortification or enrichment, and give dietary counselling and education to older adults, as they are well placed to lead the essential processes of nutritional care to older adults.

## Introduction

Malnutrition is a frequent and major problem among older adults.<sup>1,2</sup> The prevalence of malnutrition and risk for malnutrition in older adults across settings varies considerably: up to 30% of older adults in the community,<sup>3</sup> 56% – 63% of older community-dwelling adults who receive home care,<sup>3,4</sup> 48% – 76% of older adults in hospitals,<sup>3,5,6</sup> up to 78% of older adults in nursing homes and institutional long-term care.<sup>3</sup> In older adults with cognitive impairment and geriatric syndrome, the prevalence is up to 83% and 44%, respectively.<sup>7,8</sup> This substantial variance in malnutrition prevalence data reported across studies could be explained by genuine population differences, combined with the lack of a gold standard for malnutrition screening, diagnosis and monitoring.<sup>9</sup>

Malnutrition is a complex issue in older adults due to diversity in aetiology and wide range of determinants.<sup>2</sup> Malnutrition is associated with a variety of diseases and related conditions such as poor oral health,<sup>5</sup> change in taste,<sup>6</sup> difficulties chewing and swallowing,<sup>6</sup> lower cognitive and functional status,<sup>10</sup> infections<sup>6</sup> and depressive symptoms.<sup>6</sup> Also, social factors such as living alone are associated with malnutrition.<sup>11</sup> The presence of malnutrition leads to a reduced quality of life,<sup>12</sup> increased morbidity,<sup>6,10</sup> mortality,<sup>4</sup> use of healthcare facilities and costs.<sup>4,6</sup>

Nurses have an essential role in malnutrition risk screening, nutritional treatment and monitoring to ensure appropriate delivery of oral nutritional care,<sup>1,2,13</sup> which is the first choice in nutritional treatment for older adults with malnutrition and risk for malnutrition.<sup>2</sup> Nurses perform this role in different nursing care settings.<sup>2</sup> Nursing activities regarding nutritional care are essential elements of basic nursing care<sup>14</sup> and should be supported by evidence for effectiveness. However, this evidence is often lacking.<sup>15</sup>

In a number of systematic reviews and meta-analyses, one or more evidence-based interventions for the prevention and treatment of malnutrition to support oral nutritional care are described.<sup>16-23</sup> These systematic reviews and meta-analyses have illustrated contrasting results with both significant and non-significant effects on outcomes related to malnutrition. Studies with sufficient risk of bias were included in these systematic reviews and meta-analyses, which makes cautious interpretation of the results necessary. Most of the systematic reviews and meta-analyses focus on rather specific populations and/or specific conditions and/or specific care settings.

None of the systematic reviews and meta-analyses focuses on all types of interventions. In the current healthcare environment, nursing care is increasingly directed towards older adults with multiple comorbidities. This population has been excluded from these previous systematic reviews and meta-analyses. Moreover, the results have not been translated into nursing care activities, and as a consequence, these results are not applied into nursing practice. This is unfortunate, as multimorbidity among older adults is common and malnutrition is a serious disease.<sup>2</sup>

In conclusion, evidence-based nursing interventions to support oral nutrition that might be effective for prevention and treatment of malnutrition in older adults with various conditions, across diverse settings are lacking. Also, the interventions evaluated in existing literature have no explicit conceptualisation of the role of nurses in nutritional care for older adults. Therefore, a complete overview of interventions, which can be incorporated in nursing care, is missing.

## Aims

We systematically reviewed the literature to identify interventions to prevent and treat malnutrition in hospitalised, institutionalised and community-dwelling older adults with different health conditions, which can be integrated in nursing care. We also evaluated the reported effects of these interventions on outcomes related to malnutrition.

## Methods

In conducting and reporting this systematic literature review, we followed the PRISMA Statement and Cochrane Handbook for Systematic Reviews of Interventions.<sup>24,25</sup>

### Search strategy

For identifying eligible studies, a systematic search was performed in the databases PubMed, EMBASE, CENTRAL, CINAHL and PsycINFO. The search queries were formulated by one reviewer (DtC) using the PICO framework and validated independently by another reviewer (RE). Search queries included keywords from the title and abstract, and index terms from the databases. Limitations to the search were made on publication type ((controlled clinical) trial) and language (English). In the last decades, nursing care has changed under influence of huge changes in

health care.<sup>15</sup> Therefore, the publication date was limited from September 2005 – September 2018 to find up-to-date publications with potential interventions, which might fit with current nursing care. The PICO, search queries and outcomes of the search strategy can be found in Appendix 1. In addition, reference lists of assessed articles were screened manually (DtC) and study authors were contacted (DtC) to identify relevant studies.

## Eligibility criteria

The eligibility criteria are displayed in Table 1.

**Table 1.** Eligibility criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>Older adults (mean or median age <math>\geq</math> 70 years), who were in hospital, institutionalised care or living in the community</li> <li>Older adults with various common ageing conditions, like chronic obstructive pulmonary disease, diabetes mellitus, cardiovascular diseases or those who were healthy</li> <li>The intervention described could potentially be carried out by nurses</li> <li>Studies reporting the effects on malnutrition-related outcomes, which can potentially be assessed by nurses: nutritional assessment, body weight, energy and protein intake, BMI, mid-upper arm circumference, calf circumference, waist circumference, triceps skinfold, handgrip strength and ADL function</li> <li>Randomised intervention studies with comparison between an intervention and control group</li> <li>Studies with sufficient sample size based on an a priori power analysis</li> </ul>	<ul style="list-style-type: none"> <li>Older adults diagnosed with a rare disease or in the end stage of a disease</li> <li>Studies in which an intervention was part of a multicomponent intervention where this intervention could not be distinguished from the other components</li> <li>Medication studies</li> <li>Studies where the method of administration of the intervention was enteral by tube or through parenteral route</li> <li>Intervention studies focusing on general healthcare services</li> <li>Intervention studies focusing on material and technique</li> <li>Intervention studies focusing on (quality) management</li> <li>Intervention studies focusing on cost-effectiveness and economic health care</li> </ul>

*Abbreviations:* ADL = activities of daily living; BMI = body mass index.

We included adults aged 70 and above, because malnutrition is related to frailty and multimorbidity, which amongst other factors, is dependent on increased age.<sup>2</sup> Also, inclusion required the intervention to be feasible for nurses to deliver in direct client or patient care. Feasibility was assessed using three items from the feasibility section of the Dutch version of the checklist for randomised clinical trials of the Cochrane Collaboration.<sup>24</sup> These items were as follows: ‘Similarity between the patients of the study and own patient(s)’, ‘Feasibility in own clinical practice’ and ‘Advantages and disadvantages of treatment for the patient’. We extended the terms ‘own patient(s)’ and ‘own clinical practice’ to patients or clients who met the eligibility criteria of our

study and who are users of the Dutch healthcare system. This was to prevent excluding patients or clients in advance and hence create selection bias. A different composition of two reviewers with considerable work experience within nursing practice and/or nursing education discussed feasibility until agreement was reached. These two reviewers were DtC with RV or AO; DtC or RV with another member of the project group. The project group consisted of nurse lecturers and/or researchers. Their role in this systematic review was to assess methodological quality of studies and feasibility of interventions in nursing care. A study was included if the effects on malnutrition-related outcomes, which can potentially be assessed by nurses, were reported. Malnutrition-related outcomes were derived from national and international guidelines.<sup>1,13</sup> Assessment of these outcomes by nurses was judged by two reviewers (DtC and RE) based on: 1) the outcome belongs to the domain of nursing nutritional care; and 2) the outcome is not reserved for other professions. Per outcome, both criteria were also discussed with a dietitian and a physiotherapist, who are both scientific researchers, until agreement was achieved. These outcomes were as follows: 1) outcomes on nutritional assessment; 2) outcomes on nutrition intake: body weight, energy and protein intake; 3) outcomes on body composition: body mass index (BMI), mid-upper arm circumference, calf circumference, waist circumference, triceps skinfold; and 4) outcomes on physical function: handgrip strength and activities of daily living (ADL) function. Studies were included when sample size was sufficiently based on an a priori analysis. This was calculated in the statistical package R by one reviewer (DtC) and validated by a second reviewer (RE). Power was determined at 80% and the p-value at 5% (two-sided). Information to calculate sample size was abstracted from the study itself. A prerequisite was reporting of this information in the article. Studies on older adults diagnosed with a rare disease or in the end stage of a disease were excluded. In these older adults, nutritional care might be different than in older adults with more common conditions, like chronic obstructive pulmonary disease, diabetes mellitus, cardiovascular diseases or with older adults who were healthy. We excluded studies focussing on cost-effectiveness and economic health care. However, we did use these studies as a source to find randomised clinical trials on which these studies were based.

### **Study selection**

After selection on titles, all titles and subsequent abstracts from studies remaining were screened for eligibility in three rounds by two reviewers per round (DtC with RE [1<sup>st</sup>], RV [2<sup>nd</sup>], AO [3<sup>rd</sup>]). Differences in judgement were discussed and resolved by consensus. Next, full-text articles were read and screened by two reviewers (DtC with RV or AO).

## Assessment of methodological quality of studies

Methodological quality was assessed using the Dutch version of the checklist for randomised clinical trials of the Cochrane Collaboration.<sup>24</sup> Full information about the methodological features of this checklist is illustrated in Appendix 2. The CONSORT 2010 checklist of information<sup>26</sup> was used for judgement on reporting. A pilot for using both checklists was done on two included studies by three reviewers (DtC, RV, RE). The methodological quality of studies was independently assessed by two reviewers (DtC with RV or AO; DtC or RV with another member of the project group). Agreement was achieved in consensus meetings. Both the Cochrane Collaboration and the CONSORT 2010 checklist were used to fill in the revised Cochrane risk-of-bias tool for randomised trials<sup>27</sup> and the Grading of Recommendations Assessment, Development and Evaluation (GRADE) method.<sup>28</sup> The risk of bias was determined with the Cochrane tool. The five domains of the risk-of-bias tool are presented in Appendix 3. The GRADE was used to rate evidence for outcomes across included studies.

## Data extraction

Using a structured process by one reviewer (DtC) and checked by another reviewer (RE), the following data were extracted: first author, year of publication, country of data collection, source of funding, study design, participant characteristics such as age, gender, nutritional status at baseline and screening or assessment tool used, number of participants in the study groups, setting, description of the intervention and control including intervention period, method of data collection and analysis, outcomes related to malnutrition, which could be assessed by nurses, methods used for measurement of outcomes and length of follow-up. For the results, a narrative synthesis method was employed, because data were not comparable due to heterogeneous interventions and outcomes.

# Results

## Results of search

The searches in the databases yielded 2,535 citations (Figure 1). By contacting study authors, three additional records about ongoing trials were identified. Additionally, 86 articles were manually identified through reference lists of assessed articles. After removing 671 duplicates and excluding 1,855 articles after screening for eligibility 98 articles remained. These were reviewed full text for eligibility and methodological quality assessment. Based on the eligibility criteria, 77 articles were excluded. A total of 21 articles were included in the narrative analysis.

## Characteristics of the studies

Table 2 shows the main characteristics of included studies. Of the included studies, 16 studies had a two-arm randomised controlled trial (RCT) design.<sup>29-44</sup> One study had a two-arm cluster RCT design,<sup>45</sup> and three studies had a three-arm RCT design.<sup>46-48</sup> One study had a randomised crossover design.<sup>49</sup> The number of included participants ranged from 39 – 946. The percentage of participants who dropped out, were lost to follow-up or discontinued the intervention ranged from 0% – 35.8%.

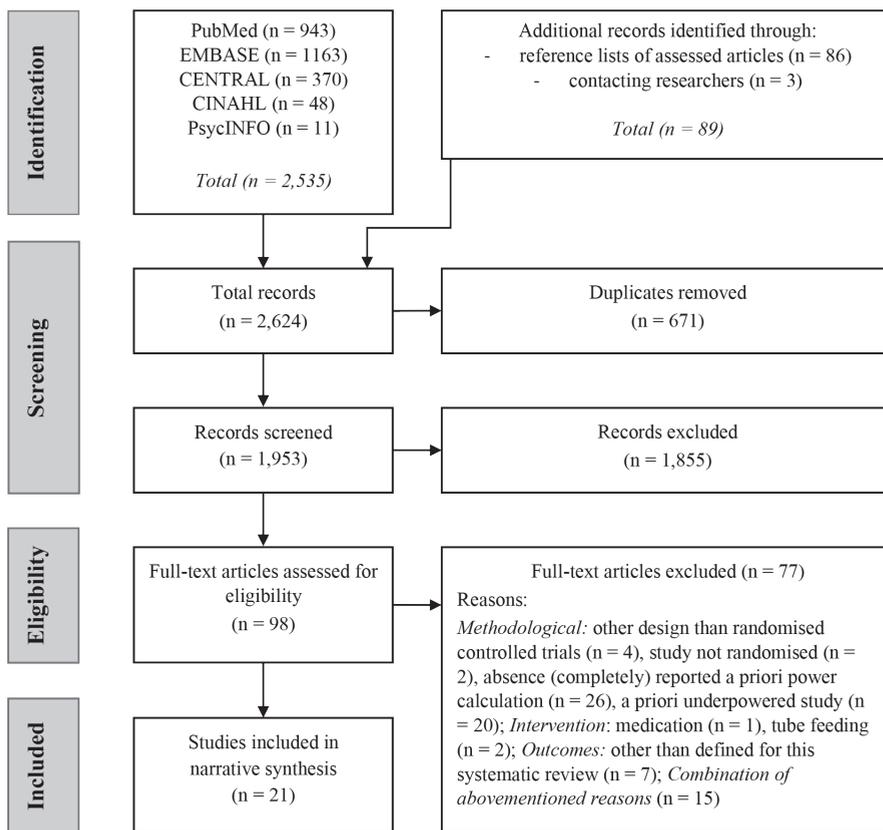


Figure 1. Flow diagram of study selection process recommended by the PRISMA Statement<sup>25</sup>

**Risk of bias of included studies**

Three studies were considered to have a low risk of bias,<sup>37,40,47</sup> whereas four studies showed some concerns<sup>29,32,35,36</sup> and 14 studies were assessed to be at high risk of bias (Table 2).<sup>30,31,33,34,38,39,41-46,48,49</sup> Main threats for the methodological quality were as follows: 1) blinding of participants, caregivers, assessors and/or research data analysts was either not performed in the study or reported in the article; 2) lack of reporting significance of differences in baseline characteristics between intervention and control group; 3) incomplete data for all outcomes and absence of intention-to-treat analysis; and 4) lack of transparency in complete reporting due to absence of detailed information from previously published study protocols. A summary of methodological features and items reported, and an overview of the five reviewed domains of the risk-of-bias tool for each of the 21 included studies is provided in Appendices 2 and 3, respectively.

Table 2. Characteristics of included studies

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Andersson et al. (2017) <sup>39</sup> Norway, Sweden	Rehabilitation A (mean): 75.2, 75.5 F (%): 69, 75 C: At risk of malnutrition or malnourished n: 52, 48	NRS-2002 <sup>d</sup> : Score 3-4: 88, 90 Score 5-7: 12, 10	IG: Standard care during rehabilitation including general advice on nutrition, and nutritional counselling by telephone and at home with focus on good nutritional status after discharge; 10 weeks after discharge  CG: Standard care including general advice on nutrition; During rehabilitation	Body weight (kg) (3 months)	RCT  4
Beelen et al. (2018) <sup>30</sup> the Netherlands	Hospital A (mean): 77.7, 79.2 F (%): 55.2, 55.0 C: Admitted to the departments of geriatrics/internal medicine or pulmonary medicine, LOS $\geq$ 4 days, without risk of developing refeeding syndrome n: 27-67, 32-80	MUST <sup>i</sup> : Score 1: 13.4, 11.3 Score $\geq$ 2: 22.4, 11.3	IG: Protein-enriched products added or replacing regular products besides standard energy- and protein-rich hospital menu; 2 days after hospital admission until hospital discharge  CG: Standard energy- and protein-rich hospital menu; 2 days after hospital admission until hospital discharge	Energy intake (kcal, kcal/kg), protein intake (g, g/kg, EN%), protein intake per meal (g), protein intake: patients reaching 1.2 g/kg/day and 1.5 g/kg/day (%) (At day 4 in hospital)	RCT  1

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Botella-Carretero et al. (2008) <sup>66</sup> Spain	Hospital A (mean): 83.1, 83.7, 84.6 F (%): 90, 76.7, 70 C: Hip fracture requiring orthopaedic surgery n: 30, 30, 30	MNA <sup>45</sup> : 18.7 ± 4.2, 19.4 ± 3.6, 20.5 ± 2.9	<b>IG:</b> Standard diet; During hospitalisation; Protein powder, 10 g packet with 9 g protein and 38 kcal, 4 packets per day; Start 48 hr after surgery and maintained after hospital discharge  <b>CG:</b> Standard diet; During hospitalisation; ONS, 200 ml with 18.8 g protein and 250 kcal, 2 bricks per day; Start 48 hr after surgery and maintained after hospital discharge	Body weight (kg), energy intake (kcal/day, kcal/kg), protein intake (g/day, g/kg), BMI (kg/m <sup>2</sup> ), MUAC (cm), TSF (mm)  (During hospitalisation)	RCT  3
Cramer et al. (2016) <sup>31</sup> USA, Spain, Italy, UK	Community A (median): 77, 77 F (%): 62, 62 C: Malnutrition, sarcopenia n: 39-131, 46-146	SGA <sup>44</sup> : B: 99.4, 100 C: 0.6, 0	<b>IG:</b> ONS, 220 ml with 330 kcal, 20 g protein, 11 g fat, 36 g carbohydrate, 1.5 g CaHMB, 499 IU vitamin D3, and additional nutrients, 2 servings per day; 24 weeks  <b>CG:</b> ONS, 220 ml with 330 kcal, 14 g protein, 11 g fat, 44 g carbohydrate, 147 IU vitamin D3, and additional nutrients, 2 servings per day; 24 weeks	Body weight (kg), energy intake (kcal/day), protein intake (g/kg/day), BMI (kg·m <sup>-3</sup> ), HGS (kg) (12 and 24 weeks)	RCT  3

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration Control; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Deutz et al. (2016) <sup>32</sup> USA	Hospital A (mean): 77.7, 78.1 F (%): 52.4, 51.8 C: Congestive heart failure, acute myocardial infarction, pneumonia, or chronic obstructive pulmonary disease, malnutrition n <sup>c</sup> : 150-313, 137-309	SGA <sup>4</sup> : B: 87.9, 86.7 C: 12.1, 13.3	IG: HP-HMB ONS, 237 ml with 350 kcal, 20 g protein, 11 g fat, 44 g carbohydrate, 1.5 g calcium-HMB, 160 IU vitamin D and other micronutrients, 2 servings per day; During hospitalisation till 90 days postdischarge  CG: Placebo ONS, 237 ml with 48 kcal, 12 g carbohydrate, 10 mg vitamin C, but no other nutrients, 2 servings per day; During hospitalisation till 90 days postdischarge	Nutritional status (SGA) (score), body weight (kg), ADL function (Katz Index) (score) (30, 60 and 90 days)	RCT  4
Ekinci et al. (2016) <sup>33</sup> Turkey	Hospital A (mean): 82.19, 83.07 F (%): 100, 100 C: Hip fracture treated with hemiarthroplasty, risk of malnutrition n <sup>c</sup> : 32, 30	NRS-2002 <sup>4</sup> : Score 3: 68.8, 53.3 Score 4: 31.3, 46.7	IG: ONS, 220 ml with 3 g CaHMB, 1,000 IU vitamin D, and 36 g protein, in addition to the standard postoperative nutrition plan containing 1,900 kcal and 76 g protein, 2 bottles per day; 30 days  CG: Standard postoperative nutrition plan containing 1,900 kcal and 76 g protein; NR	Body weight (kg), BMI (kg/ m <sup>2</sup> ), MUAC (cm), CC (cm), TSF (mm), HGS (kgf) (15 and 30 days)	RCT  1

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline IG, CG, (IGz)	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Fernández – Barrés et al. (2017) <sup>34</sup> Spain	Community with home care A (mean): 84.3, 85.4 F (%): 71.3, 63.9 C: Difficulties to perform ADL, be caregiver dependent and have a caregiver, at risk of malnutrition n: 63, 48	MNA <sup>d</sup> : 20.6 ± 2.0, 19.9 ± 2.7	IG: Nursing nutrition education sessions on preventing the increasing risk of malnutrition in dependent patients with one individual (for caregiver and patient) and one group session (for caregivers) and individual dietary monitoring of the patient at 6 and 12 months; 12 months  CG: One visit to complete an initial assessment, receiving regular care during home care visits and study-specific visits at 6 and 12 months; 12 months	Nutritional status (MNA) (score), body weight (kg), energy intake (kcal/day), protein intake (g/day), BMI (kg/m <sup>2</sup> ), ADL function (BI) (score)  (6 and 12 months)	RCT  2
Gariballa et al. (2006) <sup>35</sup> UK, United Arab Emirates	Hospital A (mean): 77.1, 76.3 F (%): 48.4, 46.4 C: Admitted to the hospital n: 119–222, 106–223	Body weight (kg): 65.7 ± 13.7, 66.7 ± 13.1 BMI (kg/m <sup>2</sup> ): 25.0 ± 4.3, 25.2 ± 4.1 MUAC (cm): 28.0 ± 3.8, 28.3 ± 3.5 TSF (mm): 15.5 ± 6.5, 15.8 ± 6.6 Albumin (g/L): 37.9 ± 4.7, 37.8 ± 4.6 Transferrin (g/L): 2.1 ± 0.5, 2.2 ± 0.5	IG: ONS, 200 ml with 995 kcal and 100% of the reference nutrient intakes for vitamins for a healthy older person, 2 bottles per day; 6 weeks  CG: Placebo ONS, 200 ml with 60 kcal and no other nutrients, 2 bottles per day; 6 weeks	Body weight (kg), BMI (kg/m <sup>2</sup> ), MUAC (cm), TSF (mm), ADL function (BI) (score)  (6 months)	RCT  4

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Hin et al. (2017) <sup>47</sup> UK, USA	Participants Community A (mean): 71, 72, 72 F (%): 49, 49, 50 C: Healthy, ambulatory n <sup>o</sup> : 102, 101, 102	IG, CG, (IGz) Body weight (kg): 77 ± 17, 79 ± 15, 78 ± 15 BMI (kg/m <sup>2</sup> ): 27 ± 5, 28 ± 5, 27 ± 4 HGS (kg): 25 ± 11, 25 ± 11, 25 ± 11	Control; Duration IG: Supplementation with vitamin D <sub>3</sub> , 4,000 IU, daily; 12 months IGz: Supplementation with vitamin D <sub>3</sub> , 2,000 IU, daily; 12 months CG: Placebo, daily; 12 months	Body weight (kg), BMI (kg/ m <sup>2</sup> ), HGS (kg) (12 months)	RCT 5
Kim and Lee (2013) <sup>46</sup> Republic of Korea	Community A (mean): 78.9, 78.4 F (%): 79.1, 79.6 C: Low income, gait speed < 0.6 m/s, at risk of malnutrition or malnourished n <sup>o</sup> : 41, 43	MNA <sup>4</sup> : 17.9 ± 3.0, 17.9 ± 3.3	IG: ONS, 200 ml with 200 kcal, 12.5 g of protein, 4.7 g essential amino acids, 28 g carbohydrate, 4.5 g lipid, and micronutrients, 2 cans per day; 12 weeks CG: No treatment	Body weight (kg), energy intake (kcal/day), protein intake (g/day), MUAC (cm), HGS (kg) (12 weeks)	RCT 4
Luger et al. (2016) <sup>37</sup> Austria	Community A (mean): 83.0, 82.5 F (%): 85, 83 C: Recently discharged from hospital, (pre)frail, able to walk, at risk of malnutrition or malnourished n <sup>o</sup> : 39, 41	MNA <sup>4</sup> : At risk: 46, 44 Malnutrition: 5, 2	IG: Six strength exercises within a circuit training session and discussion about fluid intake, animal and plant protein intake and energy intake, both performed by nonprofessional volunteers, 2 times per week; 12 weeks CG: Social contact with nonprofessional volunteers and cognitive training, 2 times per week; 12 weeks	Nutritional status (MNA) (score and %) (12 weeks)	RCT 5

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Munk et al. (2014) <sup>38</sup> Denmark, Sweden	Hospital A (mean): 75, 74 F (%): 61, 55 C: Admitted to the departments Oncology, Orthopaedics, Urology, LOS ≥ 3 days, at risk of malnutrition n: 41, 40	NRS-2002 <sup>4</sup> : Score 3: 29.3, 20	IG: Small dishes enriched with natural energy-dense ingredients and supplemented with protein powder served besides standard hospital food service with no restriction on amount; During hospitalisation with maximum 7 days  CG: Standard hospital food; During hospitalisation	Body weight (kg), participants reaching ≥75% energy and protein requirement (%), energy intake (kJ, kJ/kg), protein intake (g, g/kg), HGS (kg) (During hospitalisation)	RCT  3
Myint et al. (2013) <sup>39</sup> China	Hospital A (mean): 80.9, 81.7 F (%): 68.9, 63.3 C: Femur fracture surgically repaired n: 54-61, 49-60	MUST <sup>4</sup> : High risk: 21.3, 15.3	IG: Usual care, additional oral vitamin D supplement, 800–1,000 IU and calcium, 1,200 mg, both daily; ONS, 240 ml with 250 kcal and 9-12 g protein, 2 bottles per day; Within 3 days after hospital admission till discharge or 28 days  CG: Usual care, additional oral vitamin D supplement, 800–1,000 IU and calcium, 1,200 mg, both daily; NR	Energy intake (kcal/day), protein intake (g/day), BMI (kg/m <sup>2</sup> ), MUAC (cm), TSF (mm) (During hospitalisation, at discharge, 4 weeks after discharge)	RCT  2

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment: Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Neelemaat et al. (2011) <sup>60</sup> the Netherlands	Hospital A (mean): 74.6, 74.4 F (%): 53.3, 57.1 C: LOS > 2 days, admitted to different internal and surgical departments, malnutrition n: 48-73, 31-74	BMI $\leq 20$ kg/m <sup>2</sup> : 55.2, 53.3 Weight change last month (kg): -4.5, -4.0 Weight change past six months (kg): -9.4, -9.1	IG: Standardised nutritional support with energy- and protein-enriched diet, during hospital admission; energy- and protein-enriched ONS, 2 cans per day and 400 IE vitamin D3 and 500 mg calcium per day, during hospital admission till 3 months after discharge; six times telephone counselling by a dietitian to give advice and to stimulate compliance to the proposed nutritional intake; 3 months after discharge CG: Usual care	Body weight (kg), HGS (kg), ADL function (LASA) Functional Limitation Questionnaire (score) and LASA Physical Activity Questionnaire (score) (3 months)	RCT 5
Pedersen et al. (2016) <sup>48</sup> Denmark	Community A (mean): 86.4, 86.3, 85.6 F (%): 78, 82, 90 C: Living alone, recently discharged from hospital, at risk of malnutrition or malnourished n: 52, 54, 51	MNA <sup>4</sup> : Score 17-23: 53, 55, 56 Score <17: 47, 45, 44	Standard care, during hospital stay; Individual nutritional counselling of patient and caregiver by a dietitian based on nutritional needs with: IG: three home consultations, each consultation: 45 minutes; 4 weeks after discharge IG2: three telephone consultations, each consultation: 15 minutes; 4 weeks after discharge CG: Standard care; During hospital stay	Nutritional status (MNA) (score), HGS (kg), ADL function (BD) (score) (8 weeks)	RCT 3

Table 2. Continued

Author (year), Country	Setting	Nutritional assessment <sup>a</sup> : Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration Control; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design Study quality <sup>b</sup>
Rondanelli et al. (2016) <sup>41</sup> Italy, USA	Hospital A (mean): 80.77, 80.21 F (%): 58, 61 C: Relative muscle mass < 7.26 kg/m <sup>2</sup> (men) and < 5.5 kg/m <sup>2</sup> (women), stable body weight n <sup>c</sup> : 69, 61	MNA <sup>4</sup> : 17.84 ± 3.07, 17.84 ± 3.57	IG: Powder of essential amino acid, whey protein, and vitamin D mixture (32 g), 1 portion per day, concurrent with controlled physical activity program, 20 min, 5 times per week; 12 weeks CG: Placebo, concurrent with controlled physical activity program, 20 min, 5 times per week; 12 weeks	Nutritional status (MNA) (score), body weight (kg), energy intake (kcal/day), protein intake (g/day), BMI (kg/m <sup>2</sup> ), WC (cm), HGS (kg), ADL function (Katz Index) (score) (12 weeks)	RCT 3
Salvà et al. (2011) <sup>45</sup> Spain, France, Switzerland	Community A (mean): 79.4, 78.6 F (%): 67, 69.1 C: Mild or moderate dementia, living with caregiver n <sup>c</sup> : 448, 498	MNA <sup>4</sup> : At risk: 51.5, 34.5 Malnutrition: 7.8, 2.8	IG: Teaching and training intervention for patient, caregiver and professional with: 1) information about Alzheimer's disease, nutrition and nutritional problems, physical exercise, available aid and services; 2) support in weight monitoring; 3) action protocols and standardised help decision trees related to malnutrition risk for professionals; NR CG: Usual care	Nutritional status (MNA), (score), body weight (kg), BMI (kg/m <sup>2</sup> ), ADL function (Activities of Daily Living scale) (6 and 12 months)	RCT 3
Sharma et al. (2017) <sup>42</sup> Australia	Hospital A (mean): 82.0, 81.6 F (%): 60.3, 67.1 C: Malnourished n <sup>c</sup> : 57, 46	PG-SGA <sup>4</sup> : B: 90.5, 87 C: 9.5, 13	IG: Nutritional intervention to meet 100% of patients' energy and protein requirements CG: Usual care	Nutritional status (PG-SGA) (score), body weight (kg), BMI (kg/m <sup>2</sup> ), MUAC (cm), TSF (mm), HGS (kg) (3 months)	RCT



Table 2. Continued

Author (year), Country	Setting	Nutritional assessment*: Nutritional status at baseline IG, CG, (IG2)	Intervention; Duration	Nutritional outcomes assessed by nurses (Time measurements)	Design
Veronese et al. (2014) <sup>44</sup> Italy	Community A (mean): 71.8, 71.3 F (%): 100, 100 C: Healthy, attending a fitness program, 25(OH)D concentrations $\geq 50$ nmol/L n <sup>c</sup> : 53, 71	HGS: 22.08 $\pm$ 5, 21.16 $\pm$ 5.81	<b>Control; Duration</b> IG: Oral magnesium supplementation, 300 mg, 1 tablet per day; 12 weeks  CG: No placebo or intervention	Body weight (kg), BMI (kg/m <sup>2</sup> ), HGS (kg) (12 weeks)	RCT  2
Ziylan et al. (2016) <sup>49</sup> the Netherlands	Community A (mean): 70.5 F (%): 54.3 C: Healthy, without dietary restrictions n <sup>c</sup> : 120	MNA-SF <sup>d</sup> : At risk: 1.7	Four different beef or chicken meals: 1) 25 g protein and 450 g portion size, 2) 30 g protein and 450 g size, 3) 25 g protein and 400 g size, 4) 30 g protein and 400 g size, one of these variants once a week at lunchtime; 4 weeks  CG: Crossover	Energy intake (kJ), protein intake (g)  (After each meal)	Randomised crossover  0

*Abbreviations:* A = age (years); ADI = activities of daily living; BI = Barthel Index; BMI = body mass index; C = condition (of older participants); CaHMB = calcium  $\beta$ -hydroxy  $\beta$ -methylbutyrate; CC = calf circumference; CG = control group; F = female; HGS = handgrip strength; HP-HMB = high-protein  $\beta$ -hydroxy- $\beta$ -methylbutyrate; IG = intervention group; IG2 = intervention group 2; LOS = length of stay; MNA = Mini Nutritional Assessment; MNA-SF = Mini Nutritional Assessment short-form; MUAC = mid-upper arm circumference; MUST = Malnutrition Universal Screening Tool; NR = not reported; NRS-2002 = Nutritional Risk Screening-2002; ONS = oral nutritional supplement; PG-SGA = Patient Generated Subjective Global Assessment; SGA = Subjective Global Assessment; TSF = triceps skinfold; WC = waist circumference.

<sup>a</sup> Data are presented as %, mean  $\pm$  SD, or median (first quartile – third quartile).

<sup>b</sup> Based on the revised Cochrane risk-of-bias tool for randomised trials, where no. of items at low risk (out of 5) is shown.<sup>27</sup>

<sup>c</sup> Sample size during analysis.

<sup>d</sup> NRS-2002: score  $\geq 3$ : at risk for malnutrition; MUST: score = 1: medium risk for malnutrition, score  $\geq 2$ : high risk for malnutrition; MNA: score 17–23.5: at risk of malnutrition, score <17: malnutrition; (PG-)SGA: category B: mild-moderate malnutrition, category C: severe malnutrition; MNA-SF: score 8–11: at risk of malnutrition, score <7: malnutrition.

### **Participants**

As shown in Table 2, the mean age of the participants ranged from 70.5 – 87 years. Most studies included participants who were admitted to a hospital, followed by studies including participants living in the community with or without home care, or nursing homes, or admitted to a rehabilitation institution. Included participants were healthy, frail or suffering from different conditions including malnutrition or risk for malnutrition, sarcopenia, dementia, hip or femur fractures, or chronic heart failure, acute myocardial infarction, pneumonia or chronic obstructive pulmonary disease. In most studies, malnutrition or risk for malnutrition at baseline was measured with different screening or assessment tools and ranged from 0% – 100%. Additionally, other studies reported the mean score on the MNA, which ranged from 17.8 – 20.6, or the median score on the MNA short-form (MNA-SF), which was 9, all scores indicating a risk for malnutrition. In the remaining studies, outcomes related to nutritional status, such as body weight, BMI, mid-upper arm circumference, triceps skinfold, handgrip strength, albumin or transferrin, were reported.

### **Identified interventions**

Four intervention types, which could be integrated in nursing care, were identified in the included studies. These are oral nutritional supplements, food/fluid fortification or enrichment, dietary counselling and educational interventions. In 19 studies, single component interventions were described.<sup>29-39,41,43-49</sup> In two studies, multicomponent interventions were described (Table 2).<sup>40,42</sup> Duration of these interventions ranged from the period of hospitalisation until 12 months after discharge. Duration of the intervention was not clearly reported in two studies.<sup>45,46</sup>

#### *Oral nutritional supplements*

In 12 studies, the intervention or part of a multicomponent intervention consisted of provision of oral nutritional supplements. Nutritional drinks with high nutrient and energy density were given to older adults in 10 studies.<sup>31-33,35,36,39,40,42,43,46</sup> Older adults received oral supplements with vitamin D<sub>3</sub> in one study,<sup>47</sup> magnesium in another study,<sup>44</sup> and vitamin D<sub>3</sub> and calcium in addition to nutritional drinks.<sup>40</sup> The oral nutritional supplements were given once or twice a day, or depending upon individual patients' needs in addition to the regular oral diet.

#### *Food/fluid fortification or enrichment*

In seven studies, the intervention or part of the intervention was provision of food/fluid fortification or enrichment given to older adults. In two studies, fortification was provided, where a powder with amino acid, whey protein and vitamin D,<sup>41</sup> or a protein powder<sup>46</sup> was dissolved in fluid. In the latter study with a three-arm RCT design, the

protein powder was provided to a second intervention group, where oral nutritional supplements were given to a first intervention group.<sup>46</sup> Protein-enriched food and drink products replacing regular products or added to the menu were served in one study.<sup>30</sup> In another study with a crossover design, participants consumed four beef meals and other participants consumed four chicken meals on four different days, once per week. These meals were composed with a difference in protein amount (25 g vs. 30 g) and portion size (normal vs. reduced) according to a 2x2 factorial design.<sup>49</sup> Small dishes enriched with natural energy-dense ingredients and fortified with protein powder were supplemented in one study.<sup>38</sup> In two multicomponent interventions, an energy- and protein-enriched diet<sup>40</sup> and fortified meals and drinks<sup>42</sup> were supplied.

### *Dietary counselling*

Four studies described dietary counselling. In the first study, individual tailor-made counselling was given to older adults and provided by telephone and home visits after discharge from a rehabilitation institution. The goal was how to achieve and maintain good nutritional status at home.<sup>29</sup> In the second study, nutritional counselling based on nutritional needs, tailored to individual preferences and circumstances was provided by a dietitian to older adults and informal caregivers after hospital discharge at home. Counselling was either given through home or telephone consultation.<sup>48</sup> In the third study, dietary counselling, as part of a multicomponent intervention, consisted of advice and stimulation to comply with the proposed nutritional intake by a dietitian through telephone counselling sessions.<sup>40</sup> In the last study, dietary counselling, as part of an individualised nutrition plan, was provided by dietitians to older patients. Counselling consisted of sessions, where information about recent weight was collected, side effects of the supplementation and compliance with the dietetic plan were discussed.<sup>42</sup>

### *Educational interventions*

Three studies focussed on educational interventions. In one study, nutritional education sessions were conducted by nurses targeting informal caregivers about preventing the increasing risk of malnutrition in dependent patients and individual dietary monitoring of patients at home.<sup>34</sup> One study examined a teaching and training intervention where patients and caregivers received information about Alzheimer's disease and nutrition, and support in weight monitoring. Also, caregivers followed education sessions administered by dietitians and professionals were provided with protocols related to malnutrition risk.<sup>45</sup> Patient education about fluid intake, animal and plant protein intake, and energy intake in combination with strength exercises within a circuit training given by nonprofessional volunteers was provided to older adults in another study.<sup>37</sup>

### **Nutritional outcomes assessed by nurses**

Table 3 describes the effects of the four types of interventions on 11 nutritional outcomes, which can be assessed by nurses. Detailed information about all outcomes is displayed in Appendix 4.

#### *Oral nutritional supplements*

In 12 studies, the effect of oral nutritional supplements on 10 nutritional outcomes was evaluated. These outcomes included nutritional status, body weight, energy intake, protein intake, BMI, mid-upper arm circumference, calf circumference, triceps skinfold, handgrip strength and ADL function. No significant differences were found in triceps skinfold and ADL function. On the other eight nutritional outcomes, there were significant as well as non-significant differences. Some studies described the effects on several nutritional outcomes, but were incomplete in reporting about the mean and/or standard deviation. These are: 1) change in body weight from baseline to 90 days, where no effect was found;<sup>32</sup> 2) change in energy and protein intake from baseline to 24 weeks, where protein intake showed significant improvement ( $p < 0.0001$ );<sup>31</sup> 3) BMI, mid-upper arm circumference and triceps skinfold;<sup>46</sup> and 4) body weight and BMI<sup>44</sup> were not significantly different between intervention and control group.

#### *Food/fluid fortification or enrichment*

The effect of food/fluid fortification or enrichment on 10 nutritional outcomes, i.e. nutritional status, body weight, energy intake, protein intake, BMI, mid-upper arm circumference, waist circumference, triceps skinfold, handgrip strength and ADL function was examined in seven studies. Non-significance in waist circumference was found in one study,<sup>41</sup> and in mid-upper arm circumference and triceps skinfold in two other studies.<sup>42,46</sup> In one study, energy and protein intake was similar after each meal between the groups receiving a normal-sized and lower-protein beef meal and a reduced-size and lower-protein beef meal, a normal-sized and enriched beef meal and a reduced-sized enriched beef meal. For protein intake, this was also the case for the groups receiving a chicken meal. There was no difference in energy intake between groups receiving a normal sized lower-protein chicken meal and a reduced-size lower protein chicken meal. There were significant differences in energy intake ( $p < 0.05$ ) and protein intake ( $p < 0.001$  or  $p < 0.05$ ) between the other groups receiving a beef or chicken meal with different sizes and protein enrichment.<sup>49</sup>

**Table 3.** Effect of four types of interventions on 11 nutritional outcomes, which can be assessed by nurses

Outcomes	Interventions:			
	Oral nutritional supplements (12 studies)	Fortification/ enrichment (7 studies)	Dietary counselling (4 studies)	Education (3 studies)
Nutritional status	<u>Effect:</u> Category A, SGA: IG: 45.5% CG: 30% Category B, SGA: IG: 52.1% CG: 66.3% Category C, SGA: IG: 2.4% CG: 3.8% (p = .009) <sup>32</sup>  <u>No effect</u> <sup>3:42,43</sup>	<u>Effect:</u> Change score MNA: IG: 1.76 ± 2.19 CG: 0.24 ± 3.4 (p = .003) <sup>41</sup>  <u>No effect</u> <sup>3:42</sup>	<u>No effect</u> <sup>3:42,48</sup>	<u>Effect:</u> Score MNA: IG: 21.4 ± 3.2 CG: 18.3 ± 3.8 (p < .001) <sup>34</sup>  Change score MNA: IG: 0.46 ± 3.98 CG: -0.66 ± 3.35 (p = .028) <sup>45</sup>  <u>No effect</u> <sup>3:37</sup>
Body weight	<u>Effect:</u> kg: IG: 55.8 ± 9.7 CG: 52.2 ± 8.4 (p = .002) <sup>43</sup>  <u>No effect</u> <sup>3:31-33,35,36,42,44,47</sup>	<u>Effect:</u> Change, kg: IG: 1.12 ± 3.12 CG: -0.89 ± 2.87 (p < .001) <sup>41</sup>  <u>No effect</u> <sup>3:38,42</sup>	<u>No effect</u> <sup>3:29,42</sup>	<u>No effect</u> <sup>3:34,45</sup>
Energy intake	<u>Effect:</u> kcal/day: IG: 1,124 ± 315 CG: 896 ± 277 (p = .008) <sup>36</sup>  IG: 1,480.5 ± 207.5 CG: 1,127.4 ± 211.2 (p < .000) <sup>39</sup>  <u>No effect</u> <sup>3:31,43,46</sup>	<u>Effect:</u> kcal/day: IG: 2,163 ± 570 CG: 2,061 ± 549 (p = .047) <sup>30</sup>  kcal/kg: IG: 31.1 ± 9.9 CG: 28.6 ± 10.2 (p = .02) <sup>30</sup>  IG: 24.6 ± 9.3 CG: 19.6 ± 7.9 (p = .013) <sup>38</sup>  kj: (p < .05) <sup>3,49</sup>  <u>No effect</u> <sup>3:38,41,46,49</sup>	-	<u>No effect</u> <sup>3:34</sup>

Table 3. Continued

Outcomes	Interventions:			
	Oral nutritional supplements (12 studies)	Fortification/enrichment (7 studies)	Dietary counselling (4 studies)	Education (3 studies)
Protein intake	<p><u>Effect:</u> <i>g/day:</i> (<math>p &lt; .0001</math>)<sup>b,31</sup></p> <p>IG: <math>54.7 \pm 21.2</math> CG: <math>32.7 \pm 10.3</math> (<math>p &lt; .001</math>)<sup>36</sup></p> <p>IG: <math>73.6 \pm 10.6</math> CG: <math>63.5 \pm 12.3</math> (<math>p &lt; .000</math>)<sup>39</sup></p> <p><i>g/kg:</i> IG2: <math>1.1 \pm 0.2</math> CG: <math>0.79 \pm 0.15</math> (<math>p &lt; .001</math>)<sup>46</sup></p> <p><u>No effect</u><sup>2,43</sup></p>	<p><u>Effect:</u> <i>g/day:</i> IG: <math>105.7 \pm 34.2</math> CG: <math>88.2 \pm 24.4</math> (<math>p &lt; .01</math>)<sup>30</sup></p> <p><i>g/kg:</i> IG: <math>1.51 \pm 0.53</math> CG: <math>1.22 \pm 0.43</math> (<math>p &lt; .01</math>)<sup>30</sup></p> <p>IG: <math>1.03 \pm 0.25</math> CG: <math>0.79 \pm 0.15</math> (<math>p &lt; .001</math>)<sup>46</sup></p> <p><i>g/day:</i> IG: <math>53 \pm 16</math> CG: <math>43 \pm 17</math> (<math>p = .011</math>)<sup>38</sup></p> <p><i>g/kg:</i> IG: <math>0.9 \pm 0.4</math> CG: <math>0.7 \pm 0.3</math> (<math>p = .003</math>)<sup>38</sup></p> <p><i>Reaching <math>\geq 75\%</math> protein requirement:</i> IG: 66% CG: 30% (<math>p = .001</math>)<sup>38</sup></p> <p><i>g:</i> (<math>p &lt; .001</math>; <math>p &lt; .05</math>)<sup>3,49</sup></p> <p><u>No effect</u><sup>2,41,49</sup></p>	-	<p><u>Effect:</u> <i>g/day:</i> IG: <math>64.3 \pm 17.8</math> CG: <math>58.7 \pm 10.5</math> (<math>p = .05</math>)<sup>34</sup></p>

Table 3. Continued

Outcomes	Interventions:			
	Oral nutritional supplements (12 studies)	Fortification/enrichment (7 studies)	Dietary counselling (4 studies)	Education (3 studies)
BMI	<p><u>Effect:</u> <i>Change, kg/m<sup>2</sup>:</i> IG: 0.03 ± 1.21 CG: -0.49 ± 1.01 (p = .012)<sup>39</sup></p> <p>IG: 0.41 ± 1.87 CG: -0.36 ± 1.87 (p = .04)<sup>42</sup></p> <p><i>kg/m<sup>2</sup>:</i> IG: 23.5 ± 3.3 CG: 22.3 ± 3.1 (p = .002)<sup>43</sup></p> <p><u>No effect</u><sup>31,33,35,44,46,47</sup></p>	<p><u>Effect:</u> <i>Change, kg/m<sup>2</sup>:</i> IG: 0.42 ± 1.27 CG: -0.42 ± 1.09 (p &lt; .001)<sup>41</sup></p> <p>IG: 0.41 ± 1.87 CG: -0.36 ± 1.87 (p = .04)<sup>42</sup></p> <p><u>No effect</u><sup>34,6</sup></p>	<p><u>Effect:</u> <i>Change, kg/m<sup>2</sup>:</i> IG: 0.41 ± 1.87 CG: -0.36 ± 1.87 (p = .04)<sup>42</sup></p>	<u>No effect</u> <sup>34,45</sup>
MUAC	<p><u>Effect:</u> <i>cm:</i> IG: 24.8 ± 3.53 CG: 24.9 ± 3.25 (p = .015)<sup>43</sup></p> <p><u>No effect</u><sup>33,35,36,39,42,46</sup></p>	<u>No effect</u> <sup>34,2,46</sup>	<u>No effect</u> <sup>34,2</sup>	-
CC	<p><u>Effect:</u> <i>cm:</i> IG: 31 ± 4.4 CG: 30.3 ± 3.3 (p = .018)<sup>43</sup></p> <p><u>No effect</u><sup>33</sup></p>	-	-	-
WC	-	<u>No effect</u> <sup>34,1</sup>	-	-
TSF	<u>No effect</u> <sup>31,33,35,39,42,46</sup>	<u>No effect</u> <sup>34,2,46</sup>	<u>No effect</u> <sup>34,2</sup>	-
HGS	<p><u>Effect:</u> <i>Kgf:</i> IG: 8.63 ± 3.83 CG: 6.4 ± 3.86 (p = .026)<sup>33</sup></p> <p><u>No effect</u><sup>31,36,40,42-44,47</sup></p>	<p><u>Effect:</u> <i>Change, kg:</i> IG: 3.2 ± 4.06 CG: -0.47 ± 2.32 (p &lt; .001)<sup>41</sup></p> <p><u>No effect</u><sup>33,38,40,42</sup></p>	<u>No effect</u> <sup>34,0,42,48</sup>	-

Table 3. Continued

Outcomes	Interventions:			
	Oral nutritional supplements (12 studies)	Fortification/enrichment (7 studies)	Dietary counselling (4 studies)	Education (3 studies)
ADL function	No effect <sup>a,32,35,40,43</sup>	Effect: Change score Katz Index: IG: 0.54 ± 0.6 CG: -0.61 ± 0.72 (p < .001) <sup>a1</sup>  No effect <sup>a,40</sup>	Effect: Improved score BI: IG: 96% CG: 72% (p < .01) <sup>a8</sup>  No effect <sup>a,40,48</sup>	No effect <sup>a,34,45</sup>

Notes: Data are presented as mean ± SD, unless specified otherwise with %. - = nutritional outcome not measured. SGA: category A: well-nourished, category B: mild-moderate malnutrition, category C: severe malnutrition.

Abbreviations: ADL = activities of daily living; BI = Barthel Index; BMI = body mass index; CC = calf circumference; CG = control group; HGS = handgrip strength; IG = intervention group; IG2 = intervention group 2; MNA = Mini Nutritional Assessment; MUAC = mid-upper arm circumference; SGA = Subjective Global Assessment; TSF = triceps skinfold; WC = waist circumference.

<sup>a</sup> See Appendix 4 for precise information about the mean ± SD or percentages.

<sup>b</sup> Precise information about the median change between baseline and 24 weeks is not reported in the study.

### Dietary counselling

Four studies assessed the effect of dietary counselling on seven nutritional outcomes containing nutritional status, body weight, BMI, mid-upper arm circumference, triceps skinfold, handgrip strength and ADL function. The intervention had no significant effect on nutritional status, body weight, mid-upper arm circumference, triceps skinfold and handgrip strength. BMI significantly increased in the intervention group (p = 0.04) over a three-month period in one study.<sup>42</sup> In a three-arm intervention study, the percentage of participants with maintenance or improvement of ADL function was significantly higher in the intervention group, which received dietary counselling at home, than the control group (p < 0.01). There was no effect between the intervention group, which received dietary counselling by telephone, and the control group. However, there was no significant difference in change in ADL function from baseline to the follow-up endpoint between both interventions and the control group.<sup>48</sup>

### Educational interventions

In three studies where an educational intervention was evaluated, six nutritional outcomes were measured, including nutritional status, measured with the MNA, body weight, energy intake, protein intake, BMI and ADL function. Body weight, energy intake, BMI and ADL function were not statistically different between the

intervention and control group in single or multiple studies. The intervention group showed a significant increase in protein intake over 12 months, while intake in the control group remained the same ( $p = 0.05$ ).<sup>34</sup> Significant and non-significant differences were found in nutritional status.<sup>34,37,45</sup>

### Certainty of evidence

We graded the certainty of evidence as very low to moderate for nutritional outcomes assessed by nurses within the four identified interventions, and as a consequence, the results should be interpreted with caution (Table 4).

Certainty was decreased for several reasons. First, most studies were assessed to be at high risk of bias or had some concerns. Second, for most outcomes the sample size was smaller than 400, and according to GRADE, this is an indication for serious imprecision.<sup>28</sup> Third, the standardised mean differences or odds ratio of most nutritional outcomes were small, indicating that there is barely an intervention effect. This means that for most nutritional outcomes certainty of evidence could not be upgraded. The GRADE evidence profile is given in Appendix 5.

**Table 4.** Summary of certainty of evidence for nutritional outcomes assessed by nurses across identified interventions using GRADE<sup>a</sup>

Outcomes	Interventions:			
	Oral nutritional supplements (12 studies)	Fortification/enrichment (7 studies)	Dietary counselling (4 studies)	Education (3 studies)
Nutritional status	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	⊕○○○ Very low	⊕○○○ Very low	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup> ⊕⊕⊕○ Moderate <sup>b</sup>
Body weight	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	⊕○○○ Very low	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	⊕○○○ Very low
Energy intake	⊕○○○ Very low	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	-	⊕○○○ Very low
Protein intake	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	-	⊕○○○ Very low

Table 4. Continued

Outcomes	Interventions:			
	Oral nutritional supplements (12 studies)	Fortification/enrichment (7 studies)	Dietary counselling (4 studies)	Education (3 studies)
BMI	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	⊕○○○ Very low	⊕○○○ Very low	⊕○○○ Very low
MUAC	⊕○○○ Very low	-	⊕○○○ Very low	-
CC	⊕○○○ Very low	-	-	-
WC	-	⊕○○○ Very low	-	-
TSF	⊕○○○ Very low	-	⊕○○○ Very low	-
HGS	⊕○○○ Very low <sup>b</sup> ⊕⊕○○ Low <sup>b</sup>	⊕⊕○○ Low	⊕○○○ Very low <sup>b</sup> ⊕⊕⊕○ Moderate <sup>b</sup>	-
ADL function	⊕⊕○○ Low <sup>b</sup> ⊕⊕⊕○ Moderate <sup>b</sup>	⊕⊕○○ Low ⊕⊕⊕○ Moderate	⊕○○○ Very low <sup>b</sup> ⊕⊕⊕○ Moderate <sup>b</sup>	⊕○○○ Very low

*Abbreviations:* ADL = activities of daily living; BMI = body mass index; CC = calf circumference; HGS = handgrip strength; MUAC = mid-upper arm circumference; TSF = triceps skinfold; WC = waist circumference.

<sup>a</sup> Grading of Recommendations Assessment, Development and Evaluation (GRADE) for rating for outcomes across included studies. Certainty of evidence can be graded as: high, moderate, low and very low.<sup>28</sup>

<sup>b</sup> Within identified interventions, outcomes were graded at different levels due to use of different instruments to measure the outcomes, units to express the outcomes or reporting of outcomes between studies.

## Discussion

This is the first systematic review to highlight interventions on prevention and treatment of malnutrition in older adults, which can be integrated in nursing care. From 21 randomised clinical trials from which three studies were assessed to be at low risk of bias, we have identified four types of useful interventions that nurses can use in their care for older adults. These interventions are provision of oral nutritional supplements, provision of food/fluid fortification or enrichment, dietary counselling and education. Our findings also highlight the impact of these interventions on 11 nutritional outcomes, which were identified as being applicable for assessment by nurses. The overall certainty of evidence for these outcomes ranged from very low to moderate. The effects of provision of oral nutritional supplements and food/fluid fortification or enrichment were measured in 10 out of 11 nutritional outcomes. Both positive effects and no effects were found in nutritional status, body weight, energy and protein intake, BMI, mid-upper arm circumference, calf circumference, handgrip strength and ADL function. In both types of interventions, there were no effects in triceps skinfold. In the provision of food/fluid fortification or enrichment, no effects were found in waist circumference. Studies where dietary counselling and educational interventions were reported, focussed on seven and six out of 11 nutritional outcomes, respectively. An educational intervention showed to have a slight effect on protein intake,<sup>34</sup> and dietary counselling demonstrated to have a small effect on BMI.<sup>42</sup> Educational interventions showed no effects on BMI. In both types of interventions, both positive effects and no effects were found in nutritional status and ADL function. There were no effects in body weight, energy intake, mid-upper arm circumference, triceps skinfold and handgrip strength. Not all included studies reported adverse events, but in those that did, we found no reporting of adverse events due to the intervention under study.<sup>31-33,36,39,41,43,44,46,47</sup> It appears that the identified interventions provide a low risk for harm in older adults.

We identified four types of interventions, which had also been evaluated in previous systematic reviews and meta-analyses.<sup>16-18,20-22</sup> Additionally, in one review trained volunteer mealtime assistants<sup>19</sup> and in one meta-analysis multidisciplinary support<sup>23</sup> had been investigated. Given the inclusion criteria, these interventions were not assessed in our review, but could possibly add to nursing care to prevent and treat malnutrition in older adults.

Most of the studies described in previous reviews focussed on populations of older adults with rather specific ageing conditions or residing in a particular setting. We targeted heterogeneous older adult populations, which we considered an important

goal of our review, because in daily care nurses work with different older adult populations in various nursing care settings. More important, many older adults receive care in different settings, continuity of care could add in prevention and treatment of malnutrition.

Several included studies focussed on older adults who stay in a hospital or rehabilitation, where the intervention started during inpatient admission. In some studies, these interventions continued after discharge at home. These studies showed that at admission, a significant proportion of study participants were malnourished or at risk for malnutrition. Because of the serious and adverse consequences of malnutrition in older adults, minimalising malnutrition or decreasing the risk for malnutrition is necessary, and hence, focus on prevention of malnutrition will be beneficial.<sup>2</sup> This means, there should already be attention for malnutrition in older adults living at home, and not just in the period during inpatient admission when older adults are more vulnerable, also for malnutrition.

To provide nurses with effective nutritional interventions, we focussed on identifying interventions that can be executed by registered nurses. We did not limit our search to the nursing domain, because there are effective interventions from other domains, which can be executed by nurses. As the interventions included in our systematic review were in only one case actually carried out by nurses,<sup>34</sup> this opens up the discussion about what the results will be if the intervention would have been carried out by nurses. We expect a higher effect given that nurses play a key role in nutritional care, since nurses in general provide possibilities for more contact moments with older adults. Where dietitians in general play a key role in the composition of food,<sup>1,13</sup> nurses play a key role in eating.

In our systematic review, we identified dietary counselling and educational interventions. These are complex interventions, which are defined as interventions with several interacting components.<sup>50</sup> We found no supporting information about the development of these interventions. Potentially, lack of a comprehensive development process can be an explanation for the lack of effect of complex interventions. The complex interventions from our review showed no effects on the majority of the 11 nutritional outcomes, and only a very slight effect on protein intake<sup>34</sup> and BMI.<sup>42</sup>

We established a comprehensive overview of 11 outcomes related to malnutrition, which can be assessed by nurses in nutritional care within nursing research and nursing practice. Consensus on standardised definition and operationalisation of

malnutrition utilising standardised measurements and procedures is recommended for a consistent approach on assessing outcomes. However, a gold standard is still lacking and singular outcomes are not sufficiently validated when identifying malnutrition.<sup>9,13</sup>

In identifying older adults who are malnourished or at risk for malnutrition, there are additional considerations. A negative influence of the normal ageing process should also be taken into account when measuring outcomes like body weight, BMI, mid-upper arm circumference and triceps skinfold.<sup>16</sup> Consequently, these outcomes might not be accurate for measuring malnutrition in older adults.

The use of common screening tools like the MNA or Malnutrition Universal Screening Tool has been demonstrated to be valid in populations of older adults.<sup>13</sup> However, since these tools are developed at population level, their sensitivity at individual patient level has not been proven. This implies that current screening tools might not detect a risk for malnutrition in individual older adults.

When interpreting significant associations on several nutritional outcomes derived from the studies, the clinical relevance of these results should be kept in mind. For instance, in the study of Salvà et al. (2011), a significant difference in nutritional status in favour of the intervention group compared with the control group was found. At the 12-month follow-up, the intervention and control group showed a mean score on the MNA of 23.4 and 23.5 points, respectively.<sup>45</sup> This does not seem clinically relevant, because both scores are an indication of risk for malnutrition.

### **Limitations**

In this literature review study, we used an explicit and systematic method,<sup>24</sup> however, some potential limitations need to be considered. First, in order to be sensitive to finding interventions, which can be applied in nursing care for older adults, we did not limit our search to particular interventions, older populations and nutritional outcomes. This led to heterogeneity of the studies from which we retrieved our results, and hence, generalising should be done with caution. Subsequently, pooling of intervention effects carrying out a meta-analysis appeared not feasible.<sup>28</sup> However, with the approach of this review, we were able to provide an overview of the available knowledge.

Second, we only included studies, which are characterised by sufficient sample size. Sample size was sometimes based on other defined nutritional outcomes (e.g. vitamin D level or fat-free mass) or non-nutritional outcomes (e.g. hospital

readmission or mortality) also used in the studies. Therefore, it is possible that the sample size in some of the included studies was too small for finding an effect, and as such not provided evidence for the analysis of this systematic review. This could be an explanation why evident effects of the interventions on the 11 nutritional outcomes were not found. In addition, from three studies<sup>31,35,40</sup> we already concluded that sample size was sufficient for some of the nutritional outcomes, but not for all. To avoid study selection bias, and as a consequence not to miss information on relevant interventions, which can be integrated in nursing care, we chose to include these three studies in our review.

Finally, most studies had a moderate to high risk of bias and certainty of evidence was graded very low to moderate. This raises questions about the internal validity of these studies.<sup>24</sup> This should be kept in mind when generalising the results.

### **Future research**

Well-designed and well-executed future studies are needed to find a realistic estimation of an intervention effect.<sup>24</sup> In these studies, at least assessors and data analysts should be blinded to reduce performance bias. Moreover, intervention studies should be powered well with a power analysis based on outcomes, which are related to malnutrition, and with assumptions of expected change in the outcomes based on prior research. Also, we recommend adequate comparison between intervention studies and estimation of the true intervention effect. This is needed to equip clinical nursing practice with effective interventions to prevent and treat malnutrition in older adults. Therefore, until a gold standard is developed, we recommend to use the definition and operationalisation of malnutrition based on the latest consensus reports from national and international guidelines.<sup>1,13</sup>

We found no interventions, which were comprehensively developed, that means in practical, logical and evidence-based ways, and where contextual factors co-construct the intervention.<sup>50</sup> Moreover, no information about implementation of the interventions into nursing care could be derived from the studies. Future nursing studies about the prevention and treatment of malnutrition in older adults should focus on development as well as implementation of interventions. Here, involvement of users, that is older adults, and providers, that is nurses, might be of benefit. It results in a higher chance of successful development and implementation, and makes the intervention more likely to fit nursing practice.<sup>50</sup> For this purpose, the framework of the Medical Research Council (MRC)<sup>50</sup> could be used.

In our review, we included diverse populations of older adults. Within future nursing research, populations of older adults who are malnourished or at risk for malnutrition should be targeted. Especially, more attention is needed for interventions to prevent malnutrition to precede the severe outcomes of malnutrition.

## Conclusion

In 21 studies, we identified four types of interventions, which can be integrated in nursing nutritional care, to prevent and treat malnutrition in diverse populations of older adults residing in different healthcare settings. We evaluated the effects of these interventions on 11 nutritional outcomes, which can be assessed by nurses. In general, one or more of the four types of interventions showed contradictory effects on nutritional status, body weight, energy intake, protein intake, BMI, mid-upper arm circumference, calf circumference, handgrip strength and ADL function. We found no effects on waist circumference and triceps skinfold. In addition, an educational intervention showed a small positive effect on protein intake and dietary counselling on BMI. However, the studies had a considerable risk of bias and low certainty of evidence for the nutritional outcomes. As a result, some reservation about the effectiveness of these interventions is therefore called for. Certainly, nurses can provide oral nutritional supplements and food/fluid fortification or enrichment, and give dietary counselling and education, as they are well placed to lead the essential processes of nutritional care to older adults.

## Relevance to clinical practice

Given the repeating direct contact, mostly on a daily basis with older adults receiving care, nurses have a key role in the coordination of nutritional care, where they are in the best position to deliver excellent nutritional care in preventing and treating malnutrition in older adults. As part of basic care for nutrition, nurses can execute, monitor and evaluate the four identified interventions and use the 11 outcomes, which are related to malnutrition, appropriately. Although we did not specifically focus on safety of the interventions, we did not find these interventions might cause harm when used in daily nursing care. Therefore, nurses could use the interventions and 11 outcomes related to malnutrition in their daily practice. Here, it should be kept in mind that body weight, BMI, mid-upper arm circumference and triceps skinfold might be less accurate due to the normal ageing process. In daily care, nurses can assist older adults to eat and drink oral nutritional supplements and fortified or

enriched foods and fluids. By giving dietary counselling and education, nurses can support older adults or caregivers to improve nutritional status and ensure adequate intake by achieving behavioural change.<sup>18,48</sup> From the included studies, no instructions about implementation strategies were handed over. For implementation tailored to specific nursing practices, the MRC framework could be used.

Besides having direct contact with older adults receiving care, nurses provide care in cooperation with other disciplines like dietitians, medical doctors, housekeeping personnel and representatives from all other professions involved in the nutritional care process.<sup>1,2,13</sup> In this process, nurses themselves appropriately provide different kinds of nursing care activities, but also refer to specialist care by other disciplines where indicated. Hence, the coordination and activities of nurses in collaboration with other disciplines within nutritional care should be part of evidence-based multimodal and multidisciplinary interventions.<sup>2,23</sup> Moreover, nurses ensure there is a clinical handover across the continuum within and between different care settings. In this way, nurses are ideally placed to provide integrated patient care in collaboration with older adults receiving care and other professional groups in intramural and transmural care.<sup>1</sup> Relevant goals in multimodal and multidisciplinary nutritional care would not only be treatment of malnutrition. Maybe even more important would be prevention of malnutrition to avoid older adults experiencing deterioration of their nutritional status as well as their general health.

## Acknowledgements

Basic Care Revisited Group: prof. dr. Sandra Zwakhalen, prof. dr. Hester Vermeulen, prof. dr. Lisette Schoonhoven, dr. Janneke de Man – van Ginkel, dr. Getty Huisman – de Waal, dr. Maud Heinen, dr. Silke Metzethin, dr. Roelof Ettema, Carolien Verstraten MSc, Elise van Belle MSc, Harm van Noort MSc, Gerda van den Berg MSc, Annick van Manen MSc, Debbie ten Cate MSc. We thank members of the project group: Helen Meijrink MSc, Anne Moerman MSc, Inge Wolbers MSc, Hilda van der Heyde MSc, Lia van Straalen MSc, Coba Eefting MSc, drs. Esther Jansen, Harm van Noort MSc and Gerda van der Berg MSc for their cooperation in the assessment of methodological quality of studies. Special recognition goes to Anouk Oosterhoff MSc for her contribution in study selection, quality assessment and data extraction, and Pauline Heus MSc from the Dutch Cochrane Centre for her contribution to the data synthesis.

## References

1. The Dutch Malnutrition Steering Group. Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2017.
2. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. *Clin Nutr.* 2019;38(1):10-47.
3. Cereda E, Pedrolli C, Klersy C, Bonardi C, Quarleri L, Cappello S, et al. Nutritional status in older persons according to healthcare setting: A systematic review and meta-analysis of prevalence data using MNA®. *Clin Nutr.* 2016;35(6):1282-1290.
4. Yang Y, Brown CJ, Burgio KL, Kilgore ML, Ritchie CS, Roth DL, et al. Undernutrition at baseline and health services utilization and mortality over a 1-year period in older adults receiving Medicare home health services. *J Am Med Dir Assoc.* 2011;12(4):287-294.
5. Burks CE, Jones CW, Braz VA, Swor RA, Richmond NL, Hwang KS, et al. Risk factors for malnutrition among older adults in the emergency department: A multicenter study. *J Am Geriatr Soc.* 2017;65(8):1741-1747.
6. Vanderwee K, Clays E, Bocquaert I, Gobert M, Folens B, Defloor T. Malnutrition and associated factors in elderly hospital patients: A Belgian cross-sectional, multi-centre study. *Clin Nutr.* 2010;29(4):469-476.
7. Meyer S, Gräske J, Worch A, Wolf – Ostermann K. Nutritional status of care-dependent people with dementia in shared-housing arrangements – a one-year follow-up. *Scand J Caring Sci.* 2015;29(4):785-792.
8. Saka B, Kaya O, Ozturk GB, Erten N, Karan MA. Malnutrition in the elderly and its relationship with other geriatric syndromes. *Clin Nutr.* 2010;29(6):745-748.
9. Cederholm T, Bosaeus I, Barazzoni R, Bauer J, Van Gossum A, Klek S, et al. Diagnostic criteria for malnutrition – an ESPEN consensus statement. *Clin Nutr.* 2015;34(3):335-340.
10. Naseer M, Forssell H, Fagerström C. Malnutrition, functional ability and mortality among older people aged  $\geq$  60 years: a 7-year longitudinal study. *Eur J Clin Nutr.* 2016;70(3):399-404.
11. Westergren A, Hagell P, Sjö Dahl Hammarlund C. Malnutrition and risk of falling among elderly without home-help service – a cross sectional study. *J Nutr Health Aging.* 2014;18(10):905-911.
12. Luger E, Haider S, Kapan A, Schindler K, Lackinger C, Dorner TE. Association between nutritional status and quality of life in (pre)frail community-dwelling older persons. *J Frailty Aging.* 2016;5(3):141-148.
13. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr.* 2017;36(1):49-64.
14. Kitson A, Conroy T, Wengstrom Y, Profetto – McGrath J, Robertson – Malt S. Defining the fundamentals of care. *Int J Nurs Pract.* 2010;16(4):423-434.
15. Zwakhalen S, Hamers J, Metzethin S, Ettema R, Heinen M, de Man – van Ginkel, J., et al. Basic nursing care: The most provided, the least evidence based – A discussion paper. *J Clin Nurs.* 2018;27(11-12):2496-2505.
16. Allen VJ, Methven L, Gosney MA. Use of nutritional complete supplements in older adults with dementia: Systematic review and meta-analysis of clinical outcomes. *Clin Nutr.* 2013;32(6):950-957.
17. Avenell A, Smith TO, Curtain JP, Mak JCS, Myint PK. Nutritional supplementation for hip fracture aftercare in older people. *Cochrane Database Syst Rev.* 2016;11:CD001880.
18. Bandayrel K, Wong S. Systematic literature review of randomized control trials assessing the effectiveness of nutrition interventions in community-dwelling older adults. *J Nutr Educ Behav.* 2011;43(4):251-262.

19. Howson FFA, Sayer AA, Roberts HC. The impact of trained volunteer mealtime assistants on dietary intake and satisfaction with mealtime care in adult hospital inpatients: A systematic review. *J Nutr Health Aging*. 2017;21(9):1038–1049.
20. Milne AC, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. *Cochrane Database Syst Rev*. 2009;2:CD003288.
21. Morilla – Herrera JC, Martín – Santos FJ, Caro – Bautista J, Saucedo – Figueredo C, García – Mayor S, Morales – Asencio JM. Effectiveness of food-based fortification in older people: A systematic review and meta-Analysis. *J Nutr Health Aging*. 2016;20(2):178-184.
22. Munk T, Tolstrup U, Beck AM, Holst M, Rasmussen HH, Hovhannisyanyan K, et al. Individualised dietary counselling for nutritionally at-risk older patients following discharge from acute hospital to home: a systematic review and meta-analysis. *J Hum Nutr Diet*. 2016;29(2):196–208.
23. Rasmussen NML, Belqaid K, Lugnet K, Nielsen AL, Rasmussen HH, Beck AM. Effectiveness of multidisciplinary nutritional support in older hospitalised patients: A systematic review and meta-analyses. *Clin Nutr ESPEN*. 2018;27:44–52.
24. Higgins JPT, Green S. *Cochrane handbook for systematic reviews of interventions version 5.1.0*. The Cochrane Collaboration; 2011.
25. Moher D, Liberati A, Tetzlaff J, Altman DG, the PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA Statement. *Ann Intern Med*. 2009;151(4):264-269.
26. Schulz KF, Altman DG, Moher D, for the CONSORT Group. CONSORT 2010 statement: Updated guidelines for reporting parallel group randomised trials. *J Clin Epidemiol*. 2010;63(8):834-840.
27. Higgins JPT, Sterne JAC, Savović J, Page MJ, Hróbjartsson A, Boutron I, et al. A revised tool for assessing risk of bias in randomized trials. *Cochrane Database Syst Rev*. 2016;10(Suppl 1):29-31.
28. Schünemann H, Brożek J, Guyatt G, Oxman A, editors. *GRADE handbook for grading quality of evidence and strength of recommendations*. Updated October 2013. The GRADE Working Group; 2013. Retrieved from: [guidelinedevelopment.org/handbook](http://guidelinedevelopment.org/handbook).
29. Andersson J, Hulander E, Rothenberg E, Iversen PO. Effect on body weight, quality of life and appetite following individualized, nutritional counselling to home-living elderly after rehabilitation - An open randomized trial. *J Nutr Health Aging*. 2017;21(7):811-818.
30. Beelen J, Vasse E, Janssen N, Janse A, de Roos NM, de Groot LCPGM. Protein-enriched familiar foods and drinks improve protein intake of hospitalized older patients: A randomized controlled trial. *Clin Nutr*. 2018;37(4):1186-1192.
31. Cramer JT, Cruz – Jentoft AJ, Landi F, Hickson M, Zamboni M, Pereira SL, et al. Impacts of high-protein oral nutritional supplements among malnourished men and women with sarcopenia: A multicenter, randomized, double-blinded, controlled trial. *J Am Med Dir Assoc*. 2016;17(11):1044-1055.
32. Deutz NE, Matheson EM, Matarese LE, Luo M, Baggs GE, Nelson JL, et al. Readmission and mortality in malnourished, older, hospitalized adults treated with a specialized oral nutritional supplement: A randomized clinical trial. *Clin Nutr*. 2016;35(1):18-26.
33. Ekinci O, Yanik S, Terzioğlu Bebitoğlu B, Yılmaz Akyüz E, Dokuyucu A, Erdem Ş. Effect of Calcium  $\beta$ -Hydroxy- $\beta$ -Methylbutyrate (CaHMB), vitamin D, and protein supplementation on postoperative immobilization in malnourished older adult patients with hip fracture: A randomized controlled study. *Nutr Clin Pract*. 2016;31(6):829-835.
34. Fernández – Barrés S, García – Barco M, Basora J, Martínez T, Pedret R, Arija V, Project ATDOM-NUT group. The efficacy of a nutrition education intervention to prevent risk of malnutrition for dependent elderly patients receiving Home Care: A randomized controlled trial. *Int J Nurs Stud*. 2017;70:131-141.
35. Gariballa S, Forster S, Walters S, Powers H. A randomized, double-blind, placebo-controlled trial of nutritional supplementation during acute illness. *Am J Med*. 2006;119(8):693-699.
36. Kim CO, Lee KR. Preventive effect of protein-energy supplementation on the functional decline of frail older adults with low socioeconomic status: A community-based randomized controlled study. *J Gerontol A Biol Sci Med Sci*. 2013;68(3):309-316.

37. Luger E, Dorner TE, Haider S, Kapan A, Lackinger C, Schindler K. Effects of a home-based and volunteer-administered physical training, nutritional, and social support program on malnutrition and frailty in older persons: A randomized controlled trial. *J Am Med Dir Assoc.* 2016;17(7):671.e9-671.e16.
38. Munk T, Beck AM, Holst M, Rosenbom E, Rasmussen HH, Nielsen MA, Thomsen T. Positive effect of protein-supplemented hospital food on protein intake in patients at nutritional risk: a randomised controlled trial. *J Hum Nutr Diet.* 2014;27(2):122-132.
39. Myint MW, Wu J, Wong E, Chan SP, To TS, Chau MW, et al. Clinical benefits of oral nutritional supplementation for elderly hip fracture patients: a single blind randomised controlled trial. *Age Ageing.* 2013;42(1):39-45.
40. Neelemaat F, Bosmans JE, Thijs A, Seidell JC, van Bokhorst – de van der Schueren MA. Post-discharge nutritional support in malnourished elderly individuals improves functional limitations. *J Am Med Dir Assoc.* 2011;12(4):295-301.
41. Rondanelli M, Klersy C, Terracol G, Talluri J, Maugeri R, Guido D, et al. Whey protein, amino acids, and vitamin D supplementation with physical activity increases fat-free mass and strength, functionality, and quality of life and decreases inflammation in sarcopenic elderly. *Am J Clin Nutr.* 2016;103(3):830-840.
42. Sharma Y, Thompson CH, Kaambwa B, Shahi R, Hakendorf P, Miller M. Investigation of the benefits of early malnutrition screening with telehealth follow up in elderly acute medical admissions. *QJM.* 2017;110(10):639-647.
43. Stange I, Bartram M, Liao Y, Poeschl K, Kolpatzik S, Uter W, et al. Effects of a low-volume, nutrient- and energy-dense oral nutritional supplement on nutritional and functional status: A randomized, controlled trial in nursing home residents. *J Am Med Dir Assoc.* 2013;14(8):628.e1-8.
44. Veronese N, Berton L, Carraro S, Bolzetta F, De Rui M, Perissinotto E, et al. Effect of oral magnesium supplementation on physical performance in healthy elderly women involved in a weekly exercise program: a randomized controlled trial. *Am J Clin Nutr.* 2014;100(3):974-981.
45. Salvà A, Andrieu S, Fernandez E, Schiffrin EJ, Moulin J, Decarli B, et al. Health and nutrition promotion program for patients with dementia (NutriAlz): cluster randomized trial. *J Nutr Health Aging.* 2011;15(10):822-830.
46. Botella – Carretero JI, Iglesias B, Balsa JA, Zamarrón I, Arrieta F, Vázquez C. Effects of oral nutritional supplements in normally nourished or mildly undernourished geriatric patients after surgery for hip fracture: A randomized clinical trial. *JPEN J Parenter Enteral Nutr.* 2008;32(2):120-128.
47. Hin H, Tomson J, Newman C, Kurien R, Lay M, Cox J, et al. Optimum dose of vitamin D for disease prevention in older people: BEST-D trial of vitamin D in primary care. *Osteoporos Int.* 2017;28(3):841-851.
48. Pedersen JL, Pedersen PU, Damsgaard EM. Early nutritional follow-up after discharge prevents deterioration of ADL functions in malnourished, independent, geriatric patients who live alone – A randomized clinical trial. *J Nutr Health Aging.* 2016;20(8):845-853.
49. Ziylan C, Kremer S, Eerens J, Haveman – Nies A, de Groot LC. Effect of meal size reduction and protein enrichment on intake and satiety in vital community-dwelling older adults. *Appetite.* 2016;105:242-248.
50. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new medical research council guidance. *BMJ.* 2008;337:979-983.
51. Wan X, Wang W, Liu J, Tong T. Estimating the sample mean and standard deviation from the sample size, median, range and/or interquartile range. *BMC Med Res Methodol.* 2014;14:135.
52. Lane DM. Hyperstat online textbook. Retrieved from: <http://davidmlane.com/hyperstat/index.html>

## Appendix

## Appendix 1. PICO, search queries and outcome of the search strategy in electronic databases

PICO	Search strategy in electronic databases	Limits: (Controlled Clinical) Trial, English language, search between September 2005 – September 2018			
		PubMed	EMBASE	CENTRAL	CINAHL PsycINFO
		Results of search			
	<b>Search terms</b>				
<b>P</b>	#1 (old OR older OR aged OR aging OR elderly OR elders OR elder OR seniors OR senior OR frail OR geriatric)	171,609	168,713	94,612	26,441 3,096
<b>I</b>	#2 (“nutritional status” OR nutrition OR nutritional OR nutrient OR nutrients OR nutriments OR nutriment OR nourishment OR energy OR proteins OR protein OR vitamins OR vitamin OR food OR foods OR feeding OR intake OR intakes OR meal OR meals OR diet OR diets OR “diet therapy” OR dietary OR dietetics OR dietetic OR dietitian OR dietitians OR supplements OR supplement OR supplementations OR supplementation OR beverages OR beverage OR enteral OR enteric)	124,932	108,641	104,601	9,878 1,607
<b>O</b>	#3 (prevention OR prevent OR preventing OR preventive OR “prevention and control” OR control OR controlling OR reduction OR reduce OR reducing OR avoidance OR avoid OR avoiding)	2,853,108	218,259	350,988	21,800 8,736
	#4 (malnutrition OR undernutrition OR under-nutrition OR malnourishment OR undernourishment OR under-nourishment OR underfeeding OR insufficiencies OR insufficiency OR deficiencies OR deficiency OR “protein deficiencies” OR “protein deficiency” OR protein-deficiency OR “nutritional deficiencies” OR “nutritional deficiency” OR “energy deficiencies” OR “energy deficiency” OR “dietary deficiencies” OR “dietary deficiency” OR “nutrition deficiencies” OR “nutrition deficiency”)	6,986	10,098	12,797	725 117
	(#3 AND #4)	3,472	5,198	6,248	330 48
<b>NOT</b>	#5 (child OR children OR childhood OR pediatrics OR pediatric OR paediatrics OR paediatric OR infant OR infants OR young OR boys OR boy OR girls OR girl)	55,310	65,323	87,226	8,875 2,844
<b>PICO search rule</b>	#1 AND #2 AND (#3 AND #4) NOT #5 Total 2535 hits	943	1,163	370	48 11

Appendix 2. Overview of methodological features for each included study

Author (year)	Checklist for randomised clinical trials Cochrane collaboration:										CONSORT checklist:	
	Randomisation	Allocation concealment	Patient blinding	Caregiver blinding	Data analyst blinding	Comparison intervention and control group at baseline	Sufficient follow-up	Intention to treat	Equal treatment of intervention and control group	Undersirable influence on sponsor and precluded positive (out of 10)	Total items rated (out of 29) <sup>a</sup>	
Andersson (2017) <sup>39</sup>	yes	yes	no	NR	NR	NR	yes	yes	NR	yes	5	26
Beelen (2018) <sup>30</sup>	yes	yes	NR	NR	NR	NR	yes	NR	NR	no	3	25
Botella – Carretero (2008) <sup>46</sup>	yes	yes	NR	NR	NR	yes	yes	yes	NR	yes	6	26
Cramer (2016) <sup>31</sup>	yes	NR	yes	yes	NR	yes	yes	yes	NR	no	6	21
Deutz (2016) <sup>32</sup>	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	9	28
Ekinci (2016) <sup>33</sup>	yes	yes	NR	NR	NR	yes	yes	NR	NR	no	4	25
Fernández – Barrés (2017) <sup>34</sup>	yes	yes	no	no	NR	yes	yes	NR	no	yes	5	27
Gariballa (2006) <sup>35</sup>	yes	yes	yes	yes	yes	yes	yes	yes	yes	NR	9	21
Hin (2017) <sup>37</sup>	yes	yes	yes	yes	yes	NR	yes	yes	yes	no	8	26
Kim (2013) <sup>36</sup>	yes	yes	NR	NR	NR	yes	yes	yes	NR	no	5	28
Luger (2016) <sup>37</sup>	yes	NR	no	no	yes	yes	yes	yes	no	yes	6	28
Munk (2014) <sup>38</sup>	yes	yes	no	no	yes	NR	yes	yes	no	no	5	27

Author (year)	Checklist for randomised clinical trials Cochrane collaboration:										CONSORT checklist:	
	Randomisation	Allocation concealment	Patient blinding	Caregiver blinding	Data analyst blinding	Comparison intervention and control group at baseline	Sufficient follow-up	Intention to treat	Equal treatment of intervention and control group	Undersirable influence precluded	Total items rated positive (out of 10)	Total items reported (out of 29) <sup>a</sup>
Myint (2013) <sup>39</sup>	yes	yes	no	no	NR	yes	yes	NR	no	yes	5	25
Neelemaat (2011) <sup>40</sup>	yes	yes	no	no	yes	yes	yes	yes	no	NR	6	26
Pedersen (2016) <sup>48</sup>	yes	yes	no	no	NR	NR	yes	yes	no	yes	5	26
Rondanelli (2016) <sup>41</sup>	yes	yes	yes	yes	NR	NR	yes	NR	NR	no	5	25
Salvá (2011) <sup>45</sup>	yes	NR	NR	NR	NR	NR	yes	yes	NR	no	3	21
Sharma (2017) <sup>42</sup>	yes	yes	no	no	yes	yes	yes	NR	no	yes	6	26
Stange (2013) <sup>46</sup>	yes	yes	no	no	NR	yes	yes	yes	NR	no	5	26
Veronese (2014) <sup>44</sup>	yes	yes	no	no	yes	yes	yes	NR	no	no	5	28
Ziyilan (2016) <sup>49</sup>	yes	NR	yes	NR	NR	yes	yes	NR	NR	no	4	21

Abbreviation: NR = not reported.

<sup>a</sup> Item "Selective reporting excluded" from the Dutch version of the checklist for randomised trials of the Cochrane Collaboration<sup>24</sup> was reviewed using the CONSORT 2010 37 item checklist of information to include when reporting a randomised trial.<sup>26</sup> From the 37 items, eight items (3b, 6b, 7b, 12b, 14b, 17b, 18 and 24) were not applicable for this systematic review and 29 items were assessed.

Appendix 3. Overview of features for risk of bias for each included study

Author (year)	Risk of bias:						Overall risk of bias
	Arising from randomisation process	Due to deviations from the intended intervention	Missing outcome data	In measurement of the outcomes	In selection of the reported result		
Andersson (2017) <sup>29</sup>	-	-	-	-	?	?	Some concerns
Beelen (2018) <sup>30</sup>	-	+	+	?	?	?	High
Botella-Carretero (2008) <sup>36</sup>	-	-	-	?	?	?	High
Cramer (2016) <sup>31</sup>	?	-	-	-	?	?	High
Deutz (2016) <sup>32</sup>	-	-	-	-	?	?	Some concerns
Ekinci (2016) <sup>33</sup>	-	+	?	?	?	?	High
Fernández-Barrés (2017) <sup>34</sup>	-	+	+	?	-	-	High
Gariballa (2006) <sup>35</sup>	-	-	-	-	?	?	Some concerns
Hin (2017) <sup>37</sup>	-	-	-	-	-	-	Low
Kim (2013) <sup>36</sup>	-	-	-	-	?	?	Some concerns
Luger (2016) <sup>37</sup>	-	-	-	-	-	-	Low
Munk (2014) <sup>38</sup>	-	-	-	?	?	?	High
Myint (2013) <sup>39</sup>	-	+	?	-	?	?	High
Neelemaat (2011) <sup>40</sup>	-	-	-	-	-	-	Low
Pedersen (2016) <sup>48</sup>	-	-	-	?	?	?	High

## Appendix 3. Continued

Author (year)	Risk of bias:							Overall risk of bias
	Arising from randomisation process	Due to deviations from the intended intervention	Missing outcome data	In measurement of the outcomes	In selection of the reported result			
Rondanelli (2016) <sup>41</sup>	-	-	-	?	?	?	High	
Salvà (2011) <sup>45</sup>	?	-	-	?	-	-	High	
Sharma (2017) <sup>42</sup>	-	+	?	-	?	?	High	
Stange (2013) <sup>43</sup>	-	-	-	?	?	?	High	
Veronese (2014) <sup>44</sup>	-	+	+	-	-	?	High	
Zijlstra (2016) <sup>49</sup>	?	+	+	?	?	?	High	

Notes: - = low risk of bias; + = high risk of bias; ? = some concerns.

Appendix 4. Effect on nutritional outcomes assessed by nurses for the included studies

Author (year)	Outcomes (unit) (Follow-up end point)	Intervention group (n)	Control group (n)	Intervention group 2 (n)	p-value <sup>a</sup>	Standardised mean difference [95%CI]
Andersson (2017) <sup>29</sup>	Body weight (>5% loss) (%) (3 months)	3.9 (2)	10 (5)	-	0.22	-
Beelen (2018) <sup>30</sup>	Energy intake (kcal/day)	2,163 ± 570 (67)	2,061 ± 549 (80)	-	0.047	0.18 [-0.14, 0.51]
	Energy intake (kcal/kg)	31.1 ± 9.9 (67)	28.6 ± 10.2 (80)	-	0.02	0.25 [-0.08, 0.57]
	Protein intake (g/day)	105.7 ± 34.2 (67)	88.2 ± 24.4 (80)	-	<0.01	0.59 [0.26, 0.93]
	Protein intake (g/kg)	1.51 ± 0.53 (67)	1.22 ± 0.43 (80)	-	<0.01	0.60 [0.27, 0.94]
	Patients reaching 1.2 g/kg/day protein intake (%)	79.1 (53)	47.5 (38)	-	NR	-
	Patients reaching 1.5 g/kg/day protein intake (%) (At day 4 in hospital)	64.2 (43)	20 (16)	-	NR	-
Botella – Carretero (2008) <sup>46</sup>	Energy intake (kcal/day)	1,373 ± 291 <sup>†</sup> (30)	1,438 ± 297 <sup>†*</sup> (30)	1,598 ± 292 <sup>‡</sup> (30)	‡: NS	‡: -0.22 [-0.73, 0.29]
	Protein intake (g/kg)	1.03 ± 0.25 <sup>†</sup> (30)	0.79 ± 0.15 <sup>†**</sup> (30)	1.1 ± 0.2 <sup>‡</sup> (30)	‡: NS	‡: 0.54 [0.02, 1.05]
	BMI (kg/m <sup>2</sup> )	NR <sup>†</sup> (30)	NR <sup>†</sup> (30)	NR <sup>†</sup> (30)	‡: <0.001	‡: 1.15 [0.60, 1.70]
	MUAC (cm)	NR <sup>†</sup> (30)	NR <sup>†</sup> (30)	NR <sup>†</sup> (30)	‡: <0.001	‡: 1.73 [1.13, 2.33]
	TSF (mm) (During hospitalisation)	NR <sup>†</sup> (30)	NR <sup>†</sup> (30)	NR <sup>†</sup> (30)	‡: 0.582	-
	Complete group:	NR (131)	NR (146)	-	‡: 0.583	-
	Energy intake (kcal/day)	NR (131)	NR (146)	-	‡: 0.091	-
	Protein intake (g/kg)	NR (131)	NR (146)	-	>0.05	-
	Group Severe sarcopenia:	NR (131)	NR (146)	-	<0.0001	-
	Body weight (change) (kg)	2.1 ± 3 (80)	2.6 ± 3 (64)	-	>0.05	-0.17 [-0.50, 0.16]
	BMI (change) (kg·m <sup>-2</sup> )	0.8 ± 1.2 (80)	1.1 ± 1.4 (64)	-	>0.05	-0.23 [-0.56, 0.10]
	HGS (change) (kg)	1.2 ± 2.1 (80)	1.3 ± 2.5 (64)	-	>0.05	-0.04 [-0.37, 0.29]
	Group Sarcopenia:	NR (131)	NR (146)	-	>0.05	-
	Body weight (change) (kg)	2.1 ± 2.7 (83)	2.3 ± 2.2 (101)	-	>0.05	-0.08 [-0.37, 0.21]
	BMI (change) (kg·m <sup>-2</sup> )	0.7 ± 1 (83)	0.8 ± 0.8 (101)	-	>0.05	-0.11 [-0.40, 0.18]
	HGS (change) (kg)	1.7 ± 2.5 (83)	1.0 ± 2.9 (101)	-	>0.05	0.26 [-0.04, 0.55]
Cramer (2016) <sup>31</sup>	Complete group:	NR (131)	NR (146)	-	>0.05	-
	Energy intake (kcal/day)	NR (131)	NR (146)	-	<0.0001	-
	Protein intake (g/kg)	NR (131)	NR (146)	-	>0.05	-
	Group Severe sarcopenia:	NR (131)	NR (146)	-	<0.0001	-
	Body weight (change) (kg)	2.1 ± 3 (80)	2.6 ± 3 (64)	-	>0.05	-0.17 [-0.50, 0.16]
	BMI (change) (kg·m <sup>-2</sup> )	0.8 ± 1.2 (80)	1.1 ± 1.4 (64)	-	>0.05	-0.23 [-0.56, 0.10]
	HGS (change) (kg)	1.2 ± 2.1 (80)	1.3 ± 2.5 (64)	-	>0.05	-0.04 [-0.37, 0.29]
	Group Sarcopenia:	NR (131)	NR (146)	-	>0.05	-
	Body weight (change) (kg)	2.1 ± 2.7 (83)	2.3 ± 2.2 (101)	-	>0.05	-0.08 [-0.37, 0.21]
	BMI (change) (kg·m <sup>-2</sup> )	0.7 ± 1 (83)	0.8 ± 0.8 (101)	-	>0.05	-0.11 [-0.40, 0.18]
	HGS (change) (kg)	1.7 ± 2.5 (83)	1.0 ± 2.9 (101)	-	>0.05	0.26 [-0.04, 0.55]

## Appendix 4. Continued

Author (year)	Outcomes (unit) (Follow-up end point)	Intervention group (n)	Control group (n)	Intervention group 2 (n)	p-value <sup>a</sup>	Standardised mean difference [95%CI]
<i>(Cramer continued)</i>	Group Sarcopenia, normal gait speed:					
	Body weight (change) (kg)	2.1 ± 2.7 (61)	2.2 ± 2.3 (75)	-	>0.05	-0.04 [-0.38, 0.30]
	BMI (change) (kg·m <sup>-2</sup> )	0.7 ± 0.8 (61)	0.8 ± 0.8 (75)	-	>0.05	-0.12 [-0.46, 0.21]
	HGS (change) (kg)	1.7 ± 2.4 (61)	1.0 ± 3.2 (75)	-	>0.05	0.24 [-0.10, 0.58]
	Group Sarcopenia, normal grip strength:					
	Body weight (change) (kg)	2.6 ± 3.5 (39)	2.4 ± 1.7 (46)	-	>0.05	0.07 [-0.35, 0.50]
	BMI (change) (kg·m <sup>-2</sup> )	0.9 ± 1.2 (39)	0.8 ± 0.6 (46)	-	>0.05	0.11 [-0.32, 0.53]
	HGS (change) (kg)	0.6 ± 3.7 (39)	-0.02 ± 2.3 (46)	-	>0.05	0.20 [-0.22, 0.63]
	(24 weeks)					
Deutz (2016) <sup>32</sup>	Nutritional status (SGA) (category) (%)				0.009	
	Category A	45.5 (76)	30 (48)	-	-	-
	Category B	52.1 (87)	66.3 (106)	-	-	-
	Category C	2.4 (4)	3.8 (6)	-	-	-
	Body weight (change) (kg)	1.47 ± NR (149)	0.65 ± NR (165)	-	0.092	
	ADL function (Katz Index) (score)	6 ± 0 (313)	6 ± 0 (309)	-	NS	
	(90 days)					
Ekinci (2016) <sup>33</sup>	Body weight (kg)	50.06 ± 4.62 (32)	53.73 ± 9.17 (30)	-	0.055	-0.50 [-1.01, 0.00]
	BMI (kg/m <sup>2</sup> )	21.78 ± 1.97 (32)	22.23 ± 2.64 (30)	-	0.445	-0.19 [-0.69, 0.31]
	MUAC (cm)	24.84 ± 2 (32)	24.87 ± 2.62 (30)	-	0.969	-0.01 [-0.51, 0.49]
	CC (cm)	40.56 ± 3.78 (32)	41.77 ± 3.15 (30)	-	0.180	-0.34 [-0.84, 0.16]
	TSF (mm)	13.94 ± 3.81 (32)	13.13 ± 3.66 (30)	-	0.4	0.21 [-0.29, 0.71]
	HGS (Kgf)	8.63 ± 3.83 (32)	6.4 ± 3.86 (30)	-	0.026	0.57 [0.06, 1.08]
	(30 days)					

Appendix 4. Continued

Author (year)	Outcomes (unit) (Follow-up end point)	Intervention group (n)	Control group (n)	Intervention group 2 (n)	p-value <sup>a</sup>	Standardised mean difference [95%CI]
Fernández – Barrés (2017) <sup>34</sup>	Nutritional status (MNA) (score)	21.4 ± 3.2 (63)	18.3 ± 3.8 (48)	-	<0.001	0.89 [0.49, 1.28]
	Body weight (kg)	64.2 ± 14.4 (63)	62.7 ± 17.4 (48)	-	0.087	0.09 [-0.28, 0.47]
	Energy intake (kcal/day)	1,850 ± 388 (63)	1,719.5 ± 350.0 (48)	-	0.568	0.35 [-0.03, 0.73]
	Protein intake (g/day)	64.3 ± 17.8 (63)	58.7 ± 10.5 (48)	-	0.05	0.37 [-0.01, 0.75]
	BMI (kg/m <sup>2</sup> )	27.3 ± 5.5 (63)	26.8 ± 6.5 (48)	-	0.255	0.08 [-0.29, 0.46]
	ADL function (BI) (score) (12 months)	60.2 ± 26.1 (63)	53.8 ± 30.5 (48)	-	0.33	0.23 [-0.15, 0.60]
Gariballa (2006) <sup>35</sup>	Body weight (kg)	69 ± 14 (119)	69 ± 13 (106)	-	0.9	0.00 [-0.26, 0.26]
	BMI (kg/m <sup>2</sup> )	26 ± 4 (119)	26 ± 4 (106)	-	0.6	0.00 [-0.26, 0.26]
	MUAC (cm)	28.3 ± 4 (119)	28.6 ± 3 (106)	-	0.4	-0.08 [-0.35, 0.18]
	TSF (mm)	15.3 ± 6 (119)	15.6 ± 7 (106)	-	0.9	-0.05 [-0.31, 0.22]
	ADL function (BI) (score) (6 months)	18.3 ± 3 (222)	18.6 ± 3 (223)	-	0.9	-0.10 [-0.29, 0.09]
	-	-	-	-	-	-
Hin (2017) <sup>37</sup>	Body weight (kg)	77.8 ± 3.86 (204) <sup>b</sup>	78.4 ± 3.72 (101)	-	0.17	-0.16 [-0.40, 0.08]
	BMI (kg/m <sup>2</sup> )	27.7 ± 1.57 (204) <sup>b</sup>	27.9 ± 1.51 (101)	-	0.24	-0.13 [-0.37, 0.11]
	HGS (kg) (12 months)	23.8 ± 5.71 (204) <sup>b</sup>	24.4 ± 6.03 (101)	-	0.40	-0.10 [-0.34, 0.14]
	-	-	-	-	-	-
Kim (2013) <sup>36</sup>	Body weight (kg)	49 ± 9.4 (41)	45.8 ± 8.0 (43)	-	0.822	0.36 [-0.07, 0.80]
	Energy intake (kcal/day)	1,124 ± 315 (41)	896 ± 277 (43)	-	0.008	0.76 [0.32, 1.21]
	Protein intake (g/day)	54.7 ± 21.2 (41)	32.7 ± 10.3 (43)	-	<0.001	1.32 [0.84, 1.79]
	MUAC (cm)	25.8 ± 2.7 (41)	24.3 ± 2.7 (43)	-	0.735	0.55 [0.11, 0.99]
	HGS (kg) (12 weeks)	15.1 ± 4.8 (41)	16.4 ± 5.3 (43)	-	0.561	-0.25 [-0.68, 0.18]
	-	-	-	-	-	-
Luger (2016) <sup>37</sup>	Nutritional status (MNA) (score)	25.2 ± 3.2 (39)	25.1 ± 3.6 (41)	-	0.7	0.03 [-0.41, 0.47]
	Nutritional status (MNA) (impaired) (%) (12 weeks)	27.2 (17) <sup>c</sup>	22.7 (21) <sup>c</sup>	-	0.569	-

Author (year)	Outcomes (unit) (Follow-up end point)	Intervention group (n)	Control group (n)	Intervention group 2 (n)	p-value <sup>a</sup>	Standardised mean difference [95%CI]	
Munk (2014) <sup>38</sup>	Body weight (change) (kg)	0.4 ± 2.6 (41)	-0.4 ± 1.8 (40)	-	0.17	0.35 [-0.09, 0.79]	
	Participants reaching ≥75% energy requirement (%)	76 (31)	70 (28)	-	0.57	-	
	Participants reaching ≥75% protein requirement (%)	66 (27)	30 (12)	-	0.001	-	
	Energy intake (kcal/day) <sup>d</sup>	1,395.3 ± 396.4 (41)	1,229.6 ± 437.5 (40)	-	0.08	0.39 [-0.05, 0.83]	
	Energy intake (kcal/kg) <sup>d</sup>	24.6 ± 9.3 (41)	19.6 ± 7.9 (40)	-	0.013	0.57 [0.13, 1.02]	
	Protein intake (g/day)	53 ± 16 (41)	43 ± 17 (40)	-	0.011	0.60 [0.15, 1.05]	
	Protein intake (g/kg) <sup>d</sup>	0.9 ± 0.4 (41)	0.7 ± 0.3 (40)	-	0.003	0.56 [0.11, 1.00]	
	HGS (change) (kg) (During hospitalisation)	-0.1 ± 2.9 (41)	-0.4 ± 4.3 (40)	-	0.76	0.08 [-0.35, 0.52]	
	Myint (2013) <sup>39</sup>	Energy intake (kcal/day)	1,480.5 ± 207.5 (61)	1,127.4 ± 211.2 (60)	-	<0.000	1.68 [1.26, 2.09]
		Protein intake (g/day)	73.6 ± 10.6 (61)	63.5 ± 12.3 (60)	-	<0.000	0.87 [0.50, 1.25]
BMI (change) (kg/m <sup>2</sup> )		0.03 ± 1.21 (58)	-0.49 ± 1.01 (57)	-	0.012	0.46 [0.09, 0.83]	
MUAC (change) (cm)		-0.07 ± 1.16 (57)	-0.12 ± 1.16 (57)	-	NS	0.04 [-0.32, 0.41]	
TSF (change) (mm) (During hospitalisation or 4 weeks after discharge)		0.12 ± 1.76 (57)	-0.15 ± 2.24 (57)	-	NS	0.13 [-0.23, 0.50]	
Neelemaat (2011) <sup>40</sup>		HGS (change) (kg)	0.2 ± 5.6 (65)	1.0 ± 6.7 (53)	-	NS	-0.13 [-0.49, 0.23]
	ADL function (LASA Functional Limitation Questionnaire) (score) <sup>e</sup>	-0.3 ± 1.2 (70)	0.2 ± 1.5 (74)	-	NS	0.37 [0.04, 0.69]	
	ADL function (LASA Physical Activity Questionnaire) (score) (3 months)	0.5 ± 1.5 (57)	0.6 ± 1.5 (53)	-	NS	-0.07 [-0.44, 0.31]	

## Appendix 4. Continued

Author (year)	Outcomes (unit) (Follow-up end point)	Intervention group (n)	Control group (n)	Intervention group 2 (n)	p-value <sup>a</sup>	Standardised mean difference [95%CI]
Pedersen (2016) <sup>38</sup>	Nutritional status (MNA) (change) (score)	4.5 ± 3 <sup>†,‡</sup> (52)	3.5 ± 3 <sup>†,‡,§</sup> (54)	4 ± 3 <sup>†,§</sup> (51)	†: 0.3	‡: 0.33 [-0.05, 0.71] §: 0.17 [-0.22, 0.55]
	Nutritional status (MNA) (improvement) (%)	92 (48) <sup>†</sup>	87 (47) <sup>†</sup>	96 (49) <sup>†</sup>	†: 0.06	-
	HGS (change) (kg)	0.5 ± 3 <sup>†,‡</sup> (52)	0 ± 3 <sup>†,‡,§</sup> (54)	0 ± 4 <sup>†,§</sup> (51)	†: 0.6	‡: 0.17 [-0.22, 0.55] §: 0 [-0.38, 0.38]
	HGS (improvement) (%)	67 (35) <sup>†</sup>	63 (34) <sup>†</sup>	59 (30) <sup>†</sup>	†: 0.7	-
	ADL function (BI) (change) (score)	9.7 ± 11.4 <sup>†,‡</sup> (52)	6.7 ± 13 <sup>†,‡,§</sup> (54)	7 ± 13 <sup>†,§</sup> (51)	†: 0.3	‡: 0.24 [-0.14, 0.63] §: 0.03 [-0.36, 0.41]
	ADL function (BI) (improvement) (%) (8 weeks)	96 (50) <sup>†</sup>	72 (39) <sup>†,‡</sup>	75 (38) <sup>†</sup>	†: <0.01 ‡: NS	-
Rondanelli (2016) <sup>41</sup>	Nutritional status (MNA) (change) (score)	1.76 ± 2.19 (69)	0.24 ± 3.4 (61)	-	0.003	0.54 [0.18, 0.89]
	Body weight (change) (kg)	1.12 ± 3.12 (69)	-0.89 ± 2.87 (61)	-	<0.001	0.66 [0.31, 1.02]
	Energy intake (kcal/day)	1,573 ± 339 (69)	1,615 ± 273 (61)	-	NS	-0.13 [-0.48, 0.21]
	Protein intake (g/day)	55 ± 11 (69)	60 ± 9 (61)	-	NS	-0.49 [-0.84, -0.14]
	BMI (change) (kg/m <sup>2</sup> )	0.42 ± 1.27 (69)	-0.42 ± 1.09 (61)	-	<0.001	0.70 [0.35, 1.06]
	WC (change) (cm)	4.93 ± 24.1 (69)	2.27 ± 15.56 (61)	-	0.449	0.13 [-0.22, 0.47]
	HGS (change) (kg)	3.2 ± 4.06 (69)	-0.47 ± 2.32 (61)	-	<0.001	1.09 [0.72, 1.46]
	ADL function (Katz Index) (change) (score) (12 weeks)	0.54 ± 0.6 (69)	-0.61 ± 0.72 (61)	-	<0.001	1.73 [1.33, 2.14]
	Nutritional status (MNA) (change) (score)	0.46 ± 3.98 (448)	-0.66 ± 3.35 (498)	-	0.028	0.31 [0.18, 0.43]
	Body weight (change) (kg)	0.26 ± 8.94 (448)	0.09 ± 6.93 (498)	-	0.598	0.02 [-0.11, 0.15]
BMI (change) (kg/m <sup>2</sup> )	-0.01 ± 2.15 (448)	-0.06 ± 2.5 (498)	-	0.843	0.02 [-0.11, 0.15]	
ADL function (ADL Scale) (change) (score) (12 months)	-0.83 ± 1.51 (448)	-0.74 ± 1.36 (498)	-	0.948	-0.06 [-0.19, 0.06]	

Author (year)	Outcomes (unit) (Follow-up end point)	Intervention group (n)	Control group (n)	Intervention group 2 (n)	p-value <sup>a</sup>	Standardised mean difference [95%CI]	
Sharma (2017) <sup>22</sup>	Nutritional status (PG-SGA) (change) (score) <sup>c</sup>	-5.9 ± 5.46 (57)	-6.2 ± 6.57 (46)	-	0.79	-0.05 [-0.44, 0.34]	
	Nutritional status (PG-SGA) (class) (%)						
	Class A	72 (41)	60.9 (28)	-	0.50	-	
	Class B	26.3 (15)	37 (17)	-		-	
	Class C	1.7 (1)	2.1 (1)	-		-	
	Body weight (change) (kg)	0.7 ± 4.64 (57)	0.13 ± 4.36 (46)	-	0.52	0.13 [-0.26, 0.51]	
	BMI (change) (kg/m <sup>2</sup> )	0.41 ± 1.87 (57)	-0.36 ± 1.87 (46)	-	0.04	0.41 [0.02, 0.80]	
	MUAC (change) (cm)	0.77 ± 2 (57)	0.64 ± 2.19 (46)	-	0.75	0.06 [-0.33, 0.45]	
	TSF (change) (mm)	-0.04 ± 3.56 (57)	-0.93 ± 6.3 (46)	-	0.36	0.18 [-0.21, 0.57]	
	HGS (change) (kg) (3 months)	1.82 ± 4.09 (57)	1.56 ± 4.76 (46)	-	0.77	0.06 [-0.33, 0.45]	
	Stange (2013) <sup>26</sup>	Nutritional status (MNA-SF) (score)	9.7 ± 2.3 (42)	9 ± 1.6 (35)	-	0.8	0.33 [-0.12, 0.78]
		Body weight (kg)	55.8 ± 9.7 (42)	52.2 ± 8.4 (35)	-	0.002	0.39 [-0.06, 0.84]
Energy intake (kcal/day)		1,615 ± 442 (35)	1,496 ± 299 (31)	-	0.211	0.31 [-0.18, 0.79]	
Protein intake (g/day)		54.9 ± 18.2 (35)	48 ± 12.1 (31)	-	0.077	0.44 [-0.05, 0.93]	
BMI (kg/m <sup>2</sup> )		23.5 ± 3.3 (42)	22.3 ± 3.1 (35)	-	0.002	0.37 [-0.08, 0.82]	
MUAC (cm)		24.8 ± 3.5 (42)	24.9 ± 3.3 (35)	-	0.015	-0.03 [-0.48, 0.42]	
CC (cm)		31 ± 4.4 (42)	30.3 ± 3.3 (35)	-	0.018	0.18 [-0.27, 0.63]	
HGS (kPa)		32 ± 17.2 (28)	43.7 ± 22.3 (20)	-	0.407	-0.59 [-1.18, -0.00]	
ADL function (BI) (score) (12 weeks)		23.3 ± 26.9 (42)	31.7 ± 46.4 (35)	-	0.979	-0.22 [-0.67, 0.23]	
Veronese (2014) <sup>14</sup>		Body weight (kg)	NR	NR	-	NS	-
		BMI (kg/m <sup>2</sup> )	NR	NR	-	NS	-
		HGS (kg) (12 weeks)	23.59 ± 5.33 (53)	21.36 ± 4.91 (71)	-	NS	0.44 [0.08, 0.80]

## Appendix 4. Continued

Author (year)	Outcomes (unit) (Follow-up end point)	G1 Normal size, Lower protein (N)	G2 Normal size, Enriched (N)	G3 Reduced size, Lower protein (N)	G4 Reduced size, Enriched (N)	p-value <sup>a</sup>	Standardised mean difference [95%CI] <sup>b</sup>
Ziyian (2016) <sup>49</sup>	Beef meal: Energy intake (kJ)	1,427 ± 361.5†, \$ (60)	1,787 ± 361.5†, ¶ (60)	1,424 ± 361.5‡, ¶ (60)	1,742 ± 361.5‡, \$ (60)	†: <0.05 ‡: <0.05 \$: <0.05 ¶: <0.05	G1-G2: -0.99 [-1.37, -0.61] G1-G3: 0.01 [-0.35, 0.37] G1-G4: -0.87 [-1.24, -0.49] G2-G3: 1.00 [0.62, 1.38] G2-G4: 0.12 [-0.23, 0.48] G3-G4: -0.87 [-1.25, -0.50]
	Protein intake (g)	22.6 ± 4.38†, \$ (60)	28 ± 4.38†, ¶ (60)	23 ± 4.38‡, ¶ (60)	28.1 ± 4.38‡, \$ (60)	†: <0.001 ‡: <0.001 \$: <0.05 ¶: <0.05	G1-G2: -1.23 [-1.62, -0.83] G1-G3: -0.09 [-0.45, 0.27] G1-G4: -1.25 [-1.64, -0.86] G2-G3: 1.13 [0.75, 1.52] G2-G4: -0.02 [-0.38, 0.34] G3-G4: -1.16 [-1.54, -0.77]
	Chicken meal: Energy intake (kJ)	1,598 ± 284.8‡, \$ (60)	1,770 ± 284.8‡, ¶ (60)	1,568 ± 284.8‡, \$ (60)	1,843 ± 295.8† (60)	†vs‡: <0.05 ‡vs\$: <0.05	G1-G2: -0.60 [-0.97, -0.23] G1-G3: 0.10 [-0.25, 0.46] G1-G4: -0.84 [-1.21, -0.46] G2-G3: 0.70 [0.34, 1.07] G2-G4: -0.25 [-0.61, 0.11] G3-G4: -0.94 [-1.32, -0.56]
	Protein intake (g)	24.3 ± 3.3†, \$ (60)	30.4 ± 3.3†, ¶ (60)	23.8 ± 3.3‡, ¶ (60)	30.9 ± 3.3‡, \$ (60)	†: <0.001 ‡: <0.001 \$: <0.05 ¶: <0.05	G1-G2: -1.84 [-2.27, -1.41] G1-G3: 0.15 [-0.21, 0.51] G1-G4: -1.99 [-2.43, -1.55] G2-G3: 1.99 [1.55, 2.43] G2-G4: -0.15 [-0.51, 0.21] G3-G4: -2.14 [-2.59, -1.69]

(After each meal)

Notes: Data are presented as mean  $\pm$  standard deviation (SD), unless specified otherwise with (%). Estimation of mean  $\pm$  SD from mean  $\pm$  standard error (SE) with the formula  $SD = SE \times \sqrt{N}$ ; from mean  $\pm$  [95%CI] with the formula  $SD = \sqrt{N \times (\text{upper limit} - \text{lower limit})/3.92}$ ;<sup>24</sup> from median (range) with the formulas mean = (minimum + 2 x median + maximum)/4 and  $SD = (\text{maximum} - \text{minimum})/2^{\Phi^{-1}(n - 0.375/n + 0.25)}$ ;<sup>25</sup> from median (interquartile range) with the formulas mean = (<sup>1st</sup> quartile + median + <sup>3rd</sup> quartile)/3 and  $SD = (3^{\text{rd}} \text{ quartile} - 1^{\text{st}} \text{ quartile})/2^{\Phi^{-1}(0.75n - 0.125/n + 0.25)}$ .<sup>25</sup> (PG-)SGA: category A: well-nourished, category B: mild-moderate malnutrition, category C: severe malnutrition.

**Abbreviations:** ADL = activities of daily living; BI = Barthel Index; BMI = body mass index; CC = calf circumference; G1 = group 1; G2 = group 2; G3 = group 3; G4 = group 4; HGS = handgrip strength; MNA = Mini Nutritional Assessment; MNA SF = Mini Nutritional Assessment short-form; MUAC = mid-upper arm circumference; NR = not reported; NS = not significant; PG-SGA = Patient-Generated Subjective Global Assessment; SGA = Subjective Global Assessment; TSF = triceps skinfold; WC = waist circumference.

<sup>a</sup> Between intervention group and control group.

<sup>b</sup> Scores of both intervention groups altogether.

<sup>c</sup> These are data as described in the article.<sup>27</sup> These data are incorrect. The correct data for impaired nutritional status are (in % (n)): intervention group: 45.6 (19) and control group: 22.7 (9) (Personal communication, E. Winzer – Luger, 06-03-2019).

<sup>d</sup> Conversion of units for energy intake from kJ/day to kcal/day, and kJ kg<sup>-1</sup> to kcal/kg (1 kcal = 4.1876 kJ); and protein intake from g kg<sup>-1</sup> to g/kg.

<sup>e</sup> Better is indicated by lower values.

**Appendix 5.** Certainty of evidence for nutritional outcomes assessed by nurses across identified interventions using GRADE<sup>a</sup>

<b>Certainty assessment:</b>		<b>No of patients:</b>		<b>Effect<sup>d</sup></b>	<b>Certainty<sup>e</sup></b>					
<b>No. of studies</b>	<b>Study design</b>	<b>Risk of bias</b>	<b>Inconsistency</b>	<b>Indirectness</b>	<b>Imprecision<sup>b</sup></b>	<b>Other<sup>c</sup></b>	<b>IG</b>	<b>CG</b>		
<b>Intervention: Oral nutritional supplements</b>										
<u>Nutritional status (MNA-SF - score) (follow up: 12 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Serious	Serious	None	42	35	0.33 [-0.12, 0.78]	⊕○○○ VERY LOW
<u>Nutritional status (SGA Category A - %) (follow up: 90 days)</u>										
1	Randomised trials	Serious	Not serious	Serious	Serious	None	76/167 (45.5%)	48/160 (30%)	1.95 [1.24, 3.07] <sup>g</sup>	⊕⊕○○ LOW
<u>Body weight (kg) (follow up: range 30 days to 12 months)</u>										
5	Randomised trials	Very serious	Not serious	Serious	Not serious	None	438	315	-0.02 [-0.17, 0.13] <sup>f</sup>	⊕○○○ VERY LOW
<u>Body weight (change - kg) (follow up: 3 months)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Not serious	None	57	46	0.13 [-0.26, 0.51]	⊕⊕○○ LOW
<u>Energy intake (kcal/day) (follow up: range hospitalisation period to 12 weeks)</u>										
4	Randomised trials	Very serious	Not serious	Serious	Serious	Strong association	167	164	0.90 [0.67, 1.13] <sup>f</sup>	⊕○○○ VERY LOW
<u>Protein intake (g/day) (follow up: range hospitalisation period to 12 weeks)</u>										
3	Randomised trials	Very serious	Not serious	Serious	Serious	Strong association	137	134	0.88 [0.63, 1.14] <sup>f</sup>	⊕○○○ VERY LOW

Appendix 5. Continued

Certainty assessment:		No of patients:		Effect <sup>d</sup>	Certainty <sup>e</sup>					
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	CG		
<u>Protein intake (g/kg) (follow up: hospitalisation period)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	Strong association	30	30	1.73 [1.13, 2.33]	⊕○○○ LOW
<u>BMI (kg/m<sup>2</sup>) (follow up: range 30 days to 12 months)</u>										
4	Randomised trials	Very serious	Not serious	Serious	Not serious	None	397	272	-0.03 [-0.19, 0.13]	⊕○○○ VERY LOW
<u>BMI (change - kg/m<sup>2</sup>) (follow up: range 30 days to 3 months)</u>										
3	Randomised trials	Very serious	Not serious	Not serious	Not serious	None	378	389	0.04 [-0.10, 0.19] <sup>f</sup>	⊕○○○ LOW
<u>Mid-upper arm circumference (cm) (follow up: range 30 days to 6 months)</u>										
4	Randomised trials	Very serious	Not serious	Serious	Not serious	None	234	214	0.23 [-0.34, 0.79] <sup>f</sup>	⊕○○○ VERY LOW
<u>Calf circumference (cm) (follow up: range 30 days to 12 weeks)</u>										
2	Randomised trials	Very serious	Serious	Serious	Serious	None	74	65	-0.05 [-0.39, 0.28] <sup>f</sup>	⊕○○○ VERY LOW
<u>Triceps skinfold (mm) (follow up: range 30 days to 6 months)</u>										
2	Randomised trials	Very serious	Not serious	Not serious	Serious	None	151	136	0.01 [-0.22, 0.24]	⊕○○○ VERY LOW
<u>Handgrip strength (kg) (follow up: range 12 weeks to 12 months)</u>										
3	Randomised trials	Serious	Not serious	Serious	Not serious	None	298	215	0.01 [-0.17, 0.19] <sup>f</sup>	⊕○○○ LOW

## Appendix 5. Continued

Certainty assessment:		No of patients:		Effect <sup>d</sup>	Certainty <sup>e</sup>					
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	CG		
<u>Handgrip strength (kPa) (follow up: 12 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Serious	Serious	None	28	20	-0.59 [-1.18, -0.00]	⊕○○○ VERY LOW
<u>ADL function (Katz Index - score) (follow up: 90 days)</u>										
1	Randomised trials	Serious	Not serious	Not serious	Not serious	None	313	309	-	⊕⊕○○ MODER- ATE
<u>ADL function (BI - score) (follow up: range 12 weeks to 6 months)</u>										
2	Randomised trials	Serious	Not serious	Serious	Not serious	None	264	258	-0.12 [-0.29, 0.05]	⊕○○○ LOW
Intervention: Food/fluid fortification or enrichment										
<u>Nutritional status (change MNA - score) (follow up: 12 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	69	61	0.54 [0.18, 0.89]	⊕○○○ VERY LOW
<u>Body weight (change - kg) (follow up: range hospitalisation period to 12 weeks)</u>										
2	Randomised trials	Very serious	Not serious	Not serious	Serious	None	110	101	0.54 [0.27, 0.82]	⊕○○○ VERY LOW
<u>Energy intake (kcal/day) (follow up: range 1 day to 12 weeks)</u>										
4	Randomised trials	Very serious	Not serious	Not serious	Not serious	None	207	211	0.07 [-0.13, 0.26]	⊕⊕○○ LOW

Appendix 5. Continued

Certainty assessment:		No of patients:		Effect <sup>d</sup>	Certainty <sup>e</sup>				
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	CG	
<u>Energy intake (kcal/kg) (follow up: range 1 day to hospitalisation period)</u>									
2	Randomised trials	Very serious	Not serious	Not serious	Serious	None	108	120	0.36 [0.10, 0.62] ⊕○○○ VERY LOW
<u>Protein intake (g/day) (follow up: range 1 day to 12 weeks)</u>									
3	Randomised trials	Very serious	Not serious	Not serious	Serious	None	177	181	0.20 [-0.02, 0.41] <sup>f</sup> ⊕○○○ VERY LOW
<u>Protein intake (Patients reaching 1.5 g/kg/day protein intake - %) (follow up: 1 day)</u>									
1	Randomised trials	Very serious	Not serious	Not serious	Serious	Strong association	43/67 (64.2%)	16/80 (20%)	7.17 [3.41, 15.04] <sup>f</sup> ⊕⊕○○ LOW
<u>BMI (change - kg/m<sup>2</sup>) (follow up: 12 weeks)</u>									
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	69	61	0.70 [0.35, 1.06] ⊕○○○ VERY LOW
<u>Waist circumference (change - cm) (follow up: 12 weeks)</u>									
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	69	61	0.13 [-0.22, 0.47] ⊕○○○ VERY LOW
<u>Handgrip strength (change - kg) (follow up: range hospitalisation period to 3 months)</u>									
3	Randomised trials	Serious	Not serious	Not serious	Serious	None	175	154	0.37 [0.14, 0.59] <sup>f</sup> ⊕⊕○○ LOW

Appendix 5. Continued										
Certainty assessment:										
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	No of patients: CG	Effect <sup>d</sup>	Certainty <sup>e</sup>
<u>ADL function (change - Katz Index - score) (follow up: 12 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	Strong association	69	61	1.73 [1.33, 2.14]	⊕⊕○○ LOW
<u>ADL function (change LASA Functional Limitation - score) (follow up: 3 months)</u>										
1	Randomised trials	Not serious	Not serious	Not serious	Serious	None	70	74	0.37 [0.04, 0.69]	⊕⊕⊕○ MODERATE
Intervention: Dietary counselling										
<u>Nutritional status (change -MNA - score) (follow up: 8 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	103	108	0.25 [-0.02, 0.52]	⊕○○○ VERY LOW
<u>Body weight (change -kg) (follow up: 3 months)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	57	46	0.13 [-0.26, 0.51]	⊕○○○ VERY LOW
<u>Body weight (&gt;5% loss - %) (follow up: 3 months)</u>										
1	Randomised trials	Serious	Not serious	Not serious	Serious	None	2/52 (3.8%)	5/48 (10.4%)	0.34 [0.06, 1.86] <sup>†</sup>	⊕⊕○○ LOW
<u>BMI (change - kg/m<sup>2</sup>) (follow up: 3 months)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	57	46	0.41 [0.02, 0.80]	⊕○○○ VERY LOW

## Appendix 5. Continued

Certainty assessment:		No of patients:		Effect <sup>d</sup>	Certainty <sup>e</sup>					
No. of studies	Study design	Risk of bias	Inconsistency			Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	CG
<u>Mid-upper arm circumference (change - cm) (follow up: 3 months)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	57	46	0.06 [-0.33, 0.45]	⊕○○○ VERY LOW
<u>Triceps skinfold (change - mm) (follow up: 3 months)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	57	46	0.18 [-0.21, 0.57]	⊕○○○ VERY LOW
<u>Handgrip strength (change - kg) (follow up: range 8 weeks to 3 months)</u>										
3	Randomised trials	Serious	Not serious	Not serious	Not serious	None	225	207	0.02 [-0.17, 0.21]	⊕⊕○○ MODER- ATE
<u>Handgrip strength (improvement - %) (follow up: 8 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	65/103 (63.1%)	34/54 (63%)	1.01 [0.57, 1.76]	⊕○○○ VERY LOW
<u>ADL function (change BI - score) (follow up: 8 weeks)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	103	108	0.13 [-0.14, 0.40]	⊕○○○ VERY LOW
<u>ADL function (change LASA Functional Limitation - score) (follow up: 3 months)</u>										
1	Randomised trials	Not serious	Not serious	Not serious	Serious	None	70	74	0.37 [0.04, 0.69]	⊕⊕○○ MODER- ATE

## Appendix 5. Continued

Certainty assessment:		No of patients:		Effect <sup>d</sup>	Certainty <sup>e</sup>					
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	CG		
Intervention: Education										
<u>Nutritional status (MNA - score) (follow up: range 12 weeks to 12 months)</u>										
2	Randomised trials	Serious	Not serious	Not serious	Serious	None	102	89	0.50 [0.21, 0.80] <sup>f</sup>	⊕⊕○○ LOW
<u>Nutritional status (change - MNA - score) (follow up: 12 months)</u>										
1	Randomised trials	Very serious	Not serious	Serious	Not serious	None	448	498	0.31 [0.18, 0.43]	⊕○○○ VERY LOW
<u>Nutritional status (impaired - MNA - %) (follow up: 12 weeks)</u>										
1	Randomised trials	Not serious	Not serious	Not serious	Serious	None	19/39 (48.7%)	9/41 (22%)	3.38 [1.28, 8.91] <sup>g</sup>	⊕⊕⊕○ MODER- ATE
<u>Body weight (change - kg) (follow up: 12 months)</u>										
1	Randomised trials	Very serious	Not serious	Serious	Not serious	None	448	498	0.02 [-0.11, 0.15]	⊕○○○ VERY LOW
<u>Energy intake (kcal/day) (follow up: 12 months)</u>										
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	63	48	0.35 [-0.03, 0.73]	⊕○○○ VERY LOW

Appendix 5. Continued

Certainty assessment:		No of patients:		Effect <sup>d</sup>	Certainty <sup>e</sup>				
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision <sup>b</sup>	Other <sup>c</sup>	IG	CG	
<u>Protein intake (g/day) (follow up: 12 months)</u>									
1	Randomised trials	Very serious	Not serious	Not serious	Serious	None	63	48	0.37 [-0.01, 0.75] ⊕○○○ VERY LOW
<u>BMI (change - kg/m<sup>2</sup>) (follow up: 12 months)</u>									
1	Randomised trials	Very serious	Not serious	Serious	Not serious	None	448	498	0.02 [-0.11, 0.15] ⊕○○○ VERY LOW
<u>ADL function (change - ADL scale - score) (follow up: 12 months)</u>									
1	Randomised trials	Very serious	Not serious	Serious	Not serious	None	448	498	-0.06 [-0.19, 0.06] ⊕○○○ VERY LOW

Notes: SGA: category A: well-nourished.

Abbreviations: ADL = activities of daily living; BI = Barthel Index; BMI = body mass index; CG = control group; IG = intervention group; MNA = Mini Nutritional Assessment; MNA-SF = Mini Nutritional Assessment short-form; SGA = Subjective Global Assessment.

<sup>a</sup> Grading of Recommendations Assessment, Development and Evaluation (GRADE) for rating for outcomes across included studies.<sup>28</sup>

<sup>b</sup> Imprecision was rated 'serious' when total sample size for an outcome was < 400; and rated 'not serious' when total sample size for an outcome was > 400.<sup>28</sup>

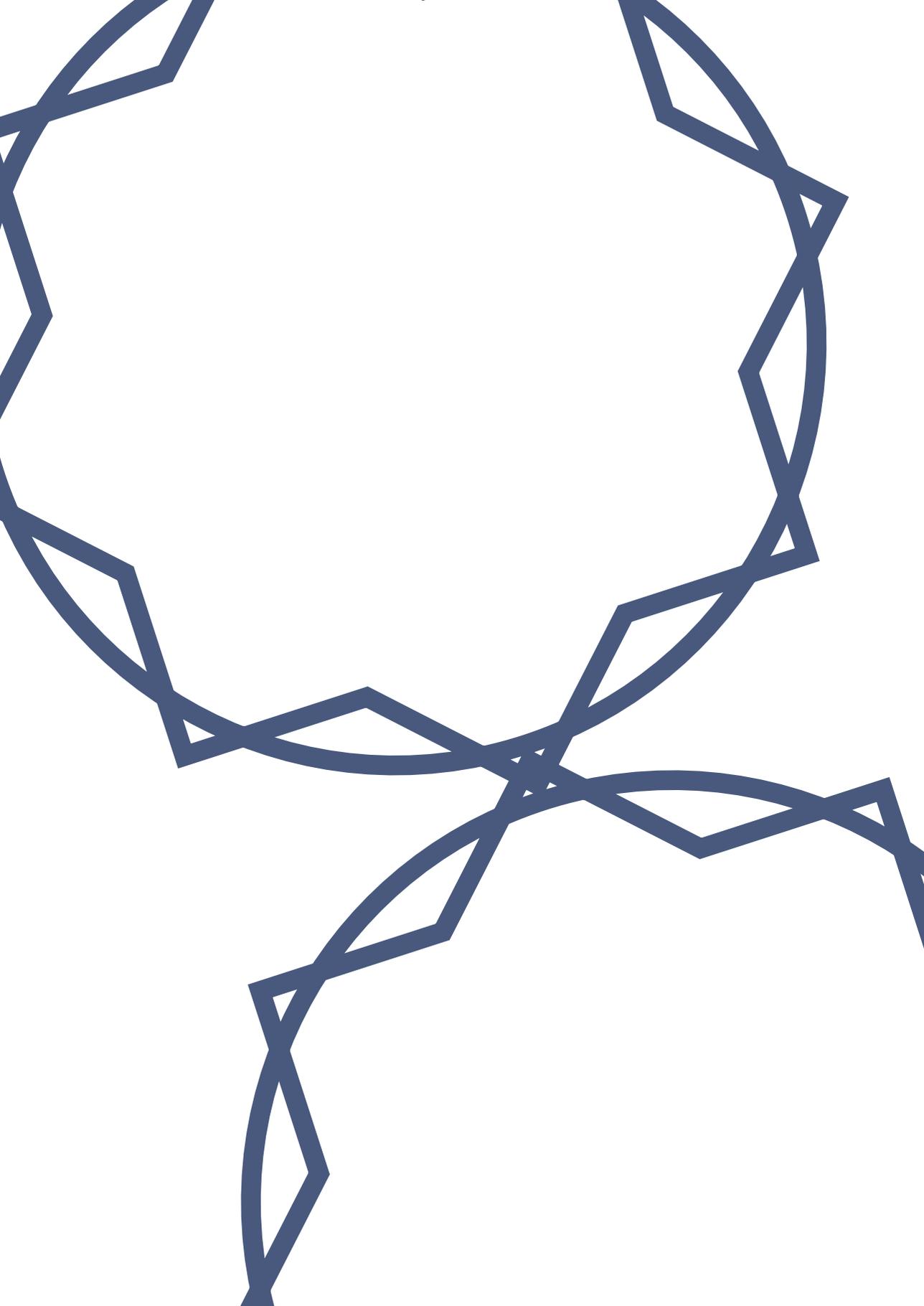
<sup>c</sup> Large effect within item 'Other' was rated 'no' when the standardised mean difference (SMD) ≤ 0.85 or OR ≤ 5.5; 'large' when the SMD > 0.85 and ≤ 2.0 or OR > 5.5 and ≤ 32; 'very large' when the SMD > 2.0 or OR > 32.<sup>28</sup>

<sup>d</sup> Effect is presented as the SMD[95%CI], unless denoted with †, then the effect is presented as OR[95%].

<sup>e</sup> Certainty of evidence can be graded as: high, moderate, low, and very low.<sup>28</sup>

<sup>f</sup> The effect shows substantial or considerable heterogeneity.<sup>24</sup>

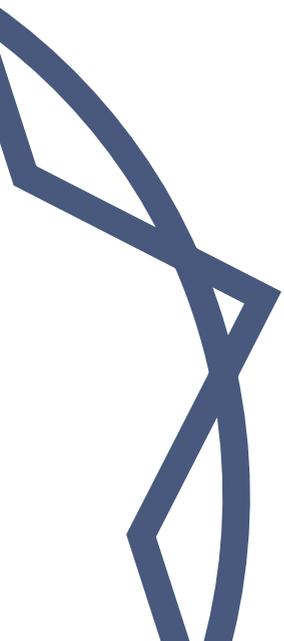




# 3

## Hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition: A cross-sectional study

Debbie ten Cate, Lisette Schoonhoven, Getty Huisman – de Waal,  
Marieke J. Schuurmans, Roelof G.A. Ettema



## Abstract

**Aims and objectives:** To gain insight into the experiences and perceptions of hospital and home care nurses regarding nutritional care for older adults to prevent and treat malnutrition.

**Background:** In-depth knowledge about hospital and home care nurses' experiences and perceptions can contribute to optimise nutritional care for older adults across the care continuum between hospital and home to prevent and treat malnutrition.

**Design:** Multicentre cross-sectional descriptive study.

**Method:** A validated questionnaire addressing malnutrition was used. A total of 1,135 questionnaires were sent to hospital and home care nurses. The STROBE statement was followed for reporting.

**Results:** The response rate was 49% (n = 556). Of all the nurses, 37% perceived the prevalence of malnutrition among their care recipients between 10% and 25%. Almost 22% of the nurses neither agreed nor disagreed or disagreed with the statement that prevention of malnutrition is possible. More than 28% of the nurses reported that malnutrition is a small or no problem. Over 95% of the hospital nurses and 52.5% of the home care nurses stated they screened routinely for malnutrition. The nurses considered several interventions for treating malnutrition important. Over 81% of the nurses indicated they wanted to follow further training.

**Conclusion:** Most hospital and home care nurses perceived that nutritional care for older adults to prevent and treat malnutrition was important. A fair group of nurses, however, had the opposite perception.

**Relevance to clinical practice:** Raising the awareness of all hospital and home care nurses about the importance of nutritional care for older adults is pivotal to increase the chance of successfully providing nursing nutritional care. Nurses should follow training for consolidation of nutritional care. Nurses are well-positioned to take a leadership role to improve continuity and quality of nutritional care across the care continuum between hospital and home.

## Introduction

Nutrition and nutrition-related activities are an important element of essential nursing care for older adults to prevent and treat malnutrition and promote health.<sup>1-3</sup> Nowadays, with an ageing population, these activities are even more emphasised to minimise burden on both a societal and individual level.<sup>3,4</sup> This is especially relevant for both the hospital and home care setting, where a majority of older adults with care needs reside.<sup>5,6</sup> This number is increasing as a result of multimorbidity, which mainly comes with age. In addition, the last years, older adults increasingly live in their own homes for longer instead of moving to residential or nursing homes due to shifts in healthcare policies.<sup>5,6</sup> Delivery of nursing nutritional care in collaboration with other disciplines in the hospital and home care context is set out in national and international guidelines,<sup>3,4,7</sup> and national policy.<sup>8</sup> Unfortunately, malnutrition in older adults who receive care in hospital or at home continues to be a serious problem with high prevalence rates.<sup>9,10</sup> Results from studies show that it appears to be challenging for hospital and home care nurses to provide high-quality nursing nutritional care in practice.<sup>11,12</sup> Given their key role and in order to improve current nursing nutritional care for older adults, more insight into hospital and home care nurses' experiences and perceptions is considered relevant.

## Background

Malnutrition is a common and serious problem in older adults who receive care in hospital and at home.<sup>3,4</sup> This is due to multimorbidity and age-related factors, which often negatively influence nutritional intake and ultimately cause malnutrition.<sup>3</sup> The prevalence of malnutrition ranges from 3.1% to 51% in hospitalised older adults<sup>9,10,13-15</sup> and from 8.7% to 21.1% in community-dwelling older adults with home care.<sup>9,15,16</sup>

Malnutrition is associated with poor health outcomes such as low muscle strength, swallowing disorders,<sup>17</sup> cognitive decline,<sup>17,18</sup> polypharmacy<sup>18</sup> and syndromes such as sarcopenia, cachexia and frailty.<sup>3,4</sup> It negatively affects functionality<sup>18</sup> and quality of life,<sup>19</sup> and is even associated with increased mortality.<sup>20</sup> As a consequence, malnutrition leads to an increased use of healthcare resources and a subsequent rise in costs.<sup>21</sup>

Hospital and home care nurses have a central role in providing appropriate nutritional care in their everyday work to the growing number of older adults in their care who are malnourished or at risk for malnutrition. Surely, nutritional-related

activities are an essential aspect of nursing care.<sup>2</sup> Nurses are the first point of contact for older adults, they spend most time interacting with older adults, and they ensure continuity and coordination of nutritional care. In this way, hospital and home care nurses can make a major contribution to multidisciplinary nutritional care in older adults as recommended by guidelines.<sup>3,7</sup>

Previous studies, assessing hospital nurses' experiences and perceptions, have demonstrated that hospital nurses experience quite a few barriers in providing appropriate nutritional care to older adults to prevent and treat malnutrition. Further, nurses' perceptions towards nutrition and nutritional care given to older adults vary from positive to negative and are sometimes ambiguous.<sup>11,12,22-24</sup>

Information on experiences and perceptions of both hospital and home care nurses are sparse. This is due to the limited number of studies, which have only been conducted in the hospital setting in a few countries in Northern Europe and one country in Asia.<sup>11,12,22-24</sup> In current nutritional care for older adults, this is a missed opportunity, as most older adults move across the continuum of care, of which a large part receives care at their homes<sup>6</sup> and in hospital.<sup>5</sup> In-depth knowledge about nurses' experiences and perceptions can increase the likelihood of successful performance of nutritional care activities and contribute to improving continuity and quality of current nursing nutritional care for older adults in the hospital and home care setting. Therefore, the aim of this study is to gain insight into hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition.

## Methods

### Study design

In a multicentre cross-sectional descriptive study, we sent out a structured questionnaire to hospital and home care nurses. In reporting this study, we followed the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) Statement.<sup>25</sup>

### Participants and setting

A purposive sampling method<sup>26</sup> on ward level (hospital) or team level (home care) was used to include registered nurses providing care to older adults. Hospital nurses worked at a general surgical or internal medicine ward. On these wards, a substantial proportion of older adults with (risk for) malnutrition was admitted. Home care

nurses provided care to mostly older adults with (risk for) malnutrition who live in the community. Nurses were selected from 34 general nursing wards in three hospitals (a university hospital and two general hospitals) and 27 nursing teams in ten home care organisations in the central and western region of the Netherlands. These wards and teams were selected to provide a representative sample of the nursing population.<sup>26</sup> One researcher (DtC) approached the head of nursing staff of the ward in the hospital, or the district manager or nurse team coordinator in the home care organisation about participation in the study.

### **Data collection procedure**

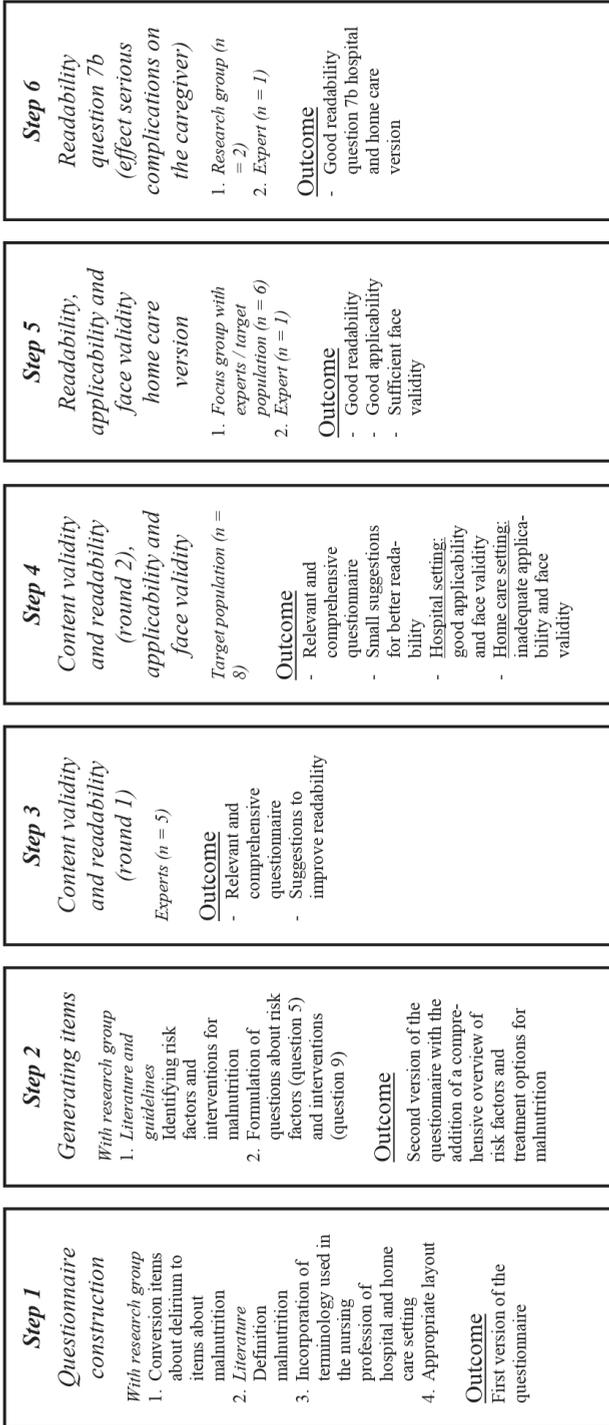
Questionnaires were sent to a total of 1,135 nurses working in the participating wards or teams between September 2016 and July 2017. To increase the chance of response, nurses received the questionnaire in one of four ways. These were 1) a hard copy, which was placed in the nurse's mailbox or personally handed out to the nurses; 2) a digital secured Microsoft Word version, which was sent as an attachment to the nurse's email address; a link, which was emailed to the nurse's work email, to an online version of the questionnaire using 3) SurveyMonkey (SurveyMonkey Inc., San Mateo, California, USA); or 4) the online form management system of the participating organisation. Each participating ward or home care team chose one way of distributing the questionnaire to all their nurses. This was done in coordination with the head of nursing staff of the ward or organisation-wide coordinator in the hospital, or district manager or nurse team coordinator in the home care organisation. These persons also distributed the questionnaire to the nurses. For each participating ward or home care nursing team, questionnaires were collected for a period of four to six weeks. During this period, the head of nursing staff of the hospital ward, or the home care district manager or nurse team coordinator informed their team about the study. Furthermore, they sent reminders for participation by email on a weekly basis. This was supported by one researcher (DtC) who communicated face-to-face or digitally with the manager or nurse team coordinator. Research assistants visited nursing wards in all three hospitals to inform nurses about the study and remind them to participate.

### **Questionnaire**

#### *Adaptation*

The questionnaire for this study was adapted from the Dutch validated questionnaire with regard to nurses' opinions about delirium.<sup>27</sup> This process was conducted in 2016 by members of the research group (DtC, MS, RE) in cooperation with experts. We modified the questionnaire to match our research question through a systematic process following six steps (Figure 1).

## Questionnaire adaptation



**Figure 1.** Adaptation of the questionnaire about hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition

*Step 1:* Members of the research group drafted a first version of the questionnaire. They converted the questions about delirium<sup>27</sup> to questions about malnutrition, extracted a widely used definition of malnutrition from literature<sup>28</sup> and incorporated terminology, which is commonly used in the nursing profession within the hospital and home care setting. In this process, seven questions about demographic characteristics and ten questions from the delirium questionnaire were adapted.

*Step 2:* The content of one question about risk factors and one question about interventions was further modified. Based on literature and guidelines, risk factors and interventions for malnutrition were identified.<sup>1,14,29-34</sup> The risk factors and interventions were embedded in the corresponding questions. This was conducted by the first author (DtC) and validated by the last author (RE) to assess the perception of nurses with regard to the importance of these risk factors and interventions. Both authors have considerable work experience within nursing practice, education and research, and expertise in malnutrition. This led to a second version of the questionnaire consisting of seven questions about demographic characteristics and ten questions about malnutrition.

*Step 3:* Experts (two nurses, one linguist, one dietitian/epidemiologist and one nurse/nurse scientist) evaluated content validity by assessing the questionnaire on relevance and comprehensiveness, and assessed readability individually by email. Experts were asked if the questions of the questionnaire were relevant, comprehensive and readable (yes/no), to explain their answer and give potentially suggestions for modification.<sup>35-37</sup> They determined the questionnaire was relevant and comprehensive and made suggestions to improve readability. Members of the research group (DtC, MS, RE) discussed these suggestions and achieved consensus, which resulted in changes to the questionnaire.

*Step 4:* Hospital nurses (n = 5) and home care nurses (n = 3) also evaluated content validity and readability individually by email.<sup>35-37</sup> They determined the complete questionnaire to be relevant, comprehensive and made some small recommendations for readability. Further, the nurses were requested to assess the applicability of the questionnaire for the hospital and home care setting (yes/no).<sup>38</sup> Also, face validity was determined.<sup>37</sup> Nurses were asked if the questionnaire was suitable to measure nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition (yes/no). For the hospital setting, they considered the questionnaire applicable and face valid. For the home care setting, the questionnaire demonstrated inadequate applicability and face validity. According to the nurses, this was mainly due to the use of unfamiliar terminology about the nursing position

and nursing process in the home care setting. Therefore, two versions of the questionnaire were created, of which only the wording differed. The hospital version was completed and consisted of seven questions about demographic characteristics and ten questions assessing nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition. The home care version remained to be developed.

*Step 5:* For the home care version, a focus group was organised to assess readability, applicability and face validity. Six experts who had a bachelor's degree in nursing and were working in various home care organisations suggested modifications to the questionnaire. These modifications concerned terminology related to the nursing position and nursing process in the home care setting. This led to good readability, applicability and face validity of the questionnaire. The home care version was verified by one expert (home care nurse/nurse scientist). The verification resulted in no changes, and the home care version of the questionnaire was finalised. This version included the same seven questions about demographic characteristics and ten questions as the hospital version with differences in terminology commonly used in the home care or hospital setting, respectively.

*Step 6:* During data collection and based on feedback from participating nurses, the question regarding the effect of serious complications on the caregiver seemed inconclusive. Therefore, two researchers (DtC, RE) added an explanation for both the hospital and home care version to increase readability. This explanation was validated and approved by one hospital nurse.

### *Content*

The questionnaire comprised of 17 questions and was divided in two parts. In the first part, demographic data including age, gender, education, current work setting and years of work experience were collected. In the second part, ten questions about malnutrition were included. These questions were mostly divided into sub-questions with open or multiple-choice answer options. Two main questions and the sub-questions of another three had a five-point Likert scale as answer option. The sub-questions of one question were open and the sub-questions of one other question had a dichotomous answer option. The answer options of sub-questions of three questions had a combination of Likert scale (three-point and/or four-point and/or five-point), open answer and/or a dichotomous answer option (see Appendix 1 and 2).

### Data analysis

Each sub-question or question in case sub-questions were not present was analysed. The data were presented as frequency (percentage) for categorical variables. To account for the skewed distribution of the data, continuous variables were expressed as median (Q1, Q3). The data resulting from open-ended sub-questions were categorised and presented as frequency (percentage). Comparisons for categorical variables between the hospital group and the home care group were made using the chi-square test or Fisher's exact test whether the assumptions for the chi-square test were not met. In case of statistical significance for categorical variables, post hoc multiple pairwise comparisons with Bonferroni corrections of the p-value were performed.<sup>39</sup> Patterns in missing values were analysed. Missing data were handled pairwise, because the percentage of variables with missing data ranged between 0.2% and 2.5%, and the full percentage of missing data was  $\leq 5\%$ .<sup>40</sup> The significance level was set at  $p \leq .05$  (two-sided). All data were analysed with IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp, Armonk, NY).

### Ethical considerations

Ethical approval was obtained from the Medical Research Ethics Committee of the University Medical Center Utrecht (16-506/C), the local Ethics Committee of the St. Antonius Hospital Nieuwegein (R&D/Z16.060) and Hospital Gelderse Vallei Ede (1610-522). All participants provided implied consent by sending the questionnaire to the researchers. Implied consent was sufficient because the questionnaires were filled in anonymous and risk for participating in this study was minimal.<sup>35</sup>

## Results

Of the 1,135 distributed questionnaires (hospital nurses:  $n = 946$ ; home care nurses:  $n = 189$ ), 556 were completed and returned (hospital nurses:  $n = 455$ ; home care nurses:  $n = 101$ ), which is an overall response rate of 49% (response rate hospital nurses: 48.1%; home care nurses: 53.4%). The median age of all the nurses was 31 years and 91.4% was female. The median duration of the nurses' overall clinical work experience was 7.9 years, and 17.4% of all the nurses had a full-time employment (Table 1).

### Prevalence of malnutrition

Of all the nurses, 17.6% believed that up to 10% of their care recipients suffered from malnutrition, 37% believed this was the case for 10% to 25% and 32.8% for 26% to 50% of their care recipients. Hospital and home care nurses' perceptions on the prevalence of malnutrition in their care recipients differed significantly ( $p \leq .01$ ).

Post hoc comparisons showed that more hospital nurses (36.1%) than home care nurses (18.2%) perceived that 26% to 50% of the care recipients were malnourished ( $\chi^2 = 11.76$ ,  $p \leq .01$ ) (Table 2).

**Table 1.** Demographic characteristics of hospital and home care nurses

Characteristics	Total (n = 556)	Hospital nurses (n = 455)	Home care nurses (n = 101)
Age (years), median (Q1, Q3)	31 (26, 48)	30 (25, 46)	38 (28, 55)
Female, n (%)	508 (91.4)	416 (91.4)	92 (91.1)
Highest level of education, n (%)			
In-service nursing education	86 (15.5)	77 (16.9)	9 (8.9)
NLQF/EQF level 4	198 (35.6)	179 (39.3)	19 (18.8)
NLQF/EQF level 6	229 (41.2)	168 (36.9)	61 (60.4)
NLQF/EQF level 7	16 (2.9)	10 (2.2)	6 (5.9)
Other	27 (4.9)	21 (4.6)	6 (5.9)
Current employment, n (%)			
Hospital	455 (81.8)		
Surgery department		147 (32.3)	
Internal medicine department		212 (46.6)	
Surgery and internal medicine department		73 (16.0)	
Other		23 (5.1)	
Home care	101 (18.2)		
Nurse			34 (33.7)
District nurse			61 (60.4)
Nurse specialist			1 (1.0)
Other			5 (5.0)
Full-time employment rate (36 hrs/wk), n (%)	97 (17.4)	83 (18.2)	14 (13.9)
Work experience (years), median (Q1, Q3)			
In current employment	5.3 (1.7, 11.7)	6.2 (1.7, 14)	3.5 (1.6, 7.2)
In nursing (total)	7.9 (2.6, 21)	7 (2.4, 19.8)	10.3 (4, 26)

*Abbreviations:* EQF = European Qualifications Framework; NLQF = Netherlands National Qualifications Framework; Q1 = first quartile; Q3 = third quartile.

### Prevention of malnutrition and malnutrition as a normal phenomenon

Almost 22% of all the nurses neither agreed nor disagreed, or (totally) disagreed with the statement that prevention of malnutrition is possible. Further, 48.6% and 48.7% of all the nurses neither agreed nor disagreed, or (totally) agreed with the statement that malnutrition is a normal phenomenon in hospital and in community-dwelling care recipients, respectively (Table 2).

### Severity and prognosis of malnutrition

More than 25% of the hospital nurses and 42.4% of the home care nurses stated that malnutrition is a small or no problem. Post hoc comparisons showed that more home care nurses (39.4%) than hospital nurses (23.2%) pointed out that malnutrition is a small problem ( $\chi^2 = 11.09$ ,  $p \leq .01$ ). More hospital nurses (35.1%) than home care nurses (19.2%) mentioned that malnutrition is a serious problem ( $\chi^2 = 9.42$ ,  $p \leq .01$ ). Almost 98% of all the nurses stated that malnutrition influences the prognosis of care recipients older than 65 years (Table 2).

**Table 2.** Hospital and home care nurses' perceptions regarding prevalence, prevention, severity and prognosis of malnutrition in older care recipients

Questions about malnutrition	Total (n = 556), n (%)	Hospital nurses (n = 455), n (%)	Home care nurses (n = 101), n (%)	p-value
Percentage of care recipients malnourished				$\leq .01^b$
Under 10%	97 (17.6)	64 (14.2)	33 (33.3)	
10% – 25%	204 (37.0)	158 (35.0)	46 (46.5)	
26% – 50%	181 (32.8)	163 (36.1)	18 (18.2)	
51% – 75%	68 (12.3)	66 (14.6)	2 (2.0)	
76% – 100%	1 (0.2)	1 (0.2)	0 (0)	
Agreement on the following statements:				
Prevention malnutrition possible				$.06^b$
Totally disagree	1 (0.2)	1 (0.2)	0 (0)	
□	27 (4.9)	23 (5.1)	4 (4.0)	
□	93 (16.8)	66 (14.5)	27 (27.0)	
□	319 (57.5)	267 (58.7)	52 (52.0)	
Totally agree	115 (20.7)	98 (21.5)	17 (17.0)	
Malnutrition normal phenomenon hospital				$.43^a$
Totally disagree	87 (15.6)	69 (15.2)	18 (17.8)	
□	199 (35.8)	167 (36.7)	32 (31.7)	
□	164 (29.5)	131 (28.8)	33 (32.7)	
□	95 (17.1)	77 (16.9)	18 (17.8)	
Totally agree	11 (2.0)	11 (2.4)	0 (0)	
Malnutrition normal phenomenon community-dwelling care recipients				$\leq .01^a$
Totally disagree	94 (17.0)	72 (15.9)	22 (22.0)	
□	190 (34.3)	146 (32.2)	44 (44.0)	
□	157 (28.3)	131 (28.9)	26 (26.0)	
□	100 (18.1)	94 (20.7)	6 (6.0)	
Totally agree	13 (2.3)	11 (2.4)	2 (2.0)	

Table 2. Continued

Questions about malnutrition	Total (n = 556), n (%)	Hospital nurses (n = 455), n (%)	Home care nurses (n = 101), n (%)	p-value
In long term, psychological and physical problems				.11 <sup>b</sup>
Totally disagree	3 (0.5)	3 (0.7)	0 (0)	
□	4 (0.7)	4 (0.9)	0 (0)	
□	14 (2.5)	8 (1.8)	6 (5.9)	
□	236 (42.4)	199 (43.7)	37 (36.6)	
Totally agree	299 (53.8)	241 (53.0)	58 (57.4)	
Extent to which malnutrition is a problem				≤ .01 <sup>b</sup>
No problem	12 (2.2)	9 (2.0)	3 (3.0)	
Small problem	144 (26.1)	105 (23.2)	39 (39.4)	
Problem	203 (36.8)	165 (36.4)	38 (38.4)	
Serious problem	178 (32.2)	159 (35.1)	19 (19.2)	
Significant problem	15 (2.7)	15 (3.3)	0 (0)	
Influence of malnutrition on the prognosis of older care recipients				.52 <sup>a</sup>
Yes	540 (97.8)	444 (98.0)	96 (97.0)	
No	12 (2.2)	9 (2.0)	3 (3.0)	

<sup>a</sup> chi-square test.

<sup>b</sup> Fisher's exact test.

### Risk factors of malnutrition

Between 79.4% and 96.4% of the nurses considered the following twelve risk factors for malnutrition important or very important: reduced appetite, decreased taste, reduced functional status, pain, comorbidity, maldigestion and malabsorption, depression, loneliness, infection, swallowing disorders, chewing problems and impaired cognitive status.

### Serious complications and unpleasant experiences or feelings

More than 96% of all the nurses (totally) agreed that in the long term, malnutrition may lead to psychological and physical problems (Table 2). The most frequently reported serious complications, which nurses witnessed in malnourished care recipients were pressure ulcers (23.4%), decline of general health (13.7%) and poor wound healing (11.3%). The most mentioned unpleasant experiences or feelings, which nurses experienced with malnourished care recipients were feelings of powerlessness (11.7%), treatment of malnutrition starting too late (3.2%) and care recipients who refuse food (2.9%) (Table 3).

### Screening for malnutrition

Over 32% of all the nurses neither agreed nor disagreed, or (totally) disagreed with the statement that malnutrition is an underdiagnosed condition. Significantly more hospital nurses (95.8%) than home care nurses (52.5%) reported they screened routinely for malnutrition ( $\chi^2 = 146.55$ ,  $p \leq .01$ ) (Table 4). Additionally, 95.8% of the hospital nurses compared to 59% of the home care nurses mentioned that they used a screening instrument ( $\chi^2 = 116.42$ ,  $p \leq .01$ ). More than 72% of the hospital nurses screened with the Malnutrition Universal Screening Tool (MUST) and 61% of the home care nurses screened with the Short Nutritional Assessment Questionnaire (SNAQ).

**Table 3.** Serious complications, and unpleasant experiences or feelings regarding malnutrition in older care recipients encountered most frequently by hospital and home care nurses

	Total (n = 556), n (%)	Hospital nurses (n = 455), n (%)	Home care nurses (n = 101), n (%)	p-value
Serious complications				
Pressure ulcers	130 (23.4)	119 (26.2)	11 (10.9)	$\leq .01^a$
Decline general health	76 (13.7)	58 (12.7)	18 (17.8)	.18 <sup>a</sup>
Poor wound healing	63 (11.3)	51 (11.2)	12 (11.9)	.85 <sup>a</sup>
Anorexia	35 (6.3)	30 (6.6)	5 (5.0)	.54 <sup>a</sup>
Significant weight loss	30 (5.4)	24 (5.3)	6 (5.9)	.79 <sup>a</sup>
Bad recovery after surgery	28 (5.0)	28 (6.2)	0 (0)	.01 <sup>a</sup>
(Infected) Wounds	17 (3.1)	11 (2.4)	6 (5.9)	.10 <sup>b</sup>
Unpleasant experiences or feelings				
Feelings of powerlessness	65 (11.7)	46 (10.1)	19 (18.8)	.01 <sup>a</sup>
Treatment starting too late	18 (3.2)	16 (3.5)	2 (2.0)	.76 <sup>b</sup>
Food refusal	16 (2.9)	12 (2.6)	4 (4.0)	.51 <sup>b</sup>
Feelings of non-fulfilment in providing quality care	9 (1.6)	6 (1.3)	3 (3.0)	.21 <sup>b</sup>
No time to help with eating and drinking	7 (1.3)	7 (1.5)	0 (0)	.36 <sup>b</sup>
Prolonged length of hospital stay	6 (1.1)	6 (1.3)	0 (0)	.60 <sup>b</sup>
Signalling malnutrition too late	5 (0.9)	3 (0.7)	2 (2.0)	.23 <sup>b</sup>
Loneliness due to malnutrition	3 (0.5)	1 (0.2)	2 (2.0)	.09 <sup>b</sup>
Do not know how to help	2 (0.4)	0 (0)	2 (2.0)	.03 <sup>b</sup>

*Note:* Frequency values reflect the number of nurses who reported the complications and experiences or feelings. Each nurse could report multiple complications and unpleasant experiences or feelings.

<sup>a</sup> chi-square test.

<sup>b</sup> Fisher's exact test.

Hospital nurses stated they screened at hospital admission (54.5%) (Table 4), possibly combined with screening once a week during hospitalisation (25.3%). Home care nurses reported screening during home care assessment (42.6%) (Table 4), possibly

in combination with a risk assessment twice a year (12.9%) and screening in case of a clinical suspicion of malnutrition (11.9%).

### Interventions for malnutrition

The majority of all the nurses considered environmental measures (85.1%), exercise (77.1%) and regular diet (94.2%) important or priority interventions. This was also the case for fortified or enriched food (95.1%), oral nutritional supplements (85.9%), tube feeding (85.7%) and parenteral nutrition (81.3%). Yet, hospital nurses rated the importance of these interventions higher than home care nurses did (p-values  $\leq .01$ ) (Table 4).

**Table 4.** Hospital and home care nurses' experiences with and perceptions on screening, diagnosis, interventions, guidelines and training regarding malnutrition in older care recipients

Questions about malnutrition	Total (n = 556), n (%)	Hospital nurses (n = 455), n (%)	Home care nurses (n = 101), n (%)	p-value
Routinely screening				$\leq .01^a$
Yes	489 (87.9)	436 (95.8)	53 (52.5)	
No	67 (12.1)	19 (4.2)	48 (47.5)	
When screening				$\leq .01^b$
At admission/during home care assessment	291 (52.3)	248 (54.5)	43 (42.6)	
Daily	20 (3.6)	13 (2.9)	7 (6.9)	
At discharge	2 (0.4)	0 (0)	2 (2.0)	
Otherwise	230 (41.4)	189 (41.5)	41 (40.6)	
Not applicable	13 (2.3)	5 (1.1)	8 (7.9)	
Agreement on the following statement:				
Malnutrition underdiagnosed condition				.12 <sup>b</sup>
Totally disagree	3 (0.5)	2 (0.4)	1 (1.0)	
□	70 (12.6)	63 (13.8)	7 (6.9)	
□	108 (19.4)	85 (18.7)	23 (22.8)	
□	281 (50.5)	233 (51.2)	48 (47.5)	
Totally agree	94 (16.9)	72 (15.8)	22 (21.8)	
Importance of interventions				
Fortified or enriched food				$\leq .01^b$
Not important	1 (0.2)	1 (0.2)	0 (0)	
Less important	4 (0.7)	0 (0)	4 (4.0)	
Neutral	22 (4.0)	14 (3.1)	8 (7.9)	
Important	327 (59.0)	263 (58.1)	64 (63.4)	
Priority	200 (36.1)	175 (38.6)	25 (24.8)	
Oral nutritional supplements				$\leq .01^b$
Not important	1 (0.2)	1 (0.2)	0 (0)	
Less important	18 (3.2)	11 (2.4)	7 (6.9)	

Table 4. Continued

Questions about malnutrition	Total (n = 556), n (%)	Hospital nurses (n = 455), n (%)	Home care nurses (n = 101), n (%)	p-value
Neutral	59 (10.6)	41 (9.1)	18 (17.8)	
Important	313 (56.5)	257 (56.7)	56 (55.4)	
Priority	163 (29.4)	143 (31.6)	20 (19.8)	
Tube feeding				≤ .01 <sup>b</sup>
Not important	2 (0.4)	0 (0)	2 (2.0)	
Less important	16 (2.9)	8 (1.8)	8 (7.9)	
Neutral	61 (11.0)	33 (7.3)	28 (27.7)	
Important	313 (56.5)	266 (58.7)	47 (46.5)	
Priority	162 (29.2)	146 (32.2)	16 (15.8)	
Parenteral nutrition				≤ .01 <sup>b</sup>
Not important	5 (0.9)	0 (0)	5 (5.0)	
Less important	18 (3.2)	8 (1.8)	10 (9.9)	
Neutral	81 (14.6)	49 (10.8)	32 (31.7)	
Important	304 (54.9)	262 (57.8)	42 (41.6)	
Priority	146 (26.4)	134 (29.6)	12 (11.9)	
Use of guideline/protocol				≤ .01 <sup>a</sup>
Yes	429 (77.3)	381 (83.9)	48 (47.5)	
No	126 (22.7)	73 (16.1)	53 (52.5)	
Ask for additional advice				≤ .01 <sup>a</sup>
Never	16 (2.9)	12 (2.7)	4 (4.0)	
Seldom	52 (9.4)	22 (4.9)	30 (29.7)	
Usually	222 (40.3)	170 (37.8)	52 (51.5)	
Always	261 (47.4)	246 (54.7)	15 (14.9)	
Past 12 months, attendance further training				.34 <sup>a</sup>
Yes	89 (16.0)	76 (16.7)	13 (12.9)	
No	467 (84.0)	379 (83.3)	88 (87.1)	
Past 12 months, read scientific article about malnutrition				.47 <sup>a</sup>
Yes	192 (34.5)	154 (33.8)	38 (37.6)	
No	364 (65.5)	301 (66.2)	63 (62.4)	

<sup>a</sup> chi-square test.<sup>b</sup> Fisher's exact test.

### Guidelines and training

Significantly more hospital nurses (83.9%) than home care nurses (47.5%) stated that a guideline on malnutrition is used in their organisation ( $\chi^2 = 62.37, p \leq .01$ ) (Table 4). In addition, 83.2% of the hospital nurses in comparison with 68.8% of the home care nurses declared they ever consulted this guideline ( $\chi^2 = 5.93, p = .02$ ). Hospital nurses (54.7%) mentioned more often that they always ask for additional advice than home care nurses (14.9%) ( $\chi^2 = 45.97, p \leq .01$ ) (Table 4). Nurses mostly asked advice from a dietitian, medical doctor or speech therapist.

More than 16% of the hospital nurses and 12.9% of the home care nurses mentioned they attended training on malnutrition in the past 12 months. Over 34% of all the nurses read a scientific article (Table 4). Above 81% of all the nurses pointed out that they wanted to follow further training.

### Discussion

In this study, we gained understanding of hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition. Almost all the nurses believed that up to half of their care recipients suffered from malnutrition, where hospital nurses estimated the prevalence rate higher than home care nurses. The majority of the nurses perceived several topics, concerning malnutrition as important. Also, a reasonable number of the nurses perceived these topics as neutral or unimportant. They also pointed out that malnutrition is a small or no problem. More hospital nurses than home care nurses stated they screened routinely for malnutrition and used a guideline. Over four-fifths of the nurses considered several interventions important for the treatment of malnutrition. Hospital nurses valued the importance of medical nutrition interventions higher than home care nurses. About one-seventh of the nurses took a training on malnutrition in the previous year. Above four-fifths of the nurses stated they wanted to follow further training in the future.

Almost half of the home care nurses estimated that 10% to 25% of their older care recipients is malnourished. According to more than eight-tenths of the hospital nurses, malnutrition occurred in up to 50% of their older patients. These estimations are in line with prevalence rates reported in several studies and the national guideline on malnutrition. Here, prevalence rates ranged from 8.7% to 21.1% in community-dwelling older adults with home care and from 3.1% to 51% in hospitalised older adults.<sup>7,9,10,13,14</sup> It seems that both home care and hospital nurses made an accurate estimation of the number of malnourished older adults in their workplace.

Despite these accurate estimations of prevalence, we found that, although a minority, still one quarter of the hospital nurses and over two-fifths of the home care nurses found that malnutrition is a small or no problem. Further, they perceived a number of malnutrition-related subjects as either neutral or not important. Similar results were found in other studies.<sup>22,41</sup> This neutral or even negative attitude may be explained by several reasons, including high workload, low prioritisation given to nutritional care, lack of knowledge, failing collaboration with other disciplines and low level of responsibility.<sup>22,41</sup> Although nutritional-related activities are an essential part of nursing care,<sup>2</sup> a neutral or negative attitude may suggest that nurses neglect this aspect of nursing care. Especially in older adults, who are vulnerable to malnutrition due to multimorbidity and complex care needs,<sup>10,19</sup> emphasis on nutrition and nutritional care is substantial. A neutral or negative attitude may contribute to nurses' neglect towards malnutrition and may pose a potential threat for the quality and continuity of nutritional care, and even more important for the health condition of older adults.<sup>41</sup> Therefore, nurses' awareness regarding the importance of nutritional care is necessary. High-quality nutritional care to prevent and treat malnutrition in older adults, as an integrated part of nursing care, should be in the forefront of nurses' minds.

Over eight-tenths of all the hospital nurses and approximately half of the home care nurses mentioned they screened routinely for malnutrition with a validated screening tool and used a guideline on malnutrition. In a study of Robison, it was also found that hospital nurses routinely screened with a validated tool.<sup>24</sup> However, in other studies, hospital nurses hardly assessed the nutritional status and if they did, they did not always use a validated tool.<sup>11,12,22,23</sup> Structural screening with validated tools and guideline use by nurses is recommended by national and international guidelines to early detect malnutrition.<sup>4,7</sup> In Dutch hospitals, structural malnutrition screening is obligatory<sup>8</sup> and routines for structural screening are common.<sup>42</sup> In contrast, this is not the case in the Dutch home care setting and screening for malnutrition with a validated tool is not fully standardised or structurally integrated in nursing care for older adults. Instead, screening for malnutrition in older adults with home care may be dependent on the personal interest of nurses. A lack of procedure to screen for malnutrition in older adults in the home care setting is also seen in other countries. This is explained by an existing gap between policy recommendations and daily care practice.<sup>42</sup>

We found that more than four-fifths of all nurses considered 12 of the 17 presented risk factors for malnutrition (very) important. Due to multimorbidity and frailty, which are prevalent phenomena in our ageing society, the presence of risk factors for malnutrition in older adults is mostly age related. This presence may indicate there

is an increased vulnerability for malnutrition. However, not all risk factors are part of malnutrition screening tools.<sup>10</sup> For the early identification of older adults who are malnourished or at risk for malnutrition, it should be considered that risk factors may be complementary to screening tools.<sup>10</sup> Therefore, awareness of and knowledge about risk factors for malnutrition in older adults is fundamental. In one study, it was found that nurses pointed out a lack of in-depth knowledge about these risk factors.<sup>11</sup> It appears that the nurses who participated in our study are aware of risk factors for malnutrition. Despite these results, we do not know what their actual knowledge is. The questionnaire used does not measure factual knowledge.

Hospital nurses in this study found medical nutrition interventions, such as fortified or enriched food, oral nutritional supplements, tube feeding and parenteral feeding more important than home care nurses. In certain countries, such as the Netherlands, home care nurses do not routinely provide medical nutrition interventions, such as tube and parenteral feeding. This may explain home care nurses' lower priority for this type of interventions. More emphasis of hospital nurses on medical nutrition interventions was also described in earlier research, although this did not necessarily lead to lower prevalence rates of malnutrition.<sup>11,23,41</sup> In a hospital setting, the primary focus is on medical treatment of patients with acute illnesses or deteriorating conditions. Medical nutrition may then be in compliance with medical treatment. Also, because the hospital nurses work closely with doctors, it seems that nurses focus more on medical treatment and adjust their interventions accordingly.<sup>43,44</sup> As a result, it seems that medical nutrition may be well integrated in nutritional care and even better than readily accessible (nursing) interventions, such as a stimulating environment, exercise and adequate intake by a regular diet.<sup>22</sup> These smooth interventions together with medical nutrition and other accessible interventions, such as good food availability, professional food delivery and pleasant mealtimes may stimulate dietary intake of older adults.<sup>1,3</sup>

Findings show that approximately one-seventh of the hospital and home care nurses obtained recent training on malnutrition, while over 80% of the nurses had a need for it. This is consistent with the results of other studies. In these studies, hospital nurses required more training due to lack of sufficient knowledge and skills about specific aspects of care regarding malnutrition.<sup>11,22,41</sup> In addition, the need was mostly not based on nurses' perceptions, because they considered nutrition-related topics as important.<sup>12,22,23</sup> A similar perception was partly confirmed in our study. Additionally, we did not identify further reasons justifying nurses' training needs. Furthermore, although nutritional care is a core business within the nursing profession,<sup>2</sup> training on malnutrition and other nutrition-related topics is hardly given in curricula of

nursing schools and education programmes in clinical practice. It seems that an important basis in providing good nursing nutritional care is lacking. Training is a proper way to improve knowledge and has impact on attitude and behaviour.<sup>45</sup> This can create ownership by nurses and contribute in a substantial way to appropriate nursing nutritional care given to older adults to prevent and treat malnutrition.

### **Strengths and limitations**

For the interpretation of the results, some strengths and limitations have to be addressed. First, using a questionnaire might have resulted in response bias.<sup>26,35</sup> The formulations of certain questions may have elicited social desirable answers. Some questions required open answers, which were not always completed by all the nurses. In a number of statements, several answer options were not labelled, which may have led to misinterpretation by the nurses. Further, during questionnaire adaptation, we assessed relevance, comprehensiveness and readability by asking open-ended and closed questions and achieved consensus with members of the research group. Instead, we may have calculated the Content Validity Index (CVI), which is a more objective and rigorous measure.<sup>36</sup> It may be appropriate to agree on acceptable criteria for the CVI, because there is discussion about how the CVI should be computed and how agreement is defined. Also, an explanation about the question regarding the effect of serious complications on the caregiver was added during data collection, because we observed that this question was not always understood correctly. As a consequence, 224 hospital nurses did not, and 332 hospital and home care nurses did receive the explanation. The ratio of missing values between these two groups was 46% vs 20.8%. This most likely means that the explanation has improved comprehensibility, but also generated instrumental bias.<sup>26</sup>

Second, although the overall response rate was 49%, not all distributed questionnaires were completed and returned. This might have led to nonresponse bias.<sup>26</sup> We attempted to gain insight into similarities and differences in demographic characteristics between respondents and non-respondents, but did not receive sufficient information about non-respondents. This means that it is uncertain if there were systematic differences between both groups. However, with the spread in demographic characteristics, we consider our study population to be a representative sample reflecting the nursing population.

Third, for data analysis on multiple-choice questions with a Likert scale, there is discussion if data from Likert scales should be considered as categorical or continuous variables and hence, which statistical test is performed. In the first case, a chi-square test or Fisher's exact test is recommended and in the latter case,

a Mann-Whitney U test or even a parametric equivalent.<sup>46</sup> In this study, we analysed the data from Likert scales with both the chi-square test or Fisher's exact test, and Mann-Whitney U test and found no major discrepancies. Because post hoc multiple pairwise comparisons were possible with the chi-square test or Fisher's exact test, we preferred using the chi-square test or Fisher's exact test. As a result, when data showed statistical significance, we could better evaluate and interpret the results.<sup>39</sup>

Finally, there might be a potential bias due to the eligibility criteria.<sup>26</sup> In this study, we included nurses from several hospitals and home care organisations, but not other nursing care professionals such as nursing assistants. Neither did we include nurses working in residential and nursing home settings. Although a majority of older adults reside in the hospital or their own homes, another considerable number of older adults live in residential or nursing homes. This led to an incomplete representation of nursing care professionals providing nutritional care to older care recipients. This should be kept in mind when generalising to other nursing care professionals.

### **Future research**

More comprehensive research is required and future work should address further validation of the questionnaire in other nursing care professionals such as nursing assistants. Nurses' nutritional care should be subsequently explored and defined to optimise multidisciplinary nutritional care for older adults. This may contribute to improving current guidelines and enhancing development of solid evidence-based interventions.<sup>45</sup> In order to provide nutritional care to older adults, sufficient knowledge is important and therefore, future studies are needed to estimate and improve knowledge of nurses regarding nutritional care.

## **Conclusion**

Almost all hospital and home care nurses encountered malnutrition in up to half of the older adults. Most nurses regarded malnutrition as a problem, though one quarter of the hospital nurses and over two-fifths of the home care nurses did not. More hospital nurses than home care nurses mentioned they screened routinely for malnutrition and used a guideline. Most nurses perceived nutritional care for older adults to prevent and treat malnutrition as important. Conversely, a fair group of nurses had the opposite perception. Nurses wanted to follow further training on malnutrition. It is pivotal to increase the awareness of all nurses that nutritional care for older adults is important. This can potentially enhance successful nutritional care

carried out by hospital and home care nurses and given to older adults across the care continuum to ensure dietary intake.

## Relevance to clinical practice

The results imply that most hospital and home care nurses perceive nutritional care provided to older adults to be important. Still, a noticeable number of nurses did not. Nurses should be fully aware that perceiving nutritional care as important is an essential step, which may add to improving nursing nutritional care. This enables nurses to substantially and actively engage in nutritional care given to older adults to eventually prevent and treat malnutrition. Because nurses have the most and direct contact with older adults, they should take a leadership role to further strengthen and positively influence the delivery of nutritional care.<sup>23,47</sup> Also, this nursing leadership role may potentially be beneficial for patient safety and quality.<sup>48</sup> Here, strategies are needed, which nurses can employ to successfully perform this role.<sup>47</sup>

There is a need to fine-tune continuity and quality of nutritional care delivered by nurses in the care continuum. This may lead to optimal support for older adults and in particular those with a higher risk for malnutrition due to multimorbidity, frailty and complex care needs.<sup>3,10,16,19</sup> Nurses should determine, plan and provide care in a structural and systematic way following the nursing process.<sup>1</sup> Here, nurses can assess malnutrition or risk for malnutrition by early detection of features of malnutrition in older adults and structural screening with a validated tool. Based on nursing diagnoses, goals and interventions to prevent and treat malnutrition can be determined, evaluated and changed periodically.<sup>1,49</sup> The focus should not only be on medical nutrition, but also on readily assessable interventions such as a regular diet, a comfortable environment and pleasant mealtimes where dietary intake of the older adult is stimulated. These interventions can be used by nurses when providing nutritional care in both the hospital and home care setting and in the transfer from home care to hospital care and vice versa to enable continuity in nursing nutritional care. This may contribute to solid dietary intake independent of the setting where the older adult resides and facilitate the older adult's transfer from one setting to the other. The nursing care should be part of a multidisciplinary team environment and occur within and between care organisations.<sup>3,4</sup> The refining of nursing nutritional care can enhance international and national guidelines and protocols of care organisations.

The results of the current study indicate there is a need for the development and implementation of training and education programs about nutritional care to prevent and treat malnutrition. This may improve knowledge and skills and promote a positive attitude.<sup>22,23,41</sup> Education and training programmes should focus on all elements of the nursing process. The programmes should consist of topics such as signs and symptoms, risk factors and complications of malnutrition. Nurses can be trained to screen for malnutrition with validated tools and to sufficiently deliver effective interventions.<sup>49</sup> The programmes can be provided to nursing professionals, where they can straightforwardly transfer what has been learnt into the workplace.<sup>50</sup> These programmes should be embedded in the curricula of nursing schools to prepare nursing students adequately for practice.<sup>22</sup>

## References

1. Carpenito – Moyet LJ. *Zakboek verpleegkundige diagnosen*. [Handbook of nursing diagnosis]. 4th ed. Groningen/Houten: Noordhoff Uitgevers; 2012.
2. Kitson AL, Conroy T, Kuluski K, Locock L, Lyons R. *Reclaiming and redefining the Fundamentals of Care: Nursing's response to meeting patients' basic human needs*. Adelaide: University of Adelaide; 2013.
3. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. *Clin Nutr*. 2019;38(1):10-47.
4. Jensen GJ, Cederholm T, Correia MITD, Gonzales MC, Fukushima R, Higashiguchi T, et al. GLIM criteria for the diagnosis of malnutrition: A consensus report from the global clinical nutrition community. *JPEN J Parenter Enteral Nutr*. 2019;43(1):32-40.
5. Rechel B, Grundy E, Robine JM, Cylus J, Mackenbach JP, Knai C, et al. Ageing in the European union. *Lancet*. 2013;381(9874):1312-1322.
6. Rostgaard T, Glendinning C, Gori C, Kroger T, Osterle A, Szebehely M, et al. *LIVINDHOME: Living independently at home: Reforms in home care in 9 European countries*. Copenhagen: SFI – The Danish National Centre for Social Research; 2011.
7. The Dutch Malnutrition Steering Group. *Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen*. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2019.
8. Health and Youth Care Inspectorate. *Basisset medisch specialistische zorg 2020 [Basic set specialist medical care 2020]*. Health and Youth Care Inspectorate; 2019.
9. Cereda E, Pedrolli C, Klersy C, Bonardi C, Quarleri L, Cappello S, et al. Nutritional status in older persons according to healthcare setting: A systematic review and meta-analysis of prevalence data using MNA®. *Clin Nutr*. 2016;35(6):1282-1290.
10. Leij – Halfwerk S, Verwijs MH, van Houdt S, Borkent JW, Guaitoli PR, Pelgrim T, et al. Prevalence of protein-energy malnutrition risk in European older adults in community, residential and hospital settings, according to 22 malnutrition screening tools validated for use in adults ≥ 65 years: A systematic review and meta-analysis. *Maturitas*. 2019;126:80-89.
11. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs*. 2015;24(5-6):696-706.
12. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs*. 2009;18(3):431-439.
13. Cansado P, Ravasco P, Camilo M. A longitudinal study of hospital undernutrition in the elderly: comparison of four validated methods. *J Nutr Health Aging*. 2009;13(2):159-164.
14. Smoliner C, Fishedick A, Sieber CC, Wirth R. Olfactory function and malnutrition in geriatric patients. *J Gerontol A Biol Sci Med Sci*. 2013;68(12):1582-1588.
15. Wolters M, Volkert D, Streicher M, Kiesswetter E, Torbahn G, O'Connor EM, et al. Prevalence of malnutrition using harmonized definitions in older adults from different settings – A MaNuEL study. *Clin Nutr*. 2019;38(5):2389-2398.
16. Yang Y, Brown CJ, Burgio KL, Kilgore ML, Ritchie CS, Roth DL, et al. Undernutrition at baseline and health services utilization and mortality over a 1-year period in older adults receiving Medicare home health services. *J Am Med Dir Assoc*. 2011;12(4):287-294.
17. Chatindiara I, Allen J, Popman A, Patel D, Richter M, Kruger M, et al. Dysphagia risk, low muscle strength and poor cognition predict malnutrition risk in older adults at hospital admission. *BMC Geriatr*. 2018;18(1):78.
18. Fávaro – Moreira NC, Krausch – Hofmann S, Matthys C, Vereecken C, Vanhauwaert E, Declercq A, et al. Risk factors for malnutrition in older adults: A systematic review of the literature based on longitudinal data. *Adv Nutr*. 2016;7(3):507-522.

19. Bakker MH, Vissink A, Spooenberg SL, Jager – Wittenaar H, Wynia K, Visser A. Are edentulousness, oral health problems and poor health-related quality of life associated with malnutrition in community-dwelling elderly (aged 75 years and over)? A cross-sectional study. *Nutrients*. 2018;10(12):1965.
20. O'Shea E, Trawley S, Manning E, Barrett A, Browne V, Timmons S. Malnutrition in hospitalised older adults: A multicentre observational study of prevalence, associations and outcomes. *J Nutr Health Aging*. 2017;21(7):830-836.
21. Abizanda P, Sinclair A, Barcons N, Lizán L, Rodríguez – Mañas L. Costs of malnutrition in institutionalized and community-dwelling older adults: A systematic review. *J Am Med Dir Assoc*. 2016;17(1):17-23.
22. Boaz M, Rychani L, Barami K, Hourri Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs*. 2013;44(8):357-364.
23. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci*. 2013;27(2):440-448.
24. Robison J, Pilgrim AL, Rood G, Diaper N, Elia M, Jackson AA, et al. Can trained volunteers make a difference at mealtimes for older people in hospital? A qualitative study of the views and experience of nurses, patients, relatives and volunteers in the Southampton Mealtime Assistance Study. *Int J Older People Nurs*. 2015;10(2):136-145.
25. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP for the STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol*. 2008;61(4):344-349.
26. Polit DF, Beck CT. *Nursing research: Generating and assessing evidence for nursing practice*. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2017.
27. Ettema R, van Harten D, Hoogerduijn J, Hoekstra T, Schuurmans M. Nurses opinions regarding delirium care in the older general hospital population and in older cardiac surgery patients specifically: A multicentre survey among Dutch nurses. *Int J Clin Med*. 2014;5(21):1352-1364.
28. Stratton RJ, Green CJ, Elia M, editors. *Disease-related malnutrition: An evidence-based approach to treatment*. 1st ed. Wallingford: CABI Publishing; 2003.
29. Anker SD, Laviano A, Filippatos G, John M, Paccagnella A, Ponikowski P, et al. ESPEN guidelines on parenteral nutrition: On cardiology and pneumology. *Clin Nutr*. 2009;28(4):455-460.
30. The Dutch Malnutrition Steering Group. Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2011.
31. Feldblum I, German L, Castel H, Harman – Boehm I, Bilenko N, Eisinger M, et al. Characteristics of undernourished older medical patients and the identification of predictors for undernutrition status. *Nutr J*. 2007;6:37.
32. Lochs H, Allison SP, Meier R, Pirlich M, Kondrup J, Schneider St, van den Berghe G, et al. Introductory to the ESPEN guidelines on enteral nutrition: Terminology, definitions and general topics. *Clin Nutr*. 2006;25(2):180-186.
33. Sobotka L, Schneider SM, Berner YN, Cederholm T, Krznaric Z, Shenkin A, et al. ESPEN guidelines on parenteral nutrition: Geriatrics. *Clin Nutr*. 2009;28(4):461-466.
34. Vanderwee K, Clays E, Bocquaert I, Gobert M, Folens B, Defloor T. Malnutrition and associated factors in elderly hospital patients: A Belgian cross-sectional, multi-centre study. *Clin Nutr*. 2010;29(4):469-476.
35. Fowler FJ. *Survey research methods*. 5th ed. Thousand Oaks: Sage Publications Inc; 2013.
36. Lynn MR. Determination and quantification of content validity. *Nurs Res*. 1986;35(6):382-385.
37. de Vet HC, Terwee CB, Mokkink LB, Knol DL. *Measurement in medicine: A practical guide*. Cambridge: Cambridge University Press; 2011.

38. Scholten RJPM, Offringa M, Assendelft WJJ, editors. *Inleiding in evidence-based medicine. Klinisch handelen gebaseerd op bewijsmateriaal. [Introduction to evidence-based medicine. Clinical practice based on evidence].* 4th ed. Houten: Bohn Stafleu van Loghum; 2013.
39. Beasley TM, Schumacker RE. Multiple regression approach to analyzing contingency tables: Post hoc and planned comparison procedures. *J Exp Educ.* 1995;64(1):79-93.
40. Bennett DA. How can I deal with missing data in my study?. *Aust N Z J Public Health.* 2001;25(5):464-469.
41. O'Connell MB, Jensen PS, Andersen SL, Fernbrant C, Nørholm V, Petersen HV. Stuck in tradition – A qualitative study on barriers for implementation of evidence-based nutritional care perceived by nursing staff. *J Clin Nurs.* 2018;27(3-4):705-714.
42. Roberts HC, Lim SE, Cox NJ, Ibrahim K. The challenge of managing undernutrition in older people with frailty. *Nutrients.* 2019;11(4):808.
43. Hyde A, Treacy MMP, Scott AP, Mac Neela P, Butler M, Drennan J, et al. Social regulation, medicalisation and the nurse's role: Insights from an analysis of nursing documentation. *Int J Nurs Stud.* 2006;43(6):735-744.
44. McCarthy MP, Jones JS. The medicalization of nursing: The loss of a discipline's unique identity. *Int J Hum Caring.* 2019;23(1):101-108.
45. Michie S, Atkins L, West R. *The behaviour change wheel. A guide to designing interventions.* Sutton: Silverback Publishing; 2014.
46. Norman G. Likert scales, levels of measurement and the "laws" of statistics. *Adv Health Sci Educ Theory Pract.* 2010;15(5):625-632.
47. Conroy T. Factors influencing the delivery of the fundamentals of care: Perceptions of nurses, nursing leaders and healthcare consumers. *J Clin Nurs.* 2018;27(11-12):2373-2386.
48. Wong CA, Cummings GG, Ducharme L. The relationship between nursing leadership and patient outcomes: a systematic review update. *J Nurs Manag.* 2013;21(5):709-724.
49. ten Cate D, Ettema RGA, Huisman – de Waal G, Bell JJ, Verbrugge R, Schoonhoven L, et al. Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review. *J Clin Nurs.* 2020;29(11-12):1883-1902.
50. Holton EF, Baldwin TT. *Improving learning transfer in organizations.* San Francisco: Jossey-Bass/Pfeiffer; 2003.

## Appendix

**Appendix 1.** Hospital version of the questionnaire about hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition

PART 1: Demographic characteristics

**What is your age?** \_\_\_\_\_ years

**What is your gender?**

- Female
- Male

**What is your highest level of completed education?**

- In-service nursing education
- NLQF/EQF level 4
- NLQF/EQF level 6
- NLQF/EQF level 7
- Other: (specify) \_\_\_\_\_

**Where do you work at the moment?**

- Hospital:
  - Surgery department: (specify) \_\_\_\_\_
  - Internal medicine department: (specify) \_\_\_\_\_
  - Surgery and internal medicine department: (specify) \_\_\_\_\_
  - Other (e.g. Emergency department, Intensive Care Unit): (specify) \_\_\_\_\_

**How many hours a week do you work at the moment?**

- Full time = 36 hours (100%)
- Part time: \_\_\_\_\_ hours (\_\_\_\_\_ %)

**How many years of work experience do you have in your current employment?**

\_\_\_\_\_ years \_\_\_\_\_ months

**How many years of work experience do you have in nursing (total)?**

\_\_\_\_\_ years \_\_\_\_\_ months

PART 2: Experiences and perceptions regarding malnutrition

Definition of 'malnutrition':

Malnutrition is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue/body form (body shape, size, composition), body function and clinical outcome (Stratton, Green & Elia, 2003).

3

**1. Approximately what percentage of care recipients in your hospital ward is malnourished?**

- Under 10%
- 10% – 25%
- 26% – 50%
- 51% – 75%
- 76% – 100%

**2. To what extent do you think malnutrition is a problem for care recipients in your hospital ward?**

*(Please tick what best reflects your opinion)*

- No problem
- Small problem
- Problem
- Serious problem
- Significant problem

**3. Does malnutrition influence the prognosis of:**

*(Please tick what best reflects your opinion)*

**a. adult care recipients (18 – 65 years)?**

- Yes
- No

**b. older care recipients (above 65 years)?**

- Yes
- No

**4. To what extent do you agree with the following statements?**

*(Please tick what best reflects your opinion)*

	Totally disagree				Totally agree
Prevention of malnutrition is possible	<input type="checkbox"/>				
Malnutrition is an underdiagnosed condition	<input type="checkbox"/>				
Malnutrition is a normal phenomenon in hospital	<input type="checkbox"/>				
Malnutrition is a normal phenomenon in community-dwelling care recipients	<input type="checkbox"/>				
Malnutrition is a normal phenomenon in the ageing process	<input type="checkbox"/>				
Malnutrition is a problem that requires an immediate and active intervention by the medical doctor and the nurse	<input type="checkbox"/>				
In the long term, malnutrition may lead to psychological and physical problems	<input type="checkbox"/>				

**5. In your experience, which of the following risk factors may lead to malnutrition?**

*(Please, rate factors in terms of their importance by encircling the number that best reflects your opinion on the following scale: 1 represents "not important" and 5 represents "very important")*

	Not important			Very important	
Reduced appetite	1	2	3	4	5
Decreased taste	1	2	3	4	5
Reduced functional status, including decreased mobility, reduced possibility or impossibility to get groceries (or to have someone get these), and to prepare food	1	2	3	4	5
Pain	1	2	3	4	5
Comorbidity, including COPD, malignant diseases and heart failure	1	2	3	4	5
Maldigestion and malabsorption in the gastrointestinal tract	1	2	3	4	5
Depression	1	2	3	4	5

Anxiety	1	2	3	4	5
Loneliness	1	2	3	4	5
Infection	1	2	3	4	5
Swallowing disorders	1	2	3	4	5
Chewing problems	1	2	3	4	5
Impaired cognitive status, such as dementia and delirium	1	2	3	4	5
Increased length of hospital stay	1	2	3	4	5
Medication use (amount and side effects)	1	2	3	4	5
Poverty	1	2	3	4	5
Low level of education	1	2	3	4	5

## 6.

a. **In your hospital ward, are care recipients with an increased risk for malnutrition routinely screened?**

- Yes  
 No

b. **When are care recipients with an increased risk for malnutrition screened?**

- At admission  
 Daily  
 At discharge  
 Otherwise, namely: \_\_\_\_\_  
 Not applicable

c. **Do you use any instrument for this?**

- Yes, please specify: \_\_\_\_\_  
 No  
 Not applicable

**7. What is the most serious complication you have witnessed in a malnourished care recipient before treatment for malnutrition was started?**

- a. For the care recipient: \_\_\_\_\_  
\_\_\_\_\_
- b. For you as a caregiver (which unpleasant experiences or feelings have you encountered with a malnourished care recipient?): \_\_\_\_\_  
\_\_\_\_\_

**8.**

**a. Do you know if a guideline and/or protocol on malnutrition is used in your hospital ward?**

- Yes  
 No

If yes, have you ever consulted this guideline and/or protocol?

- Yes  
 No  
 Not applicable

If yes, do you find this guideline and/or protocol useful?

- Yes  
 No  
 Not applicable

**b. How often do you ask for additional advice in dealing with a malnourished care recipient in your hospital ward?**

- Never  
 Seldom  
 Usually  
 Always

If you request for advice, to which specialism? \_\_\_\_\_

**9. How important do you consider the following interventions to be in the treatment of care recipients with malnutrition?**

*(Please tick what best reflects your opinion)*

**a. Environmental measures (quiet ambience, own belongings, food as required)**

- Not important     Less important     Neutral     Important     Priority

**b. Exercise**

Not important     
  Less important     
  Neutral     
  Important     
  Priority

**c. Adequate intake of energy, macronutrients (like carbohydrates, proteins and fats) and micronutrients (like vitamins and minerals) by:****I. regular diet**

Not important     
  Less important     
  Neutral     
  Important     
  Priority

**II. fortified or enriched food (regular diet supplemented with specific nutrients) (in case adequate dietary intake cannot be achieved with a regular diet)**

Not important     
  Less important     
  Neutral     
  Important     
  Priority

**III. oral nutritional supplements (pills, liquids etcetera) (in case adequate dietary intake cannot be achieved with a regular diet and fortified/enriched food)**

Not important     
  Less important     
  Neutral     
  Important     
  Priority

**IV. tube feeding (in case adequate dietary intake cannot be achieved with a regular diet, fortified/enriched food and oral nutritional supplements)**

Not important     
  Less important     
  Neutral     
  Important     
  Priority

**V. parenteral nutrition (in case adequate dietary intake cannot be achieved with a regular diet, fortified/enriched food, oral nutritional supplements and tube feeding)**

Not important     
  Less important     
  Neutral     
  Important     
  Priority

**10. During the past 12 months, have you:****a. attended further training on malnutrition?**

- Yes  
 No

If not, would you like to follow further training?

- Yes
- No
- Not applicable

**b. read a scientific article about malnutrition?**

*(Excluding the guideline/protocol of your hospital ward/organisation)*

- Yes
- No

**11. Comments:** \_\_\_\_\_  
\_\_\_\_\_

**Appendix 2.** Home care version of the questionnaire about hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition

PART 1: Demographic characteristics

**What is your age?** \_\_\_\_\_ years

**What is your gender?**

- Female
- Male

**What is your highest level of completed education?**

- In-service nursing education
- NLQF/EQF level 4
- NLQF/EQF level 6
- NLQF/EQF level 7
- Other: (specify) \_\_\_\_\_

**Where do you work at the moment?**

- Home care, as:
  - Nurse
  - District nurse
  - Nurse specialist: (specify) \_\_\_\_\_
  - Other: (specify) \_\_\_\_\_

**How many hours a week do you work at the moment?**

- Full time = 36 hours (100%)
- Part time: \_\_\_\_\_ hours ( \_\_\_\_\_ %)

**How many years of work experience do you have in your current employment?**

\_\_\_\_\_ years \_\_\_\_\_ months

**How many years of work experience do you have in nursing (total)?**

\_\_\_\_\_ years \_\_\_\_\_ months

PART 2: Experiences and perceptions regarding malnutrition

Definition of 'malnutrition':

Malnutrition is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measurable adverse effects on tissue/body form (body shape, size, composition), body function and clinical outcome (Stratton, Green & Elia, 2003).

**1. Approximately what percentage of care recipients in your home care district is malnourished?**

- Under 10%
- 10% – 25%
- 26% – 50%
- 51% – 75%
- 76% – 100%

**2. To what extent do you think malnutrition is a problem for care recipients in your home care district?**

*(Please tick what best reflects your opinion)*

- No problem
- Small problem
- Problem
- Serious problem
- Significant problem

**3. Does malnutrition influence the prognosis of:**

*(Please tick what best reflects your opinion)*

**a. adult care recipients (18 – 65 years)?**

- Yes
- No

**b. older care recipients (above 65 years)?**

- Yes
- No

**4. To what extent do you agree with the following statements?***(Please tick what best reflects your opinion)*

	Totally disagree					Totally agree				
Prevention of malnutrition is possible	<input type="checkbox"/>									
Malnutrition is an underdiagnosed condition	<input type="checkbox"/>									
Malnutrition is a normal phenomenon in hospital	<input type="checkbox"/>									
Malnutrition is a normal phenomenon in community-dwelling care recipients	<input type="checkbox"/>									
Malnutrition is a normal phenomenon in the ageing process	<input type="checkbox"/>									
Malnutrition is a problem that requires an immediate and active intervention by the medical doctor and the nurse	<input type="checkbox"/>									
In the long term, malnutrition may lead to psychological and physical problems	<input type="checkbox"/>									

**5. In your experience, which of the following risk factors may lead to malnutrition?***(Please, rate factors in terms of their importance by encircling the number that best reflects your opinion on the following scale: 1 represents "not important" and 5 represents "very important")*

	Not important					Very important				
Reduced appetite	1	2	3	4	5	1	2	3	4	5
Decreased taste	1	2	3	4	5	1	2	3	4	5
Reduced functional status, including decreased mobility, reduced possibility or impossibility to get groceries (or to have someone get these), and to prepare food	1	2	3	4	5	1	2	3	4	5
Pain	1	2	3	4	5	1	2	3	4	5
Comorbidity, including COPD, malignant diseases and heart failure	1	2	3	4	5	1	2	3	4	5
Maldigestion and malabsorption in the gastrointestinal tract	1	2	3	4	5	1	2	3	4	5
Depression	1	2	3	4	5	1	2	3	4	5

### Chapter 3

---

Anxiety	1	2	3	4	5
Loneliness	1	2	3	4	5
Infection	1	2	3	4	5
Swallowing disorders	1	2	3	4	5
Chewing problems	1	2	3	4	5
Impaired cognitive status, such as dementia and delirium	1	2	3	4	5
Increased length of hospital stay	1	2	3	4	5
Medication use (amount and side effects)	1	2	3	4	5
Poverty	1	2	3	4	5
Low level of education	1	2	3	4	5

6.

**a. In your home care district, are care recipients with an increased risk for malnutrition routinely screened?**

- Yes
- No

**b. When are care recipients with an increased risk for malnutrition screened?**

- During home care assessment
- Daily
- At home care discharge
- Otherwise, namely: \_\_\_\_\_
- Not applicable

**c. Do you use any instrument for this?**

- Yes, please specify: \_\_\_\_\_
- No
- Not applicable

**7. What is the most serious complication you have witnessed in a malnourished care recipient before treatment for malnutrition was started?**

a. For the care recipient: \_\_\_\_\_  
\_\_\_\_\_

b. For you as a caregiver (which unpleasant experiences or feelings have you encountered with a malnourished care recipient?): \_\_\_\_\_  
\_\_\_\_\_

**8.**

**a. Do you know if a guideline and/or protocol on malnutrition is used in your home care team?**

- Yes
- No

If yes, have you ever consulted this guideline and/or protocol?

- Yes
- No
- Not applicable

If yes, do you find this guideline and/or protocol useful?

- Yes
- No
- Not applicable

**b. How often do you ask for additional advice in dealing with a malnourished care recipient in your home care district?**

- Never
- Seldom
- Usually
- Always

If you request for advice, to which specialism? \_\_\_\_\_

**9. How important do you consider the following interventions to be in the treatment of care recipients with malnutrition?**

*(Please tick what best reflects your opinion)*

**a. Environmental measures (quiet ambiance, own belongings, food as required)**

- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> |
| Not important            | Less important           | Neutral                  | Important                | Priority                 |

**b. Exercise**

- Not important       Less important       Neutral       Important       Priority

**c. Adequate intake of energy, macronutrients (like carbohydrates, proteins and fats) and micronutrients (like vitamins and minerals) by:**

**I. regular diet**

- Not important       Less important       Neutral       Important       Priority

**II. fortified or enriched food (regular diet supplemented with specific nutrients) (in case adequate dietary intake cannot be achieved with a regular diet)**

- Not important       Less important       Neutral       Important       Priority

**III. oral nutritional supplements (pills, liquids etcetera) (in case adequate dietary intake cannot be achieved with a regular diet and fortified/enriched food)**

- Not important       Less important       Neutral       Important       Priority

**IV. tube feeding (in case adequate dietary intake cannot be achieved with a regular diet, fortified/enriched food and oral nutritional supplements)**

- Not important       Less important       Neutral       Important       Priority

**V. parenteral nutrition (in case adequate dietary intake cannot be achieved with a regular diet, fortified/enriched food, oral nutritional supplements and tube feeding)**

- Not important       Less important       Neutral       Important       Priority

**10. During the past 12 months, have you:**

**a. attended further training on malnutrition?**

- Yes  
 No

If not, would you like to follow further training?

- Yes
- No
- Not applicable

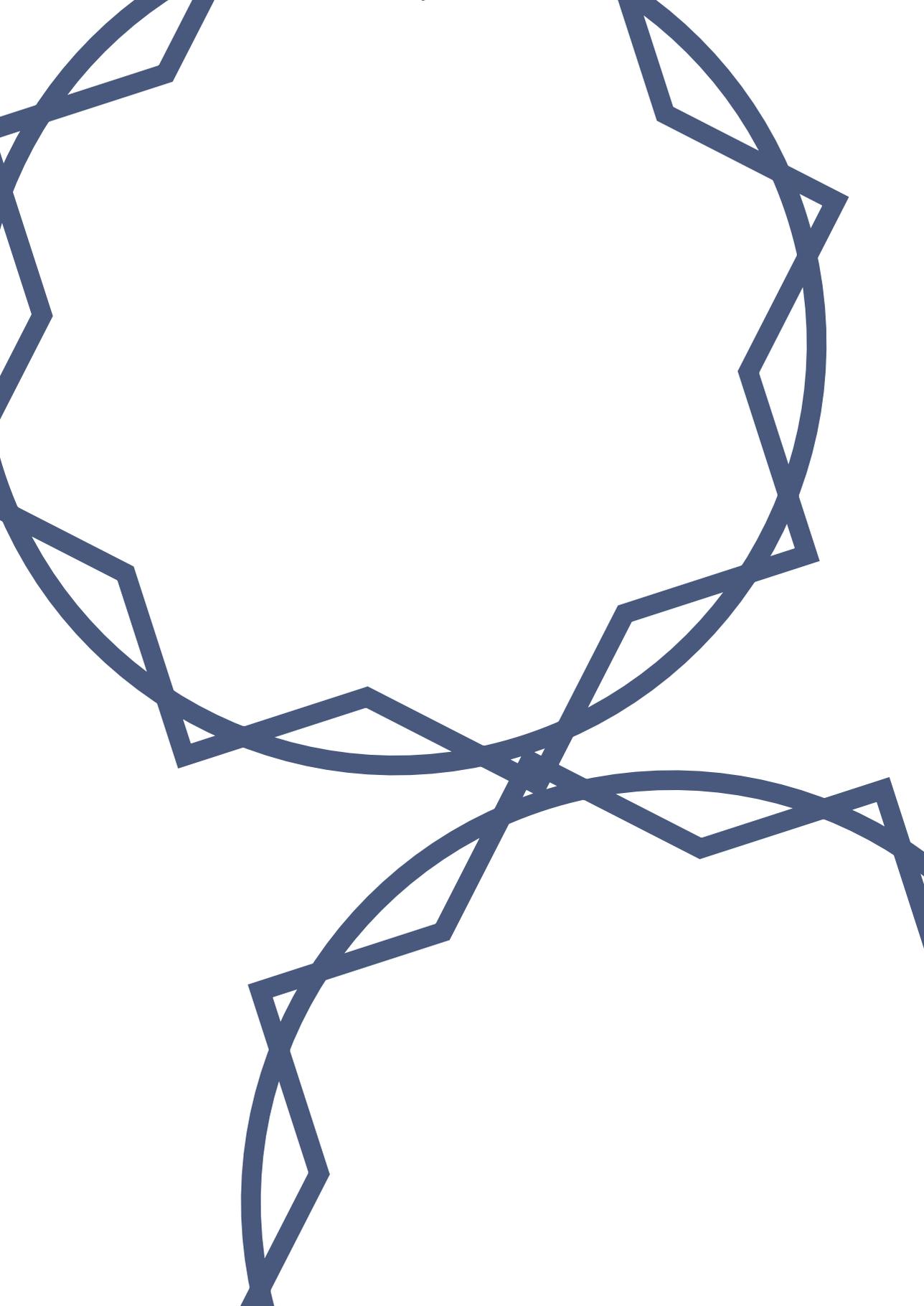
**b. read a scientific article about malnutrition?**

*(Excluding the guideline/protocol of your home care team/organisation)*

- Yes
- No

**11. Comments:** \_\_\_\_\_

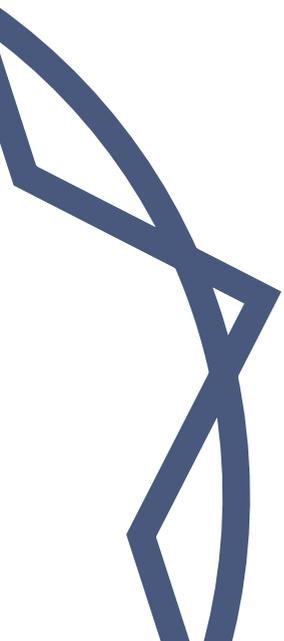
---



# 4

## Older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization: A qualitative study

Debbie ten Cate, Mattanja Mellema, Roelof G.A. Ettema,  
Marieke J. Schuurmans, Lisette Schoonhoven



## Abstract

To enhance prevention and treatment of malnutrition in older adults before, during and after hospitalization, deeper understanding of older adults' and informal caregivers' perspective on nutritional care is important. One-time in-depth interviews were conducted with 15 older adults who had been discharged from hospital, and seven informal caregivers. We explored their experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization. Five themes emerged from the data: 1) dietary intake, 2) food service during hospitalization, 3) nutrition-related activities, 4) whose job it is to give nutritional care, and 5) competing care priorities. Further, several opinions about nutritional issues were identified. Older adults and informal caregivers did not always experience optimal nutritional care. When discussing nutritional care, they mainly focused on the in-hospital period. When providing nutritional care and developing guidelines, older adults' and informal caregivers' perspective on nutritional care should be incorporated. Here, the periods before, during and after hospitalization should be taken into account equally.

## Introduction

Malnutrition is a considerable health problem in older adults of 70 years and older during the period of hospitalization.<sup>1,2</sup> At admission, during hospitalization as well as at discharge, the reported prevalence rates for malnutrition range from 3.1% to 51% and for risk of malnutrition from 33% to 51.3%.<sup>3-7</sup> The large variability in prevalence can be explained by heterogeneity of older populations across individual studies<sup>4</sup> and the use of different malnutrition screening and assessment tools.<sup>1</sup>

During the in-hospital period, the great susceptibility to malnutrition is often generated by an acute deterioration of nutritional status.<sup>8</sup> This is often caused by illness, medical procedures and tests, fasting procedures,<sup>9-11</sup> or other various risk factors such as poor appetite, difficulties swallowing and polypharmacy.<sup>12</sup> Additionally, malnutrition is associated with numerous conditions and complications, including eating and functional dependencies,<sup>6,12</sup> reduction of immune and organ function,<sup>8</sup> and infections.<sup>13</sup> Malnutrition can result in poor wound healing,<sup>8</sup> reduced quality of life,<sup>14</sup> increased length of hospital stay,<sup>7,15</sup> more use of healthcare facilities<sup>7</sup> and mortality.<sup>5,15</sup>

Adequate and high-quality nutritional care is essential in older adults in order to acquire or to maintain good nutritional status in the periods before, during and after hospitalization.<sup>16,17</sup> The periods before and after hospitalization are crucial in delivering nutritional care, because in-hospital periods are usually short.<sup>18,19</sup> Guidelines recommend a multidisciplinary, multimodal and patient-centered approach, where a multidisciplinary team determines the nutritional treatment together with the older adult and informal caregiver.<sup>2,10,20</sup> Here, the effectiveness of interventions is determined by the extent to which the experiences,<sup>21</sup> needs,<sup>21,22</sup> preferences,<sup>22,23</sup> perceptions and capacities<sup>22</sup> of older adults and their informal caregivers are taken into account.

The few studies from the perspective of older adults and informal caregivers have shown that in nutritional care there are both chances and threats for dietary intake. Chances are older adults' satisfaction with meals, they believe that meals are important, their will to maintain independence concerning food and meals, and encouragement of family members. Threats include older adults' beliefs that poor nutritional intake or malnutrition is not a problem and treatment for malnutrition is not a priority. Furthermore, threats comprise presence of a deteriorating nutritional status or risk factors for malnutrition, lack of consideration for individual needs and values, and feeling dependent on caregivers and informal caregivers. In addition,

threats are problems in communication between older adults and caregivers, improper catering and physical environment of meals, inflexibility of the food service system and caregivers' lack of support to informal caregivers.<sup>24-27</sup>

In these studies, focus was only on the period during, or during and after hospitalization. The periods before, during and after hospitalization were not explored simultaneously. Furthermore, despite their substantial role in nutritional care, studies in which the perspective of the informal caregiver is described are sparse. In addition, deeper understanding of both older adults' and their informal caregivers' perspective on nutritional care provided in these periods can potentially ensure a good nutritional status and enhance the prevention and treatment of malnutrition. Also, their perspective can eventually promote the delivery and continuity of quality nutritional care. Therefore, the aim of this study is to explore older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization.

## Methods

### Study design

A qualitative design with in-depth, semi-structured interviews was chosen. We held one-time interviews with older adults who had been recently hospitalized and their informal caregivers post discharge from hospital at their homes. They were asked to retrospectively reflect back on the periods before, during and after their hospitalization. In reporting this study, we followed the consolidated criteria for reporting qualitative studies (COREQ)<sup>28</sup> and the Standards for Reporting Qualitative Research (SRQR).<sup>29</sup>

### Sample and setting

A purposive sampling method<sup>30</sup> was used to include community-dwelling older adults who had been discharged from hospital between two and 12 weeks before the moment of recruitment. If present, their informal caregivers were also asked to participate, i.e. a convenience sample.<sup>30</sup> Older adults were selected from the departments of geriatrics, internal medicine and lung diseases of a university hospital and the departments of internal medicine, orthopedics and vascular surgery of a general hospital in the Netherlands. The selection was carried out by either the hospital ward's physician (five departments) or medical coordinator (one department). Each hospital ward's physician screened all admitted patients for eligibility during a period of four to eight weeks. The hospital ward's medical

coordinator retrospectively screened all patients who had been admitted until ten weeks before screening. The complete screening and selection procedure took place in a total time frame of nine months, between January to September 2017. Initially, 37 patients seemed eligible, but seven were excluded based on study eligibility criteria. Subsequently, 30 older adults were approached by the physicians or medical coordinator and five older adults declined to participate. We, the researchers, were given permission to approach 25 older adults.

The eligibility criteria for older adults are displayed in Table 1. Older adults were excluded from participation if they were diagnosed with a rare or end-stage disease, undergoing a rare treatment or a long-term medical procedure. In addition, they were excluded from participation if they were seriously ill or had a significant mental or cognitive impairment. This was indicated by the hospital ward's physician. If during the interview, the researcher assessed significant mental or cognitive impairment in the older adult, this led to exclusion of the older adult in this study. Informal caregivers were not eligible to participate if they were unable to understand and speak Dutch.

**Table 1.** Study eligibility criteria for community-dwelling older adults who were hospitalized

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>• Adults with age <math>\geq</math> 70 years</li> <li>• Living in the community</li> <li>• Hospital discharge between two and 12 weeks before the moment of recruitment</li> <li>• Adequate command of the Dutch language</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient mental or cognitive status</li> <li>• Diagnosed with a rare disease or in the end stage of a disease</li> <li>• Undergoing rare treatment</li> <li>• Undergoing a long-term medical procedure</li> </ul>

Maximum variation sampling, which is a type of purposive sampling, with regard to medical diagnosis was used to increase variation in older adults' and their informal caregivers' experiences and needs in nutritional care.<sup>30</sup> Besides a variation in medical diagnosis, this resulted in a diverse sample concerning gender, age, length of hospital stay and risk for malnutrition during hospitalization. Inclusion of participants continued until data saturation was reached.<sup>31</sup>

### Recruitment and informed consent

When older adults were willing to participate, they were contacted by one researcher (MM). In total, 25 older adults were recruited for participation and nine of them were eventually excluded (could not be reached ( $n = 1$ ), not fit enough to participate ( $n = 7$ ), significant cognitive impairment based on the judgment of the researchers ( $n = 1$ )). Hence, 16 older adults were included. Of these older adults, five had no informal

caregiver because the older adults were widowed ( $n = 2$ ), or they had a relative who was physically too ill ( $n = 2$ ) or had been diagnosed with early dementia ( $n = 1$ ). Of the 11 present informal caregivers, four were not interested and seven agreed to participate.

### Data collection

A semi-structured interview guide was developed for the in-depth face-to-face interviews. Based on literature and professional experiences, the research team operationalized the research question into relevant topics with the main focus on nutritional care.<sup>30</sup> We defined nutritional care as ‘the form of nutrition, nutrient delivery and the system of education that is required for meal service or to treat any nutrition-related condition in both preventive nutrition and clinical nutrition’.<sup>10</sup> The interview included five topics and accompanying open-ended key questions, which were presented to the participants in the same sequence. Within each topic, we formulated probing questions to explore the topic in depth.<sup>31,32</sup> All interviews started with the same question: “Can you tell us why you have been admitted to the hospital?”. The main topics and key questions can be found in Table 2.

The key questions representing a topic were each presented to a researcher, a nurse and a patient. They were asked if the questions were relevant (yes/no), unambiguous (yes/no), comprehensible (yes/no) and applicable for the future participants of this study (yes/no). With a few suggestions in wording, the researcher, nurse and patient considered the key questions appropriate. One pilot interview was performed by one researcher (MM) with one adult who met the eligibility criteria of our study. This interview was considered as a practice interview to test the interview guide and to practice the interview techniques of the interviewer. The pilot interview was evaluated by three researchers (DtC, MM, RE) and did not lead to changes in the interview guide.<sup>30</sup>

The interview data of 15 older adults were used for data analysis. All interviews took place at the older adults’ homes. Eight older adults were interviewed individually. In seven interviews, the older adult and informal caregiver were interviewed together. Each interview was prepared in advance by two researchers (DtC, MM) and conducted by one researcher (MM). Both researchers were not involved in the treatment and care of the older adults. The researchers and participants were not acquainted. The interviewer informed the participants that she was a physiotherapist and health scientist with interest in nutrition. The duration of the one-time interviews ranged from 25 to 55 minutes. All interviews were audio recorded. In addition, memos were made during and directly after the interviews.

Characteristics of older adults and informal caregivers were collected at the start of the interview through a standardized questionnaire. Additionally, information about medical diagnosis, past illnesses, nutritional status using the Malnutrition Universal Screening Tool (MUST) and nutritional care during the current hospitalization was extracted from the electronic patient record.

**Table 2.** Main topics and key questions of the semi-structured interviews with older adults and their informal caregiver

Main topics	Key questions
General	<i>Addressed to the older adult:</i> Standard opening question: “Can you tell me why you have been admitted to the hospital?”
Nutritional care experiences	<i>Addressed to the older adult and informal caregiver:</i> “You have/the person you care for has been hospitalized recently. Can you tell me your experiences about nutritional care in the periods before, during and after hospitalization?”
Nutritional care needs	<i>Addressed to the older adult and informal caregiver:</i> “Suppose, you have/the person you care for must be admitted to the hospital again. Can you tell me your needs regarding nutrition and nutritional care in the periods before, during and after hospitalization?”
Perceptions on how to improve nutritional care in the periods before, during and after hospitalization	<i>Addressed to the older adult and informal caregiver:</i> “We have the intention to develop a nutritional intervention, which can be carried out by nurses. This means that we are going to develop (a combination of) activities concerning nutritional care in order to keep older adults well-nourished in the periods before, during and after hospitalization. These activities will be carried out by nurses. What do you think is important concerning nutrition and nutritional care? What do we need to take into account for comprehensive development?”
Final	<i>Addressed to the older adult and informal caregiver:</i> Last question: “Do you want to add something that has not been discussed before?”

## Data analysis

After each interview, the audio record was transcribed verbatim by one researcher (MM) and verified by another researcher (DtC). The interviews were analyzed using QSR International’s NVivo 11 qualitative data analysis software (NVivo qualitative data analysis software version 11, QSR International Pty Ltd., 2015), using thematic analysis.<sup>33</sup> We conducted a cumulative analysis for all 15 interviews. Data analysis consisted of five steps, started after the first two interviews and was data-driven. Within steps one to four, two researchers (DtC, MM) conducted the analysis, where they coded each interview independently. They held face-to-face meetings after every two interviews and during the entire analysis process, three additional consensus meetings with two experts on qualitative research (JE, JD). They discussed codes, themes and sub-themes, and their potential relationships to reach consensus. Within

step five, the themes were defined and named. The analysis was validated by other members of the research team (RE, MS, LS).

Data saturation was monitored through constant comparison during data collection and data analysis.<sup>31</sup> Data saturation was reached after the 13th interview when no new information emerged from the interviews that added to an understanding of the themes. For validation, two additional interviews were conducted.

The 15-point checklist of criteria for good thematic analysis was used during the phases of data collection and analysis.<sup>33</sup> This checklist can be found in Appendix 1.

### **Trustworthiness**

To ascertain trustworthiness during the study, the criteria established by Lincoln and Guba were followed.<sup>34</sup> Credibility was enhanced by maximum variation sampling, prolonged engagement with data during data collection and thematic analysis, and researcher triangulation.<sup>34</sup> Dependability was assessed by writing a study protocol, using an interview guide during each interview,<sup>30</sup> and performing a stepwise replication strategy where two researchers independently analyzed the data.<sup>34</sup> Furthermore, an external audit with an expert was held to examine the process and the product of the study.<sup>30</sup> Confirmability was ensured by involving five researchers of this study and two experts on qualitative research in all phases of the study.<sup>32</sup> Transferability was obtained by providing detailed descriptions of the participants, the context and the information emerging from the interviews.<sup>34</sup>

### **Ethical issues**

This study was approved by the Medical Research Ethics Committee of the University Medical Center Utrecht, the Netherlands (16-761/C) and by the local Ethics Committee of the St. Antonius Hospital, Nieuwegein, the Netherlands (R&D/Z17.005). Written informed consent was obtained from all participants at the start of the interview.

## **Results**

Six older adults had been admitted to a university hospital, whereas the remaining nine stayed in a general hospital. Maximum variation was accomplished for gender (67% female), age (range 70 – 87 years; median 76 years), medical diagnosis (Table 3), length of hospital stay (range 2 – 30 days; median 7 days) and risk for malnutrition (73% low risk; 7% medium risk; 20% high risk). The age of the interviewed informal caregivers ranged from 70 to 83 years (median 80 years). All informal caregivers were

married to and lived together with the older adult. Characteristics of older adults and informal caregivers are shown in Table 3.

### **Identified themes**

Six main themes, with each several incorporated sub-themes, emerged from the data. Five themes concerning experiences and/or needs of older adults and their informal caregiver were identified: dietary intake, food service during hospitalization, nutrition-related activities, whose job it is to give nutritional care and competing care priorities. One theme illustrated older adults' and their informal caregivers' opinions regarding nutritional issues. We described nutritional issues as features in the broadest possible sense related to nutrition. The themes are presented and illustrated by quotes in Table 4.

#### *Theme 1: Dietary intake*

Most older adults experienced a reduced dietary intake in the period during and in most cases also after hospitalization. Some older adults already experienced a reduced dietary intake before hospitalization. This was also observed by the informal caregivers. Older adults and their informal caregivers mentioned several factors, which caused a reduced dietary intake (Table 5). As a consequence, some older adults had (acute) weight loss.

In contrast, a few older adults experienced no change in dietary intake compared to their normal life at home due to good appetite during hospital admission. Also, older adults and their informal caregivers acknowledged the importance of eating habits and personal food preferences on dietary intake. Therefore, older adults favored their own food from home, which was brought to the hospital by family.

Table 3. Characteristics of participating older adults and informal caregivers

Older adults (n = 15)							
No.	Age range <sup>a</sup>	Gender	Educational level <sup>b</sup>	Living situation <sup>c</sup>	Medical diagnosis	MUST score <sup>e</sup>	
					Comorbidity <sup>d</sup>	LOS	
1	80-84	F	High	2, 4	Asthma exacerbation	Y	10
2	85-89	M	High	2, 4	Pleural effusion	Y	3
3	70-74	F	Middle	2	Anemia	Y	7
4	70-74	F	High	3	Revision total hip replacement	Y	5
5	70-74	M	High	2	Cellulitis	Y	7
6	75-79	F	High	2, 4	Rheumatoid arthritis exacerbation	Y	8
7	70-74	F	Low	1	Reverse total shoulder replacement	Y	3
8	75-79	M	Middle	2	Pneumonia and exacerbation COPD	Y	7
9	80-84	F	Low	2, 4	Heart failure	Y	5
10	75-79	M	Middle	2	Limb ischemia	Y	2
11	70-74	F	Middle	1, 3	Total hip replacement	Y	30
12	75-79	F	High	2	Cellulitis/ erysipelas	Y	8
13	85-89	F	Low	1	Occlusive peripheral arterial disease	Y	7
14	70-74	M	High	2	Total hip replacement	N	3
15	70-74	F	Low	3	Total hip replacement	Y	3
Informal caregivers (n = 7)							
No.	Caregiver of	Relation	Age range <sup>a</sup>	Gender	Educational level <sup>b</sup>	Living situation <sup>c</sup>	
C-1	1	Spouse	74-79	M	High	5	
C-2	2	Spouse	80-84	F	High	5	
C-3	5	Spouse	70-74	F	High	5	
C-4	6	Spouse	80-84	M	High	5	
C-5	8	Spouse	70-74	F	Middle	5	
C-6	9	Spouse	80-84	M	Middle	5	
C-7	10	Spouse	80-84	F	Low	5	

*Abbreviations:* F = female; LOS = length of hospital stay; M = male; MUST = Malnutrition Universal Screening Tool; N = no; Y = yes.

<sup>a</sup> Age range in years.

<sup>b</sup> Low: primary school through vocational education; medium: secondary school or vocational education; high: bachelor's or master's degree.

<sup>c</sup> 1: living alone, absence informal caregiver; 2: living with partner/family member, who is informal caregiver; 3: participant is informal caregiver of partner/family member; 4: presence professional caregivers; 5: living together with older adult.

<sup>d</sup> Comorbidity is defined as "additional conditions not causally linked to the principal diagnosis".<sup>35</sup>

<sup>e</sup> MUST score: 0 = low risk of malnutrition; 1 = middle risk of malnutrition;  $\geq 2$  = high risk of malnutrition.<sup>36</sup>

<sup>f</sup> Consult with a dietitian during hospitalization.

<sup>g</sup> Consult with a dietitian after hospitalization.

**Table 4.** Identified main themes, incorporated sub-themes and characteristic quotes from the interviews

Main themes and sub-themes	Selected quotes
<b>Theme 1: Dietary intake</b>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>Reduced dietary intake</li> <li>Sufficient dietary intake due to good appetite</li> <li>Personal food preferences and eating habits</li> </ul>	<ul style="list-style-type: none"> <li>“He has poor intake, very poor. ... What he eats would fit on a saucer. Just a little bit.” (informal caregiver C-7)</li> <li>“[I ate] the same amount. Nothing was wrong with my appetite. It was just there, despite ... the anesthetic.” (older adult 15)</li> <li>“So, I always had cereal with milk in the morning. ... I did not need more. I also eat this at home for breakfast.” (older adult 5)</li> </ul>
<b>Theme 2: Food service during hospitalization</b>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>Sufficient food choice and food amount</li> <li>Appealing and unappealing sensory perception of food</li> <li>Failing service in food delivery</li> </ul>	<ul style="list-style-type: none"> <li>“I have experienced it [food choice and food amount] as good. As I already said, the trolley they now have, well, it is a salvation. There is so much in and on it. There is so much to choose.” (older adult 7)</li> <li>“I thought [the food] was very tasty ... It was nice and warm. It was really ... very tasty.” (older adult 6)</li> <li>“I did not always like the food in the hospital ... I left it right where it was.” (older adult 13)</li> <li>“...When a bed is empty ..., the patient is not here ... Wait a moment or ask fellow patients, who also know that you are in the bathroom ... Ask. And do not run away.” (older adult 4)</li> </ul>
<u>Needs:</u>	
<ul style="list-style-type: none"> <li>More food choices</li> <li>Appealing sensory perception of food</li> <li>Satisfactory service in food delivery</li> </ul>	<ul style="list-style-type: none"> <li>“I would personally like more fresh vegetables.” (older adult 1)</li> <li>“The colors of the plates, the colors of the dish, yes. A little parsley on it, ..., you know. A twist of this and a twist of that. It adds so much value toward food.” (older adult 14)</li> <li>“Look, when you are bedridden, then you don't know what happens in the hallway with the food ... Of course, nothing can be changed about that. It is difficult to enter every room with that trolley. That would be nice, then you can see what is on it.” (older adult 1)</li> </ul>
<b>Theme 3: Nutrition-related activities</b>	
<i>Carried out by older adults</i>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>Monitoring weight</li> <li>Cooking</li> </ul>	<ul style="list-style-type: none"> <li>“... I weigh myself ... I eat pretty well ..., but I have to be careful that I don't lose weight.” (older adult 7)</li> <li>“... I think ... I have to walk on crutches anyway ... If I start cooking simple food, a potato, vegetables and a piece of meat.” (older adult 15)</li> </ul>
<u>Needs:</u>	
<ul style="list-style-type: none"> <li>Learning to cook</li> <li>Eating together</li> </ul>	<ul style="list-style-type: none"> <li>“[If] you can't cook ... go on a course once a week where you can learn to cook.” (informal caregiver C-4)</li> <li>“... I think eating in the hospital is a social event, which is very important ..., because it is a moment where people can have a break from the hospital routine. Eating and talking with each other.” (older adult 14)</li> </ul>

Table 4. Continued

Main themes and sub-themes	Selected quotes
<i>Carried out by the informal network:</i>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>Bringing food to older adult</li> <li>Stimulating older adult to eat</li> <li>Cooking</li> <li>Monitoring nutritional situation</li> <li>Eating together</li> </ul>	<ul style="list-style-type: none"> <li>"... Sometimes, she [daughter] brought me tasty snacks. Or I said: 'bring me a sausage roll or a croquette', and then she did." (older adult 13)</li> <li>"... Like my husband had dinner with me, and I said: 'I don't want anymore', he said: 'now you just try'. You do what he tells you." (older adult 12)</li> <li>"... My daughter lives nearby. ... At first, I could not cook, but she'll make sure I have food." (older adult 7)</li> <li>"I checked: 'what do you get to eat? Is it enough?' And that was okay." (informal caregiver C-3)</li> <li>"Because, tonight I'm going to eat at the community center. ... I get plenty [of food there]. ... Or we [eat] together. Then, I eat at her [friend] place or she is having dinner at my place. ... So, I always get my nutrition." (older adult 9)</li> </ul>
<u>Needs:</u>	
<ul style="list-style-type: none"> <li>Bringing food preferred by older adult</li> <li>Stimulating older adult to eat</li> <li>Cooking</li> <li>Monitoring nutritional situation</li> <li>Eating together</li> <li>Contact with professional caregiver</li> </ul>	<ul style="list-style-type: none"> <li>"Then [future hospitalization] I would ask my wife 'would you bring me something?' A shrimp sandwich or another sandwich.... To satisfy the cravings you still have." (older adult 14)</li> <li>"Well, suppose if he would lose a lot of weight, then I would make sure it [the food] goes in. 'Listen, you ate something with the coffee, but you didn't eat your slice of bread with cheese. First, eat this and then later, you can eat something tasty'." (informal caregiver C-5)</li> <li>"In the last two weeks before surgery, [an informal caregiver or children] make sure that [someone] eats enough or they bring some [cooked food]." (older adult 15)</li> <li>"That [an informal caregiver or children] keep an eye on [nutritional intake]." (older adult 15)</li> <li>"A good solution is when older adults ... join a food club." (older adult 3)</li> <li>"At some point, he or she [informal caregiver] should tell a medical doctor about the situation at home .... That she eats or drinks little and that care should be taken to ensure that she drinks something occasionally and she doesn't dehydrate. ... Attention must be paid to that." (older adult 14)</li> </ul>
<i>Carried out by professionals:</i>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>Monitoring weight and food intake</li> <li>Consultation professional caregiver</li> <li>Intake energy- and protein-enriched diet and supplements</li> <li>Stimulating food intake</li> </ul>	<ul style="list-style-type: none"> <li>"[In the hospital they told me] to gain strength. ... I was also weighed there." (older adult 9)</li> <li>"From the dietitian, I received extra nutrition in the form of these bottles." (older adult 13)</li> <li>"Yes, because I very much decreased food intake. Then, I received those bottles with food. I still use these at the moment." (older adult 13)</li> <li>"... That solution for the oatmeal was nice too." (informal caregiver C-2) "Yes, yes [the] oatmeal went right in." (older adult 2)</li> </ul>

Table 4. Continued

Main themes and sub-themes	Selected quotes
<ul style="list-style-type: none"> <li>• Education</li> <li>• Professional food delivery</li> <li>• Absence nutritional care</li> </ul>	<ul style="list-style-type: none"> <li>• <i>“They [professional caregivers in the hospital] gave advice to eat well. Red meat ... and things like that. So I needed a lot of calories. They did say that.” (older adult 10)</i></li> <li>• <i>“You have to eat anyway. So, then you order the ready things [meals] again.” (older adult 4)</i></li> <li>• <i>“Well, I think there is not much going on around food. From my point of view as a patient, I have the feeling that nothing happens. ... Then you lie there for two days, ... they have no insight into it [nutritional situation of the patient]. This is not possible either.” (older adult 4)</i></li> </ul>
<u>Needs:</u>	
<ul style="list-style-type: none"> <li>• Monitoring nutritional status</li> <li>• Consultation professional caregiver</li> <li>• Intake sufficient nutrition, possibly via enriched food or supplements</li> <li>• Stimulating food intake</li> <li>• Education</li> <li>• Good communication between disciplines</li> <li>• One contact point for nutritional topics</li> <li>• Professional food delivery</li> <li>• No need for more nutritional care</li> </ul>	<ul style="list-style-type: none"> <li>• <i>“Yes, it would be nice if you [professional caregivers] know that someone, who will be hospitalized, is already not eating that well. ... That the general practitioner needs to sound the alarm bell in advance, they sometimes already know whether someone is eating very badly, for some reason.” (older adult 7)</i></li> <li>• <i>“There must be dietitians in the hospital, ... They can send them when the nurses say: ‘Yes’. ... Then of course that patient must also be monitored when they go home.” (older adult 3)</i></li> <li>• <i>“Because then [in case of nutritional deterioration] they [professional caregivers] can intervene. That they say: ‘Instead of margarine take butter, or ... take whole fat yogurt’. That the calories will increase, or a little whipped cream.” (older adult 4)</i></li> <li>• <i>“Maybe a little more pressure for people [older patients] to put some extra [food] on the table. ... [professional caregivers] saying: ‘... I will give you a sandwich ..., because I think you’ll like that.’” (older adult 12)</i></li> <li>• <i>“...So, some suggestions could be given ... to the person looking after [the older adult]. ... Like, you should eat this, eat that, ...you have to pay attention to this and that. I think, that would be useful.” (informal caregiver C-6)</i></li> <li>• <i>When an older adult has a worsening of nutritional status: “... It could be a task for home care when it is ... recognized that someone is eating very badly. This should be communicated with home care. ... But the hospital should arrange that [contact with home care].” (informal caregiver C-4)</i></li> <li>• <i>“I considered the absence of [a] contact point [for nutritional topics] quite problematic. ... Urology has specialists who serve as a kind of informal contact. ...” Interviewer: ‘And you would need such a contact point?’ “Yes, yes.” (informal caregiver C-3)</i></li> <li>• <i>In case of nutritional deterioration: “That they [general practitioner or home care nurse] make arrangements with some meal service [for] a few times a week.” (older adult 3)</i></li> <li>• <i>“I can’t say I missed anything during my two hospital experiences. ... So when I get back to the hospital, I can’t imagine that I would explicitly ask for things that I would like or appreciate and would not receive otherwise.” (older adult 5)</i></li> </ul>
<b>Theme 4: Whose job it is to give nutritional care</b>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>• Involving the informal network</li> </ul>	<ul style="list-style-type: none"> <li>• <i>“No, not at all [involvement in nutritional care]. I assume that they can also cook in the hospital. No, but I didn’t expect anything, that was not necessary.” (informal caregiver C-5)</i></li> </ul>

Table 4. Continued

Main themes and sub-themes	Selected quotes
<ul style="list-style-type: none"> <li>Professional caregivers' involvement and responsibility</li> </ul>	<ul style="list-style-type: none"> <li>"I don't know if that's their job [check dietary intake]. ... I don't know if that belongs to the people who deliver the food." (older adult 11)</li> </ul>
<u>Needs:</u>	
<ul style="list-style-type: none"> <li>Involving the informal network</li> </ul>	<ul style="list-style-type: none"> <li>After asking if the informal caregiver felt the need to be involved in nutritional care, she said: "No, no, not at all. If [he] was very weak and every bite ... was so important. [Or] if he would only like a few things .... But all of this does not apply. No, he eats what's on the table. And usually with appetite. So, no, he is doing fine." (informal caregiver C-5)</li> </ul>
<ul style="list-style-type: none"> <li>From informal to formal care after hospitalization</li> </ul>	<ul style="list-style-type: none"> <li>"Well, if you are ... single and you have no children. ... and no family or anything, yes, then only neighbors remain. And when they're not present, yes, then a social worker or someone from home care will have to take care of that [nutritional care]." (older adult 14)</li> </ul>
<ul style="list-style-type: none"> <li>Preferred caregivers giving nutritional care</li> </ul>	<ul style="list-style-type: none"> <li>"But if it is really serious, ... I would just call in the dietitian. ... And then pass it to the general practitioner, who can ask a home care nurse or makes an agreement with a professional organization about ready-to-eat meals for a few times a week." (older adult 3)</li> <li>"... You can hardly saddle the nursing staff with keeping an eye on it [monitoring dietary intake], because they don't do that. ... And if the catering [room service] is competent enough to keep an eye on which plates come back full with food, I don't know." (informal caregiver C-1)</li> </ul>
<b>Theme 5: Competing care priorities</b>	
<u>Experiences:</u>	
<ul style="list-style-type: none"> <li>The tension between nutrition-related activities versus other care activities</li> </ul>	<ul style="list-style-type: none"> <li>"... Then they [room service personnel] arrive with that car [food trolley], they put it [meal] on the table, but in the meantime something can occur, like the lab comes, or they have to measure something, or inject .... And when you want to start [eating], they already take it away." (older adult 4)</li> <li>"... They [nurses] have to be able to work a little on time and have everything ready on the ward. This is how it was, so you just accept that. You don't complain about that." (older adult 10)</li> </ul>
<ul style="list-style-type: none"> <li>Medical treatment as driver for nutritional care</li> </ul>	<ul style="list-style-type: none"> <li>"[I was] weighed a number of times, yes. ... You retain so much fluid, ... you retain kilos of fluid." (older adult 2)</li> </ul>
<b>Theme 6: Opinions regarding nutritional issues</b>	
<ul style="list-style-type: none"> <li>Indulgence toward nutritional issues</li> </ul>	<ul style="list-style-type: none"> <li>"Then you feel guilty toward the nurses, who are already so busy. That you have to ring the bell for something silly [receive breakfast]. But you yourself are not capable to run after it." (older adult 4)</li> <li>"And they [professionals] really had the feeling they had to fatten him up a little. ... That it was very good for him to eat well and a lot. ... They really did their best. ... [But it only worked] when he came home and felt better." (informal caregiver C-3)</li> </ul>
<ul style="list-style-type: none"> <li>Nutritional issues are none of older adults' concern</li> </ul>	<ul style="list-style-type: none"> <li>"... I noticed he ate less, but yes, I thought that would be fine if he would feel more healthy." (informal caregiver C-2) "You see. ... Well, I'm not worried. Imagine, I would lose a few kilos. This will be gained again later." (older adult 2)</li> <li>"Yes, I try to ingest those nutrients, so. I'm doing my best. I don't want ... my energy to decline even more." (older adult 11)</li> <li>"But he is not a person who says quickly: 'This is not good and that is not good.'" (informal caregiver C-3) "No, I am not that assertive in situations like that. And I tend to think that they [professional caregivers] know what is the right thing to do." (older adult 5)</li> </ul>

Table 4. Continued

Main themes and sub-themes	Selected quotes
<ul style="list-style-type: none"> <li>Malnutrition: sufficient knowledge and knowledge gap</li> </ul>	<ul style="list-style-type: none"> <li>“Yes, that you give a person some extra [food] before hospitalization .... If you manage that you are in good condition before the surgery, you will also recover more easily after surgery. And that is the way how I look at food also.” (older adult 15)</li> <li>“I don't think [he was malnourished], because he ate all meals. ... [He] just ate every meal. But he had really lost a lot of weight in that period. Really hard. But that was due to the illness and not the lack of good food.” (informal caregiver C-5) “[Due to] illness, I think, I don't know.” (older adult 8)</li> </ul>
<ul style="list-style-type: none"> <li>Ambiguous about trusting professionals giving nutritional care</li> </ul>	<ul style="list-style-type: none"> <li>“I think they [professionals] could observe that [signs of nutritional deterioration]. Of course, they detect this in the hospital.” (older adult 6)</li> <li>“... They [professionals] don't verify if you lose weight .... They can't know either. ...If you are there [in the hospital] for two days, [which is] normal for hip surgery, they can never check this.” (older adult 4)</li> </ul>
<ul style="list-style-type: none"> <li>Confident about eating healthily</li> </ul>	<ul style="list-style-type: none"> <li>“I think we eat very healthily.” (informal caregiver C-4) “Yes, I agree. ... I always take only a small piece of meat, but I am very fond of vegetables. And potatoes not so much either.” (older adult 6)</li> </ul>

Table 5. Causes for reduced dietary intake according to older adults and informal caregivers

<i>Physical/Medical</i>
<ul style="list-style-type: none"> <li>(Acute) Illness</li> <li>Distortion gastrointestinal tract/nausea/diarrhea</li> <li>Pain</li> <li>Painful or dry mouth</li> <li>Decreased appetite</li> <li>Decreased flavor</li> <li>Decreased taste</li> <li>Immobility</li> <li>Tiredness</li> <li>Inflammation/infection</li> </ul>
<i>Psychological</i>
<ul style="list-style-type: none"> <li>Delirium</li> </ul>
<i>Social</i>
<ul style="list-style-type: none"> <li>Unable to prepare food</li> </ul>

### Theme 2: Food service during hospitalization

In general, older adults appreciated the extensive range in variety and amount of food offered during breakfast, lunch and dinner during hospitalization. Although generally satisfied, some older adults wanted more choice in food, such as more fruit and vegetables.

Older adults had different opinions about the appeal of the sensory perception of food. Some older adults expressed their dissatisfaction to the room service personnel, but others ate the food without complaining. Unsatisfied older adults wanted to eat attractive food, served appealingly in an enabling environment.

Several older adults experienced poor service from and a lack of communication with room service personnel about food delivery. Older adults needed a more satisfactory service in food delivery, e.g. by presenting an overview of available food and better communication with the personnel.

### *Theme 3: Nutrition-related activities*

Within this theme, several nutrition-related activities, which could be carried out by older adults, the informal network (i.e. spouse, family, friends, acquaintances, neighbors) and professionals were distinguished (Table 4). We described nutrition-related activities as activities or actions, which may affect nutrition and nutritional outcomes.

#### Carried out by older adults

A few older adults stated they monitored their weight or had the intention to monitor weight after hospitalization at home to check weight loss or weight gain due to fluid retention. One older adult said she started cooking again at home after her surgical procedure. An informal caregiver stated the need that older adults should learn to cook. One older adult expressed his wish that patients should eat together during hospitalization. No activities before hospitalization were mentioned.

#### Carried out by the informal network

During hospitalization, several older adults experienced and one adult needed that the informal network brought food. Stimulating older adults to eat well was another experienced activity during hospitalization and a need at home after hospitalization. The informal network of older adults cooked regularly after hospitalization. One older adult underlined the need for this before hospitalization to stimulate dietary intake in preparation for surgery.

Some older adults and informal caregivers pointed out that the informal network monitored the nutritional situation during and after hospitalization, whereas others preferred more monitoring at home after hospitalization. A few older adults experienced eating and drinking together with the informal network during and after hospitalization, while other older adults and informal caregivers stated the need for this. Some older adults indicated the need for contact between informal and professional caregivers about nutritional issues before and during hospitalization.

#### Carried out by professional caregivers

Various older adults and informal caregivers experienced a variety of nutrition-related activities carried out by professional caregivers, mostly during and/or after, but not before the in-hospital period. These activities were monitoring weight

or food intake, stimulating food intake and receiving targeted education about nutritional issues. Older adults who had a middle or high risk of malnutrition mentioned a consult with a dietitian, where the dietitian advised treatment with an energy- and protein-enriched diet and oral nutritional supplements. Most older adults and informal caregivers experienced an absence of nutritional care activities before, during and after hospitalization. Also, some older adults received ready-to-eat meals from supermarkets or delivery services after hospitalization.

Older adults and their informal caregivers made suggestions on nutrition-related activities carried out by professional caregivers. They mainly focused on the periods during and after hospitalization and to some degree on the period before hospitalization. They differentiated between needs of older adults who suffered nutritional difficulties and their own needs. The needs of older adults with nutritional problems, which they mentioned were monitoring weight, food intake or nutritional status; professional consultation; sufficient nutrition, possibly enriched; stimulating food intake; good communication between various disciplines involved in nutritional care within and between organizations; and ready-to-eat meals or delivery of groceries at home. Older adults and their informal caregivers pointed out that they themselves needed education and one contact point with whom they could discuss nutritional matters. Quite some older adults and informal caregivers pointed out that current nutritional care during hospitalization had been satisfactory and that more nutritional care would not be necessary. The older adults and the informal caregivers spoke about the needs as if they did not identify themselves as older adults who suffered nutritional difficulties.

### *Theme 4: Whose job it is to give nutritional care*

Older adults and their informal caregivers indicated that most of the time informal caregivers were not involved in nutritional care in the hospital, but they were before and after hospitalization. Some older adults and informal caregivers wanted more engagement in nutritional care, while others did not. They agreed that nutritional aftercare should be given by the informal network. In case of absence of an informal caregiver or impossibility of an informal caregiver to give care properly, professional support would be needed.

Several older adults pointed out that during and after, but not before their hospitalization dietitians, room service personnel, medical specialists and hospital or home care nurses were involved in and responsible for their nutritional care. The general practitioner or medical specialist were not involved. Some older adults did not know who was involved in or responsible for their nutritional care. Many older

adults and informal caregivers believed that nutritional care was not the job of nurses and room service personnel, or that they were too busy or incompetent to deliver nutritional care.

#### *Theme 5: Competing care priorities*

During hospitalization, quite a number of older adults mentioned that other care activities and ward regulations were guiding, which frequently resulted in the impossibility to eat well. Reasons were interruptions for examinations, measurements or following nurse's activity schedule. Although the older adults expressed their dissatisfaction commonly, they also stated not knowing in what way things should change.

Several older adults suffered comorbidities for which they adhered strictly to a diet, fluid restriction or activities such as weighing themselves, which were determined by a medical doctor or dietitian. They also told that, before, during and after hospitalization, they evaluated the interventions regularly with a professional caregiver who was alert that the interventions were carried out sufficiently.

#### *Theme 6: Opinions regarding nutritional issues*

##### Indulgence toward nutritional issues

Older adults and their informal caregivers were not always satisfied with nutritional issues, but they understood that they had to accept the situation and nutritional issues did not always work out as they wanted. They pointed out that professional caregivers did their best to give nutritional care, but were not always able to give good nutritional care due to high workload and too many duties.

##### Nutritional issues are none of older adults' concern

Older adults and their informal caregivers seemed to assume that malnutrition could not happen to the older adult. They talked about malnutrition as something that could happen to another person but not to themselves. They did not worry about weight loss or reduced intake, and considered this as a temporary situation that comes with hospitalization and would be resolved if the older adult had recovered. In this way, they were inconclusive toward their own responsibility in nutritional issues in the periods before, during and after hospitalization.

##### Malnutrition: sufficient knowledge and knowledge gap

Older adults and informal caregivers had sufficient knowledge but simultaneously gaps in their knowledge about malnutrition. A number of them could sum up causes of malnutrition, that weight loss could go unnoticed and that it was important to

take adequate actions. On the other hand, older adults and their informal caregivers could not name causes of malnutrition, how someone could suffer from malnutrition in the hospital or what a malnourished person would look like.

### Ambiguous about trusting professionals giving nutritional care

The confidence of several older adults and informal caregivers in professional caregivers supplying sufficient care was ambiguous. On the one hand, they were confident that nutritional care was in great hands with these professionals. On the other hand, they noticed during their hospitalization that some professionals were not able to carry out their activities, were not engaged in nutritional care or made mistakes in the food delivery.

### Confident about eating healthily

A number of older adults and their informal caregivers believed that, unlike others, they followed a healthy and varied diet and considered this important. They disliked unhealthy food and ready-to-eat meals from supermarkets.

## Discussion

This study generated valuable insight into the experiences and needs of 15 older adults and seven informal caregivers regarding nutritional care provided in the periods before, during and after hospitalization. During all three periods, dietary intake of older adults varied between normal and reduced. Older adults and informal caregivers had opinions regarding nutritional issues, which may influence dietary intake. They pointed out that sufficient nutritional care was given when it was part of medical treatment. They mentioned nutrition-related activities carried out by themselves and professional caregivers, but underlined the need for other activities, mostly during and after and to some extent before hospitalization. During hospitalization, older adults appreciated the sufficient food choice and food amount, but wanted a better food service. They experienced competing care activities at the expense of nutritional care. Older adults and informal caregivers considered that certain professional caregivers should be involved in nutrition-related activities. They found it unclear who exactly was responsible for giving nutritional care in the periods during and after hospitalization. Older adults and informal caregivers mentioned that participation of the informal network was preferred at home before and after hospitalization.

Most older adults experienced reduced dietary intake and they mentioned various risk factors causing the decline. Most risk factors occurred during hospitalization, e.g. acute illness, but others had existed for a longer period at home, e.g. being unable to prepare food. Several of these risk factors were also reported in previous studies by hospitalized or community-dwelling older adults, e.g. nausea, declined appetite or mouth problems. Other reported risk factors, such as medication use, living alone or loneliness,<sup>26,27,37</sup> were not mentioned by the participants of our study. However, we did identify most of these risk factors from the data. It seems that older adults are already dealing with risk factors in their home environment, but these stack up due to hospitalization. The presence of these risk factors can ultimately lead to malnutrition or risk for malnutrition.

We found that older adults were both satisfied and dissatisfied with the food. The unsatisfied older adults wanted to eat appealing food in a proper environment. In one study, over 90% of the patients was satisfied with their meals and they believed meals are essential.<sup>24</sup> However, the importance of a stimulating environment to enhance dietary intake and well-being during meals was underlined.<sup>24,37,38</sup> Also, older adults experienced limited access to food caused by poor food service. Food access difficulties were also found in other studies.<sup>37,39</sup> Good food and food service seem important factors for adequate dietary intake and the older adults' welfare, which may then play a significant role in the prevention of malnutrition.

Older adults and their informal caregivers experienced and needed numerous of nutritional care activities carried out by professionals. Most activities are in line with interventions described in guidelines.<sup>2,10,20</sup> However, the effectiveness of some interventions, such as oral nutritional supplements, food fortification or education is not always clear.<sup>2,40,41</sup> Other interventions, such as monitoring and stimulating food intake lack evidence and are graded as practical.<sup>2</sup> Regardless of the strength of research evidence, these activities can provide added value when included into nutritional care, because with these interventions care recipients' needs, preferences and values are taken into account.<sup>21-23</sup> The importance of this was recently emphasized in the study of Hestevik and colleagues.<sup>27</sup>

Good communication with the older adults and their informal caregivers and between disciplines within and between organizations was considered an important factor for adequate nutritional care. This was also found in earlier studies.<sup>24,38,42-44</sup> Poor communication may result in discontinuity of nutritional care, which puts older adults at a higher risk of malnutrition.

Findings show that older adults do not exactly know who is responsible for nutritional care. Relevant guidelines describe the collaboration of physicians, dietitians, nurses and nursing assistants, physiotherapists, room service personnel and representatives from all other professionals involved in nutritional care. However, task descriptions for each discipline working in a multidisciplinary team and its coordination are not clearly outlined in guidelines.<sup>2,10,20</sup> This is emphasized in several studies, where professional caregivers acknowledged their role and the shared responsibility in nutritional care,<sup>42,45</sup> but also experienced a lack of role clarity.<sup>43</sup> Lack of role clarity may contribute to insufficiently performed nutritional care activities. This may lead to decline in the quality of nutritional care.

We found that during hospitalization professionals hardly involved the informal network in nutritional care and the informal network infrequently took their responsibility to contribute to nutritional issues. Some studies reported about professionals and the informal network striving for active participation of the informal network during mealtimes encouraging older adults' dietary intake.<sup>37,38,44</sup> Little involvement contradicts with the guidelines emphasizing a patient-centered approach with involvement of informal caregivers.<sup>2,10,20</sup> Despite their substantial position in nutritional care for older adults, there seems a small role for the informal network to contribute to nutritional care during hospitalization.

Older adults and informal caregivers experienced that other care activities and ward regulations were considered more important than nutritional care. Some studies also reported about the conflict between other care activities, the strict structure of routines and rounds, and the hospital system versus nutrition-related activities and mealtimes.<sup>25,38,39,45</sup> In addition, professionals' low value toward nutritional care contributed to a lack of priority giving suitable nutritional care.<sup>25,37,45</sup> For several professional caregivers such as nurses and food service personnel, nutritional care is a fundamental element of their profession. Unfortunately, it seems that they fail to fulfill their responsibilities and provide moderate or even poor quality nutritional care and thus inadequate support to older adults recovering from their hospitalization.

Our study showed that older adults and their informal caregivers were unaware about malnutrition. They did not seem worried about their weight loss or reduced dietary intake, and they did not establish the relation with malnutrition. In addition, older adults and informal caregivers provided information about malnutrition like this could not happen to them but to another person. Comparable misperceptions were found in previous studies where community-dwelling older adults overestimated their underweight<sup>46</sup> and patients did not consider malnutrition or reduced dietary

intake as a problem.<sup>25,26,37</sup> A lack of awareness about becoming malnourished may contribute to an increased vulnerability to become malnourished in the period of hospitalization.

In this study, most older adults mostly emphasized nutritional care in the periods during and after hospitalization, but scarcely in the period before hospitalization. From the literature, it can be concluded that most interventions preventing and treating malnutrition in hospitalized older adults start during the in-hospital period and are occasionally continued after discharge. This was even the case in studies when a considerable percentage of older adults were malnourished or at risk for malnutrition at hospital admission<sup>40</sup> or at discharge.<sup>27</sup> Attention for nutritional issues only during the in-hospital period may be insufficient and lead to discontinuity of nutritional care, and more importantly to worsening of nutritional status and adverse outcomes.

### **Strengths and limitations**

In our study, we followed a rigorous qualitative research approach.<sup>47</sup> However, several limitations need to be taken into account. First, older adults and their informal caregivers were interviewed simultaneously. This may have precluded an inclusive dialogue about certain topics and led to a mutual influence on each other's responses. One could argue that this may have affected credibility.<sup>32</sup> However, the information from both the older adult and informal caregiver provided a different perspective on nutritional care and was therefore considered complementary. The double interview especially provided an important added value in case older adults had been critically ill or developed a delirium during the in-hospital period. In addition, with a one-time interview post discharge, we asked the participants to retrieve information from a fairly extensive period. This may have influenced the accuracy of the provided information and may have led to a potential threat in credibility.<sup>34,47</sup> However, the research team reflected on this issue by comparing the interviews with existing literature, where participants were interviewed about nutritional care given at the very moment of the interviews, and concluded that no relevant information was left out by the interviewees.

Second, we combined the interviews with the older adults and their informal caregiver, and the older adults only for our thematic analysis and did not analyze these groups separately. The information of older adults with and without presence of the informal caregiver during the interviews did not show essential differences.

Third, we did not carry out a member check. Although data analysis was conducted thoroughly, the time between interviews and final data analysis was quite long. Member checking could then lead to an unnecessary burden on the older adults and their informal caregivers due to difficulty to recall information from the interview. This led to a threat in credibility.<sup>34,47</sup> However, credibility of this study was ensured by researcher triangulation, participation of experts monitoring the whole research process and enabling an external audit with an expert to assess accuracy of the study.<sup>34,47</sup>

Finally, some older adults were excluded due to a decreased health condition. These older adults may be at a higher risk for malnutrition, due to several nutritional risk factors such as cognitive problems and living alone. They may have had other perspectives by which we missed relevant information for the study purpose. However, a recently published study showed results very similar to ours. In this study, the researchers targeted older adults who were malnourished or at risk for malnutrition, with more complex care needs than the older adults participating in our study.<sup>27</sup> Moreover, in our study, maximum variation and data saturation was reached.<sup>47</sup> Both maximum variation and data saturation enhanced transferability of the findings.

## Conclusions

This is one of the first studies investigating older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization. We established their perspective on dietary intake, food service during hospitalization, nutrition-related activities, who is responsible for this, competing care activities and nutritional issues. The findings indicate that older adults and informal caregivers did not always experience optimal nutritional care. They expressed in what way nutritional care could fit their needs. Older adults and informal caregivers mainly focused on the period during hospitalization, to a certain extent on the period after hospitalization, but rarely on the period before hospitalization.

For further development of the current guidelines for nutritional care and future development of credible evidence-based interventions,<sup>48</sup> it is important to address these findings. Because still little is known about the informal caregivers' perspective and pre- and post-hospital phase, future research should focus more on this to gain more evidence for their crucial position in nutritional care.

## Implications for clinical practice

Nutritional care should be based on the experiences and needs of older adults and informal caregivers with proportionate emphasis on the periods before, during and after hospitalization. The ultimate goal is an appropriate dietary intake for older adults to prevent and treat malnutrition in this vulnerable period. This requires an adequate provision of quality nutritional care and good implementation of guidelines, where older adults and their informal caregivers should actively participate in nutritional care.<sup>2,10,20,49</sup> Here, an important step is raising older adults' and their informal caregivers' awareness of malnutrition. Professional caregivers should have a key role in educating older adults and informal caregivers about malnutrition.

Active participation demands different strategies in the care process of professional caregivers and healthcare organizations with a higher prioritization of food and nutritional care. Also, it asks for more involvement and responsibility of the older adult in nutritional care.<sup>27,50,51</sup> It should be kept in mind that some older adults are too ill at times and not able to direct their own nutritional care.<sup>52</sup> Therefore, nutritional care should be at all times a shared responsibility of caregivers and care recipients.

Nutrition, and the delivery and continuity of quality nutritional care should be part of treatment of older adults who have to be hospitalized to optimize nutritional status, prevent and treat malnutrition, and to enhance successful recovery.<sup>2,24,25</sup> This is important during and after hospitalization, but just as crucial before hospitalization, although this phase is mostly underexposed in guidelines and clinical practice. Older adults and informal caregivers should be educated and supported by professional caregivers about energy- and protein-enriched food, which matches with individual food preferences and personal circumstances of the older adult.<sup>2,20,27,49</sup> Food and meals served appealingly in a personalized way should have a prominent position during the in-hospital period. To enhance the delivery and continuity of quality nutritional care, effective collaboration, coordination and good communication of nutritional care between professional caregivers within and between organizations should be of added value.<sup>24,45,49</sup>

## Acknowledgements

We thank all older adults and their informal caregivers who participated in this study. We acknowledge all managers, medical doctors, and nurse specialists for their support in recruiting participants. We also thank Josien Engel, PhD RN, and Jeroen Dikken, PhD RN, for their contribution during the data analysis.

## References

1. Cederholm T, Bosaeus I, Barazzoni R, Bauer J, Van Gossum A, Klek S, et al. Diagnostic criteria for malnutrition – an ESPEN consensus statement. *Clin Nutr.* 2015;34(3):335-340.
2. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. *Clin Nutr.* 2019;38(1):10-47.
3. Cansado P, Ravasco P, Camilo M. A longitudinal study of hospital undernutrition in the elderly: comparison of four validated methods. *J Nutr Health Aging.* 2009;13(2):159-164.
4. Cereda E, Pedrolli C, Klersy C, Bonardi C, Quarleri L, Cappello S, et al. Nutritional status in older persons according to healthcare setting: A systematic review and meta-analysis of prevalence data using MNA®. *Clin Nutr.* 2016;35(6):1282-1290.
5. O'Shea E, Trawley S, Manning E, Barrett A, Browne V, Timmons S. Malnutrition in hospitalised older adults: A multicentre observational study of prevalence, associations and outcomes. *J Nutr Health Aging.* 2017;21(7):830-836.
6. Smoliner C, Fishedick A, Sieber CC, Wirth R. Olfactory function and malnutrition in geriatric patients. *J Gerontol A Biol Sci Med Sci.* 2013;68(12):1582-1588.
7. Vanderwee K, Clays E, Bocquaert I, Gobert M, Folens B, Defloor T. Malnutrition and associated factors in elderly hospital patients: A Belgian cross-sectional, multi-centre study. *Clin Nutr.* 2010;29(4):469-476.
8. Barker LA, Gout BS, Crowe TC. Hospital malnutrition: prevalence, identification and impact on patients and the healthcare system. *Int J Environ Res Public Health.* 2011;8(2):514-527.
9. Arenas Moya D, Plascencia Gaitán A, Ornelas Camacho D, Arenas Márquez H. Hospital malnutrition related to fasting and underfeeding: Is it an ethical issue? *Nutr Clin Pract.* 2016;31(3):316-324.
10. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr.* 2017;36(1):49-64.
11. Krumholz HM. Post-hospital syndrome – A condition of generalized risk. *N Engl J Med.* 2013;368(2):100-102.
12. Fávoro – Moreira NC, Krausch – Hofmann S, Matthys C, Vereecken C, Vanhauwaert E, Declercq A, et al. Risk factors for malnutrition in older adults: A systematic review of the literature based on longitudinal data. *Adv Nutr.* 2016;7(3):507-522.
13. Laurent M, Basuji – Garin S, Plonquet A, Bories PN, Le Thuaud A, Audureau E. et al. Interrelations of immunological parameters, nutrition, and healthcare-associated infections: Prospective study in elderly in-patients. *Clin Nutr.* 2015;34(1):79-85.
14. Naseer M, Forssell H, Fagerström C. Malnutrition, functional ability and mortality among older people aged  $\geq 60$  years: a 7-year longitudinal study. *Eur J Clin Nutr.* 2016;70(3):399-404.
15. Agarwal E, Ferguson M, Banks M, Batterham M, Bauer J, Capra S, et al. Malnutrition and poor food intake are associated with prolonged hospital stay, frequent readmissions, and greater in-hospital mortality: Results from the Nutrition Care Day Survey 2010. *Clin Nutr.* 2013;32(5):737-745.
16. Visser M, Volkert D, Corish C, Geisler C, de Groot LC, Cruz – Jentoft AJ, et al. Tackling the increasing problem of malnutrition in older persons: The malnutrition in the elderly (MaNuEL) knowledge hub. *Nutr Bull.* 2017;42(2):178-186.
17. Soeters P, Bozzetti F, Cynober L, Forbes A, Shenkin A, Sobotka L. Defining malnutrition: A plea to rethink. *Clin Nutr.* 2017;36(3):896-901.
18. Price R, Daly F, Pennington CR, McMurdo MET. Nutritional supplementation of very old people at hospital discharge increases muscle strength: A randomized controlled trial. *Gerontology.* 2005;51(3):179-185.
19. Neelemaat F, Thijs A, Seidell JC, Bosmans JE, van Bokhorst – de van der Schueren MAE. Study protocol: Cost-effectiveness of transmural nutritional support in malnourished elderly patients in comparison with usual care. *Nutr J.* 2010;9:6.

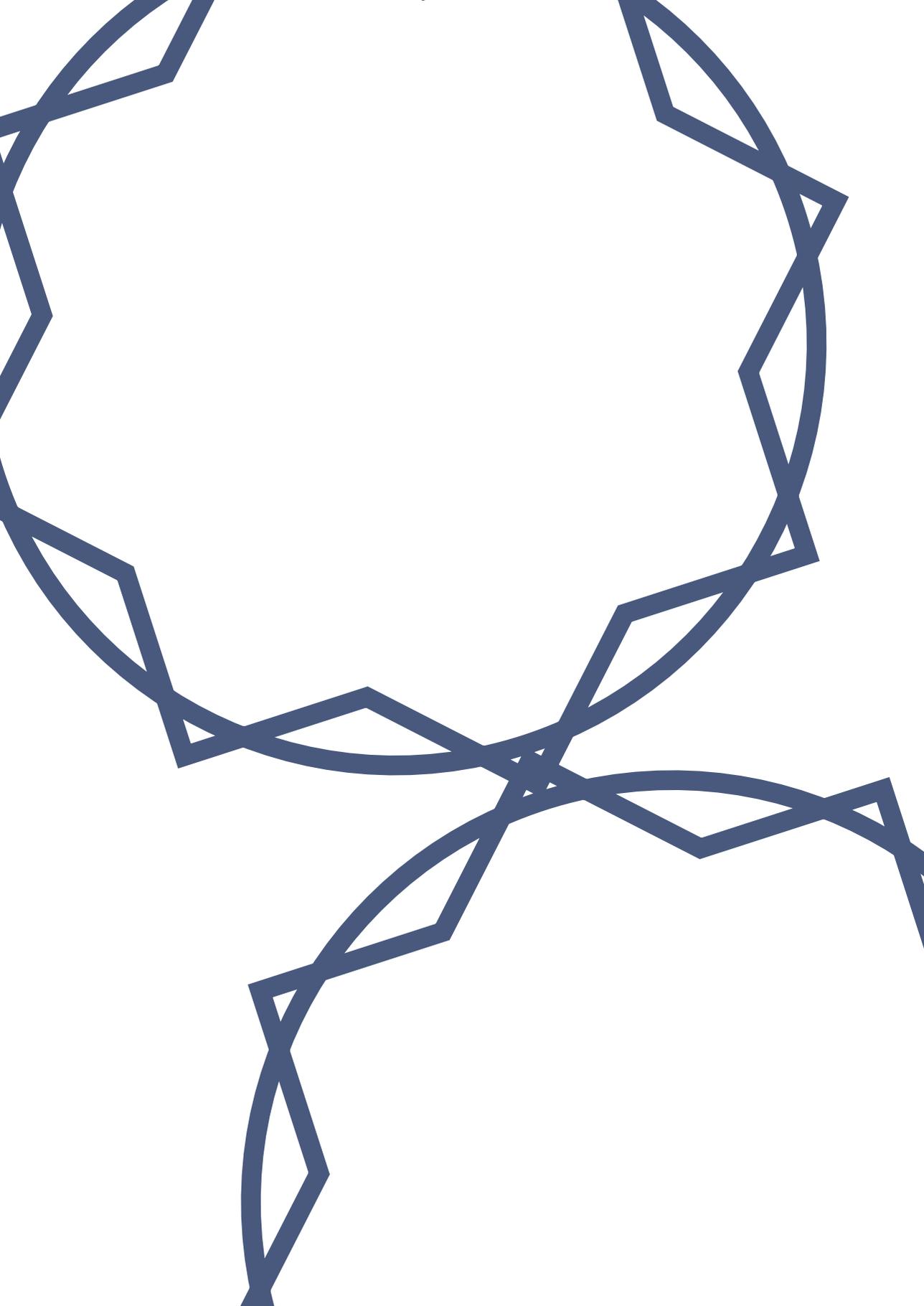
20. The Dutch Malnutrition Steering Group. Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2019.
21. van Meijel B, Gamel C, van Swieten – Duijffes B, Grypdonck MHF. The development of evidence-based nursing interventions: methodological considerations. *J Adv Nurs*. 2004;48(1):84-92.
22. Bleijenberg N, de Man – van Ginkel JM, Trappenburg JCA, Ettema RGA, Sino CG, Heim N, et al. Increasing value and reducing waste by optimizing the development of complex interventions: Enriching the development phase of the Medical Research Council (MRC) Framework. *Int J Nurs Stud*. 2018;79:86-93.
23. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new medical research council guidance. *BMJ*. 2008;337:979-983.
24. Lassen K, Kruse F, Bjerrum M. Nutritional care of Danish medical inpatients – patients' perspectives. *Scand J Caring Sci*. 2005;19(3):259-267.
25. Bell J, Bauer J, Capra S, Pulle CR. Barriers to nutritional intake in patients with acute hip fracture: time to treat malnutrition as a disease and food as a medicine? *Can J Physiol Pharmacol*. 2013;91(6):489-495.
26. Hope K, Ferguson M, Reidlinger DP, Agarwal E. "I don't eat when I'm sick": Older people's food and mealtime experiences in hospital. *Maturitas*. 2017;97:6-13.
27. Hestevik CH, Molin M, Debesay J, Bergland A, Bye A. Older patients' and their family caregivers' perceptions of food, meals and nutritional care in the transition between hospital and home care: a qualitative study. *BMC Nutr*. 2020;18:6:11.
28. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349-357.
29. O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. Standards for reporting qualitative research: A synthesis of recommendations. *Acad Med*. 2014;89(9):1245-1251.
30. Creswell JW. *Qualitative inquiry and research design: Choosing among five approaches*. 3rd ed. London: Sage Publications; 2013.
31. Boeije H. *Analysis in qualitative research*. 1st ed. London: Sage Publications; 2010.
32. Holloway IM, Wheeler S. *Qualitative research in nursing and healthcare*. 3rd ed. West-Sussex: Wiley – Blackwell; 2012.
33. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101.
34. Lincoln YS, Guba EG. *Naturalistic inquiry*. Beverly Hills: Sage Publications; 1985.
35. Iezzoni LI, Foley SM, Daley J, Hughes J, Fisher ES, Heeren T. Comorbidities, complications, and coding bias. Does the number of diagnosis codes matter in predicting in-hospital mortality? *JAMA*. 1992;267(16):2197-2203.
36. Elias M. The MUST report. Nutritional screening of adults: a multidisciplinary responsibility. Redditch: BAPEN; 2003.
37. Winter JE, McNaughton SA, Nowon CA. Older adults' attitudes to food and nutrition: a qualitative study. *J Aging Res Clin Pract*. 2017;5(2):114-119.
38. Ottrey E, Porter J, Huggins CE, Palermo C. "Meal realities" – An ethnographic exploration of hospital mealtime environment and practice. *J Adv Nurs*. 2018;74(3):603-613.
39. Naithani S, Thomas JE, Whelan K, Morgan M, Gulliford MC. Experiences of food access in hospital. A new questionnaire measure. *Clin Nutr*. 2009;28(6):625-630.
40. ten Cate D, Ettema RGA, Huisman – de Waal G, Bell JJ, Verbrugge R, Schoonhoven L, et al. Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review. *J Clin Nurs*. 2020;29(11-12):1883-1902.

41. Morilla – Herrera JC, Martín – Santos FJ, Caro – Bautista J, Saucedo – Figueredo C, García – Mayor S, Morales – Asencio JM. Effectiveness of food-based fortification in older people: A systematic review and meta-Analysis. *J Nutr Health Aging*. 2016;20(2):178-184.
42. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs*. 2009;18(3):431-439.
43. 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(1):41-46.
44. Edwards D, Carrier J, Hopkinson J. Assistance at mealtimes in hospital settings and rehabilitation units for patients (>65 years) from the perspective of patients, families and healthcare professionals: A mixed methods systematic review. *Int J Nurs Stud*. 2017;69:100–118.
45. Boaz M, Rychani L, Barami K, Hourri Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs*. 2013;44(8):357-364.
46. Craven DL, Lovell GP, Pelly FE, Isenring E. Community-living older adults' perceptions of body weight, signs of malnutrition and sources of information: a descriptive analysis of survey data. *J Nutr Health Aging*. 2018;22(3):393-399.
47. Creswell JW, Poth CN. *Qualitative inquiry and research design: Choosing among five approaches*. 4th ed. London: Sage Publications; 2018.
48. Richards DA, Hilli A, Pentecost C, Goodwin VA, Frost J. Fundamental nursing care: A systematic review of the evidence on the effect of nursing care interventions for nutrition, elimination, mobility and hygiene. *J Clin Nurs*. 2018;27(11-12):2179-2188.
49. Laur C, McCullough J, Davidson B, Keller H. Becoming food aware in hospital: A narrative review to advance the culture of nutrition care in hospitals. *Healthcare (Basel)*. 2015;3(2):393-407.
50. Kolovos P, Kaitelidou D, Lemonidou C, Sachlas A, Zyga S, Sourtzi P. Patient participation in hospital care: Nursing staffs' point of view. *Int J Nurs Pract*. 2015;21(3):258-268.
51. Oxelmark L, Ulin K, Chaboyer W, Bucknall T, Ringdal M. Registered nurses' experiences of patient participation in hospital care: supporting and hindering factors patient participation in care. *Scand J Caring Sci*. 2018;32(2):612-621.
52. Merrell J, Philpin S, Warring J, Hobby D, Gregory V. Addressing the nutritional needs of older people in residential care homes. *Health Soc Care Community*. 2012;20(2):208-215.

## Appendix

**Appendix 1.** The 15-point checklist of criteria for good thematic analysis according to Braun and Clarke<sup>33</sup>

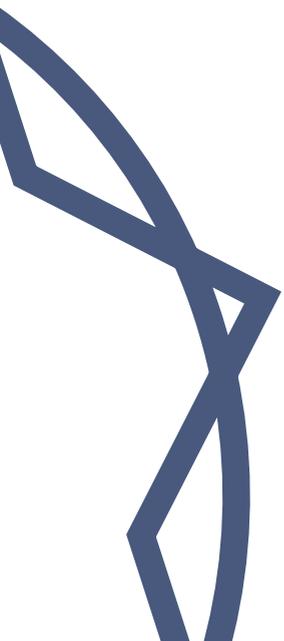
Process	Criteria	Conducted
Transcription	1. The data have been transcribed to an appropriate level of detail and the transcripts have been checked against the tapes for 'accuracy'.	Yes
Coding	2. Each data item has been given equal attention in the coding process.	Yes
	3. Themes have not been generated from a few vivid examples (an anecdotal approach), but instead the coding process has been thorough, inclusive and comprehensive.	Yes
	4. All relevant extracts for all each theme have been collated.	Yes
	5. Themes have been checked against each other and back to the original data set.	Yes
Analysis	6. Themes are internally coherent, consistent and distinctive.	Yes
	7. Data have been analyzed – interpreted, made sense of - rather than just paraphrased or described.	Yes
	8. Analysis and data match each other – the extracts illustrate the analytic claims.	Yes
	9. Analysis tells a convincing and well-organized story about the data and topic.	Yes
Overall	10. A good balance between analytic narrative and illustrative extracts is provided.	Yes
	11. Enough time has been allocated to complete all phases of the analysis adequately, without rushing a phase or giving it a once-over-lightly.	Yes
Written report	12. The assumptions about and specific approach to, thematic analysis are clearly explicated.	Yes
	13. There is a good fit between what you claim you do and what you show you have done – i.e., described method and reported analysis are consistent.	Yes
	14. The language and concepts used in the report are consistent with the epistemological position of the analysis.	Yes
	15. The researcher is positioned as active in the research process; themes do not just 'emerge'.	Yes



# 5

## Factors influencing nurses' behavior in nutritional care for community-dwelling older adults before, during, and after hospitalization: A Delphi study

Debbie ten Cate, Marieke J. Schuurmans, Jorna van Eijk,  
Jack J. Bell, Lisette Schoonhoven, Roelof G.A. Ettema



## Abstract

**Background:** To improve nutritional care for community-dwelling older adults before, during, and after hospitalization, factors influencing nurses' current behavior should be targeted. The aim of this study was to obtain expert consensus on which factors influencing the behavior of hospital and home care nurses are most relevant, modifiable, and feasible to influence.

**Method:** In a two-round Delphi study, nine pre-selected factors were rated by 26 experts.

**Results:** Eight factors were rated as relevant, modifiable, and feasible to influence: 1) lack of sufficient knowledge, 2) mainly neutral attitude, 3) low prioritization, 4) ambiguous motivation to routinely use guidelines and screening tools, 5) moderate awareness about risk factors, 6) lack of sense of involving informal caregivers, 7) ambiguous motivation to follow education and training, and 8) strong focus on medical nutrition.

**Conclusion:** The expert panel reached consensus on eight factors influencing nurses' current behavior. To enhance nutritional care to prevent malnutrition in older adults, strategies are needed for targeting these factors in nursing practice, education, and research.

## Introduction

Malnutrition is a common and significant problem in community-dwelling older adults throughout the periods before, during, and after hospitalization.<sup>1</sup> The prevalence rates for malnutrition, defined according to the criteria of the Global Leadership Initiative on Malnutrition,<sup>2</sup> reported in the literature range from 17% to 42.4% for hospitalized older adults, an increasing number of whom are cared for in their home as a result of shifts in healthcare policies,<sup>3,4</sup> and from 10.7% to 23.4% for community-dwelling older adults. The reported rate of risk for malnutrition in these populations of older adults is approximately 15%.<sup>5-9</sup>

In the periods before, during, and after hospitalization, malnutrition in community-dwelling older adults is predominantly associated with age-related factors, multiple acute and chronic diseases, and increased risk of complications.<sup>1,10</sup> During the course of a hospital stay, fasting procedures, medical procedures, and tests can provoke malnutrition.<sup>11,12</sup> Furthermore, malnutrition is associated with poor health outcomes such as decreased muscle strength, mental health problems,<sup>8</sup> impaired activities of daily living,<sup>6</sup> and increased mortality rate.<sup>5,7</sup> Malnutrition is associated with syndromes such as frailty, sarcopenia, and cachexia.<sup>1,2</sup> The presence of malnutrition is related to several social and economic factors, including low education, living alone, and low income.<sup>13</sup> Malnutrition leads to increased use of healthcare resources and increased healthcare and societal costs.<sup>14</sup>

Preventing malnutrition and stimulating good nutrition are crucial to promoting healthy aging and minimizing functional impairment, disease and health problems, and healthcare, economic, and social burdens.<sup>15,16</sup> This is especially important in the periods before, during, and after hospitalization when older adults may be even more vulnerable to malnutrition.<sup>17</sup> Hospital and home care nurses are in a pivotal position to address the prevention of malnutrition and the promotion of health through the daily care they provide. They spend the most time with older adults and should promote the integration, continuity, and coordination of nutritional care along the health care continuum within and between the hospital and home care settings.<sup>18</sup> By conducting various nutrition-related activities, hospital and home care nurses can make a substantial contribution to multidisciplinary care, although their contribution may differ between countries as a result of differences in care delivery systems. They are to be supported in this regard by management and policy makers as recommended by national and international guidelines and policy.<sup>1,19</sup>

In the changing healthcare environment with an increased number of older adults with multiple interacting care needs, nutritional care to prevent malnutrition provided by hospital and home care nurses remains suboptimal.<sup>20,21</sup> Previous studies have shown that this is partly due to nurses' current behavior arising from barriers encountered in providing adequate nutritional care to older adults, such as lack of knowledge, moderate awareness, and neutral attitudes.<sup>20-23</sup> As a result, nurses place a limited value on nutritional care and decline to take full responsibility.<sup>24-26</sup> This results in nurses' lack of attention toward essential nutritional care. To enhance nursing nutritional care, changing the current behavior of hospital and home care nurses to desired behavior by addressing factors that influence current behavior is key. This concerns factors that influence behavior that are considered most relevant, can be potentially modified, and are feasible to influence, meaning that these factors are actionable,<sup>27</sup> in the routine practice of hospital and home care nurses. Behavior can be defined as "any observable or measurable movement or activity of an individual. Behavior can be verbal or nonverbal, overt or covert. Covert responses are private or unobservable events that can be cognitive, emotional, or physiological".<sup>28</sup> Changing nurses' current behavior may ultimately contribute to preventing malnutrition in community-dwelling older adults before, during, and after hospitalization.

There is limited evidence regarding the current behavior of hospital and home care nurses. A comprehensive and thorough understanding of this behavior is essential as the initial step in the development of an appropriate intervention.<sup>29</sup> Experts in the fields of care practice, education, and research have provided an overview of the subject and understand the underlying issues of current behavior and what desired behavior is necessary.<sup>30,31</sup> The aim of this study was to obtain expert consensus on which factors influencing the behavior of hospital and home care nurses are most relevant, modifiable, and feasible to influence in order to optimize nutritional care of community-dwelling older adults in the periods before, during, and after their hospitalization.

## Method

### Study design

A Delphi method was used according to research guidelines for the Delphi survey technique<sup>30</sup> and components of the RAND/UCLA appropriateness method.<sup>32</sup> With this method, the authors combined the best available scientific evidence with the collective judgment of experts to enhance decision-making<sup>30,32</sup> regarding nurses' behavior in nutritional care. The authors followed a modified Delphi approach.<sup>31</sup>

To identify factors influencing nurses' current behavior in nutritional care that were related to suboptimal nursing nutritional care, six preparatory studies were conducted. These were two literature reviews to gain insight into nurses' knowledge, attitude, role, and responsibility regarding nutritional care; two qualitative studies exploring care professionals' experiences, perceptions, and preferences regarding nutritional care; a cross-sectional descriptive study to understand nurses' experiences and perceptions regarding nutritional care; and a qualitative study exploring older adults' and their informal caregivers' experiences and needs regarding nutritional care. This resulted in the identification and clustering of distinctive and essential factors that influence nurses' current behavior, which were subsequently presented to an expert panel in several Delphi rounds. These rounds were used to reach consensus<sup>32</sup> about which factors influencing the current behavior of nurses could be changed to optimize nutritional care to prevent malnutrition in the periods before, during, and after hospitalization. An overview of the methodology of the six preparatory studies is presented in Table 1. The iterative multistage process of this study is illustrated in Figure 1. The Guidance on Conducting and REporting DELphi Studies was followed for reporting.<sup>33</sup>

### **Generating factors that influence nurses' current behavior from the best available scientific evidence**

#### *Overview of the six preparatory studies*

*Study 1.* A literature review was performed to gain insight into nurses' and nursing assistants' knowledge and attitude regarding nutritional care for hospitalized or community-dwelling older adults. In a structured process, results regarding knowledge and attitude of nurses and nursing assistants were extracted from five selected studies (Table 1 and see Appendix 1).

*Study 2.* A literature review was conducted to provide an overview of the role and responsibility of hospital and home care nurses and nursing assistants in nutritional care for older adults. Results about the role and responsibility of nurses and nursing assistants were systematically extracted from seven selected studies (Table 1 and see Appendix 1).

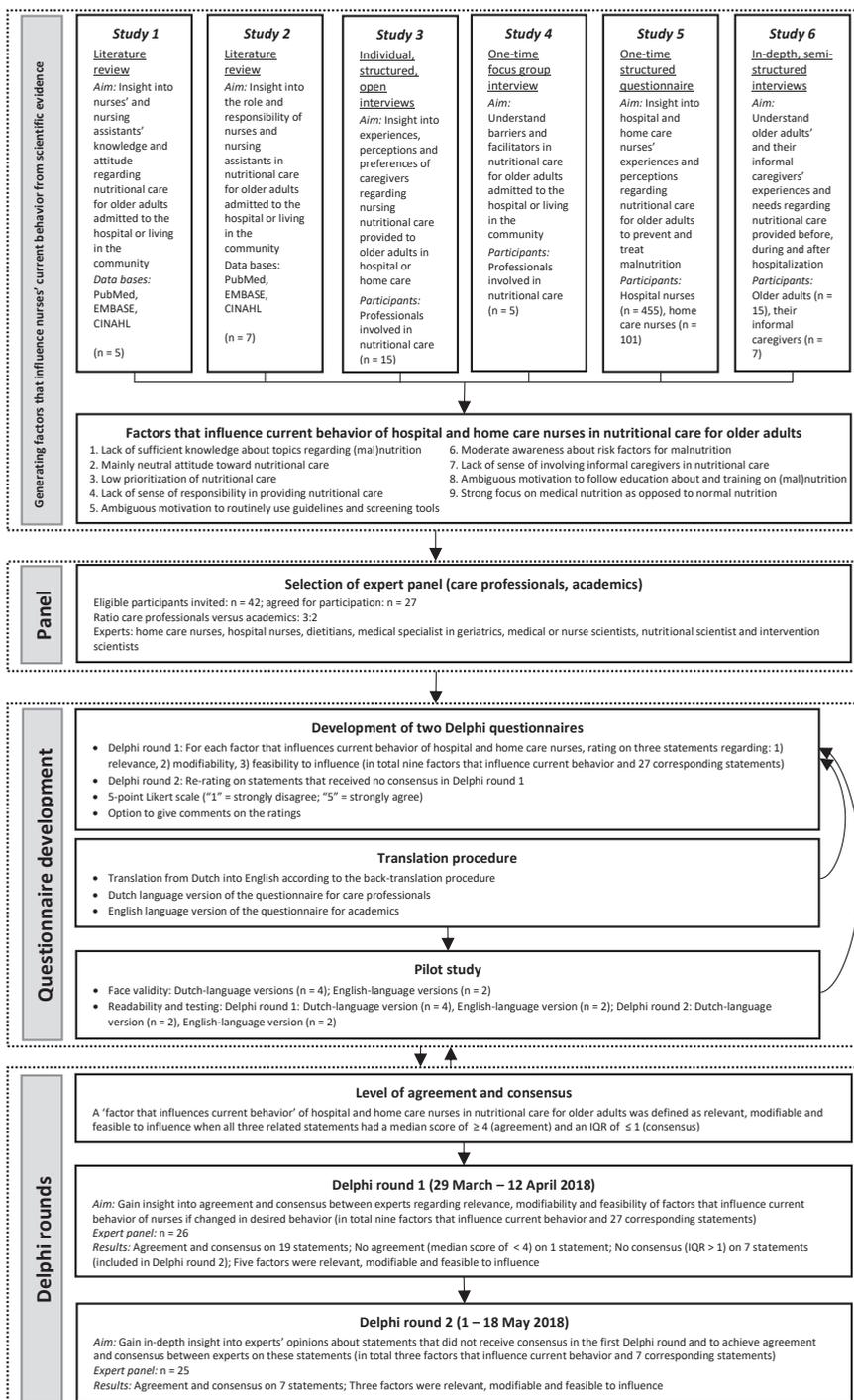


Figure 1. Stages of the Delphi process

*Study 3.* The authors held one-time, face-to-face, individual structured open interviews to gain insight into the experiences, perceptions, and preferences of professional caregivers regarding causes, screening, and outcomes of malnutrition; interventions to prevent and treat malnutrition; and the role of nurses and nursing assistants in nutritional care for older adults. Between March and May 2017, the authors interviewed 15 healthcare professionals, including one clinical geriatrician, three hospital nurses, two hospital dietitians, seven home care nurses, and two home care nursing assistants (Table 1 and see Appendix 1).

*Study 4.* In November 2017, the authors held a one-time focus group interview to explore perceived barriers to and facilitators of nutritional care for older adults admitted to the hospital or living in the community. Participants were healthcare professionals who were involved in the multidisciplinary nutritional care of older adults in the hospital (one clinical geriatrician and one nurse) and in primary care (one dietitian and two nurses) (Table 1 and see Appendix 1).

*Study 5.* From September 2016 to July 2017, the authors performed a multicenter, cross-sectional descriptive study involving 455 hospital nurses and 101 home care nurses. The aim of the study was to gain insight into hospital nurses' and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition. Participants completed a validated structured questionnaire once (Table 1).<sup>34</sup>

*Study 6.* Between April and October 2017, the authors held one-time, individual, in-depth, semi-structured interviews to explore older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during, and after hospitalization. Fifteen community-dwelling older adults and seven informal caregivers were interviewed (Table 1).<sup>17</sup>

Table 1. Study methodology of six preparatory studies to identify factors that influence hospital and home care nurses' current behavior in nutritional care for older adults

Study	Study design	Aim	Search strategy	Eligibility criteria	Study selection	Data extraction
1	Literature review	Gain insight into nurses' and nursing assistants' knowledge and attitude regarding nutritional care for older adults admitted to the hospital or living in the community	<ul style="list-style-type: none"> <li>Databases PubMed, EMBASE and CINAHL</li> <li>Search: April 2016, update: March 2018</li> <li>Search terms: 'nurs*', 'nursing*', 'nutritional care', 'nutrition*', 'nutritional care', 'food', 'diet', 'old*', 'ag*', 'elder*', 'senior'</li> <li>Identification of additional studies through handsearching reference lists of included studies</li> </ul>	<ul style="list-style-type: none"> <li>Studies providing insight into the study's aim</li> <li>Written in English language</li> <li>Published from 2001 to exclude dated information</li> </ul>	<ul style="list-style-type: none"> <li>Screening studies on title and abstract, then evaluation of full-text articles</li> <li>By one researcher</li> </ul>	<ul style="list-style-type: none"> <li>First author, year of publication, country of data collection, study design, characteristics and number of participants, setting, method data collection and analysis</li> <li>By one researcher</li> <li>Checked by another researcher</li> </ul>
2	Literature review	Gain insight into the role and responsibility of nurses and nursing assistants in nutritional care for older adults admitted to the hospital or living in the community	<ul style="list-style-type: none"> <li>Databases PubMed, EMBASE and CINAHL</li> <li>Search: May 2016, update: March 2018</li> <li>Search terms: 'nurs*', 'role', 'responsibility', 'task', 'function', 'nutrition*', 'nutritional care', 'old*', 'ag*', 'elder*', 'senior'</li> <li>Identification of additional studies through handsearching reference lists of included studies</li> </ul>	<ul style="list-style-type: none"> <li>Studies providing insight into the study's aim</li> <li>Written in English language</li> <li>Published from 2001 to exclude dated information</li> </ul>	<ul style="list-style-type: none"> <li>Screening studies on title and abstract, then reading full-text articles</li> <li>By one researcher</li> </ul>	<ul style="list-style-type: none"> <li>First author, year of publication, country of data collection, study design, characteristics and number of participants, setting, method data collection and analysis</li> <li>By one researcher</li> <li>Checked by another researcher</li> </ul>
3	Qualitative study with one-time, structured interviews	Comprehend experiences, perceptions and preferences of professional caregivers regarding nursing nutritional care for older adults to prevent and treat malnutrition in hospital and home care	<ul style="list-style-type: none"> <li>Purposive sampling of different healthcare professionals involved in nutritional care</li> <li>Hospital and home care</li> <li>Inclusion of 15 professionals (3 hospital nurses, 2 hospital dietitians, 1 clinical geriatrician, 7 home care nurses, 2 home care nursing assistants)</li> </ul>	<ul style="list-style-type: none"> <li>Data collection between March to May 2017</li> <li>Structured interview guide with a pre-determined set of topics and related open-ended questions</li> <li>Questions presented to participants in the same sequence</li> <li>Testing face validity and readability of questions by one researcher</li> <li>Interviews were audio-recorded and memos were made</li> <li>Duration one-time interviews ranged from 12 to 30 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Each interview was transcribed verbatim</li> <li>Each topic was categorized and presented as frequency (percentage)</li> <li>Provided in-depth information was qualitatively analyzed using an iterative approach; data were open, axial and selective coded into themes and subthemes</li> <li>Monitoring of data saturation through constant comparison during data collection and analysis</li> </ul>	<ul style="list-style-type: none"> <li>Following criteria established by Lincoln and Guba</li> <li>Credibility: prolonged engagement with data, researcher triangulation, member checking</li> <li>Dependability: consistent use interview guide, 2 researchers involved in data analysis</li> <li>Confirmability: involving 3 researchers, 5 research assistants and 1 expert during study duration</li> <li>Transferability: detailed description of the participants, context and information from interviews</li> </ul>

Table 1. Continued

Study	Study design	Aim	Participants and setting	Data collection	Data analysis	Trustworthiness
4	Qualitative study with a one-time focus group interview	Explore perceived barriers and facilitators in nutritional care for older adults admitted to the hospital or living in the community	<ul style="list-style-type: none"> <li>Purposive sampling of different healthcare professionals involved in nutritional care</li> <li>Hospital and primary care</li> <li>Inclusion of 5 professionals (1 hospital nurse, 1 clinical geriatrician, 2 home care nurses, 1 dietitian primary care)</li> </ul>	<ul style="list-style-type: none"> <li>Data collection was in November 2017</li> <li>Semi-structured interview guide with 7 topics and corresponding open-ended key questions</li> <li>Questions presented to participants in pre-determined sequence</li> <li>Testing face validity and readability of questions by one researcher</li> <li>Focus group was audio-recorded and memos were made</li> <li>Duration one-time focus group was 92 minutes</li> </ul>	<ul style="list-style-type: none"> <li>The focus group interview was transcribed verbatim</li> <li>In-depth information was qualitatively analyzed using an iterative approach; data were open, axial and selective coded into themes and subthemes</li> </ul>	<ul style="list-style-type: none"> <li>Following criteria established by Lincoln and Guba</li> <li>Credibility: prolonged engagement with data, researcher triangulation, member checking</li> <li>Dependability: study protocol, use interview guide, 2 researchers independently analyzing data</li> <li>Confirmability: involving 3 researchers and 4 research assistants during study duration</li> <li>Transferability: detailed description of the participants, context and information from interviews</li> </ul>
5	Quantitative, multicenter, cross-sectional descriptive study <sup>34</sup>	Gain insight into hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition	<ul style="list-style-type: none"> <li>Purposive sample on ward (hospital) or team (home care) level</li> <li>Registered nurses providing care to older adults</li> <li>Selection from 34 general nursing wards (3 hospitals) and 27 nursing teams (10 home care organizations)</li> <li>Inclusion of 455 hospital nurses and 101 home care nurses with overall response rate: 49% (response rate hospital nurses: 48.1%; home care nurses: 53.4%)</li> </ul>	<ul style="list-style-type: none"> <li>Total time frame data collection: September 2016 to July 2017</li> <li>Data collection for each participating team was in a period of four to six weeks</li> <li>Validated structured questionnaire addressing malnutrition. Questions were mostly divided into sub-questions with open or multiple-choice answer options</li> </ul>	<ul style="list-style-type: none"> <li>Categorical variables: frequency (percentage)</li> <li>Open-ended questions: categorized and presented as frequency (percentage)</li> <li>Comparisons categorical variables between hospital and home care nurses: chi-square of Fisher's exact test; post hoc multiple pairwise comparisons with Bonferroni corrections of p value</li> </ul>	-

Table 1. Continued

Study	Study design	Aim	Participants and setting	Data collection	Data analysis	Trustworthiness
6	Qualitative study with one-time, in-depth, semi-structured interviews <sup>17</sup>	Explore older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization	<ul style="list-style-type: none"> <li>Inclusion of 15 community-dwelling older adults (≥ 70 years) who were discharged from hospital between 2 and 12 weeks before recruitment</li> <li>Inclusion of 7 informal caregivers</li> <li>Individual interviews with 8 older adults and 7 interviews with older adults and informal caregivers simultaneously</li> </ul>	<ul style="list-style-type: none"> <li>Operationalization of research aim into topics</li> <li>Semi-structured interview guide with 5 topics and accompanying open-ended key questions</li> <li>Questions presented to participants in the same sequence</li> <li>Testing face validity and readability of questions by a researcher, nurse and older adult</li> <li>One pilot interview in advance of data collection</li> <li>Interviews were audio-recorded and memos were made</li> <li>Duration one-time interviews ranged from 25 to 55 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Each interview was transcribed verbatim</li> <li>Data analysis following the method of thematic analysis with a cumulative analysis for all 15 interviews</li> <li>Monitoring of data saturation through constant comparison during data collection and analysis</li> </ul>	<ul style="list-style-type: none"> <li>Following criteria established by Lincoln and Guba</li> <li>Credibility: maximum variation sampling, prolonged engagement with data, researcher triangulation</li> <li>Dependability: study protocol, use interview guide, 2 researchers independently analyzing data, external audit with expert</li> <li>Confirmability: involving 5 researchers and 2 experts during study duration</li> <li>Transferability: detailed description of the participants, context and information from interviews</li> </ul>

Notes: The results regarding the factors that influence nurses' current behavior, which were extracted from these studies can be found in Table 4.

*Synthesis of best available scientific evidence*

On the basis of the results of the six preparatory studies, the authors identified factors that influence the current behavior of hospital and home care nurses in nutritional care for older adults to prevent and treat malnutrition and searched for patterns, which were subsequently categorized. This process was performed by one researcher and validated by two other researchers.

**Selection of the expert panel**

A purposive sample was used to select a panel consisting of Dutch care professionals and academics, both working in the Netherlands, and academics with other nationalities who were working in countries other than the Netherlands. The eligibility criteria for the experts are presented in Table 2.

**Table 2.** Study inclusion criteria for the expert panel members

- 
- All experts: expertise of 2 or more years in multidisciplinary nutritional care for older adults in hospital or primary care (care practice, education, or research)
  - All experts: currently working in either care practice, education, research, or a combination of these areas
  - Care professionals: direct contact with older adults in providing multidisciplinary nutritional care in daily practice
  - Lecturers: lecturing on multidisciplinary nutritional care for older adults in routine practice
  - Researchers: participation in current research focusing on multidisciplinary nutritional care and 3 or more scientific publications about this topic
- 

Panel members had a focus on either care practice, education, research, or a combination of these areas. They had expertise in multidisciplinary nutritional care for older adults in hospital or primary care settings.<sup>30</sup> A heterogeneous sample was chosen to reflect the variety and various areas of expertise of participants about the influence of nurses' behavior on nutritional care for community-dwelling older adults before, during, and after hospitalization.<sup>32</sup>

Based on the heterogeneity of the sample and inclusion of key experts, the number of participants on the panel was determined to be 15.<sup>32</sup> In line with an expected response rate of 33% for web-based surveys,<sup>35</sup> the authors anticipated that approximately 45 participants should be approached. Because judgments of experts must also adequately reflect current practice, the authors used a ratio of three care professionals to two academics for the panel. Between February and March 2018, two of the researchers approached 42 eligible participants individually by email regarding the study.

## Delphi questionnaires

### *Development*

A priori, two Delphi rounds were proposed to ensure meaningful results regarding the behavior of hospital and home care nurses in providing nutritional care to community-dwelling older adults in the periods before, during, and after hospitalization. In the case of lack of agreement or consensus after two rounds, a third Delphi round would be undertaken.<sup>30,31</sup> Therefore, a questionnaire was developed for each Delphi round by the research group.

The aim of the first Delphi round was to gain insight into agreement and consensus between experts regarding which factors influencing the behavior of hospital and home care nurses are most relevant, modifiable, and feasible to influence. The first questionnaire consisted of two parts. The first part included seven sociodemographic questions regarding gender, age, highest level of education, current profession, field of expertise, years of work experience, and country of residence. In the second part, the focus was on the nine factors that influence the current behavior of nurses in nutritional care for community-dwelling older adults in the periods before, during, and after hospitalization (Table 4). The experts were asked to rate each factor on three statements: 1) the relevance of improving this factor that influences behavior to optimize nutritional care for preventing malnutrition, 2) the extent to which this factor that influences behavior can be modified, and 3) the feasibility to influence this factor. The statements were derived from those used in a Delphi study about self-management behaviors to reduce exacerbation impact in patients with chronic obstructive pulmonary disease.<sup>36</sup> A total of 27 statements were presented to the experts. All statements were rated on a 5-point Likert scale, with 1 indicating *strongly disagree* and 5 indicating *strongly agree*.<sup>31,37,38</sup> For each factor that influences behavior, the experts had the option to give comments on the ratings on the three statements. Also, the experts could give suggestions for additional factors or provide feedback on the study. An example of three statements for one factor is presented in Table 3.

**Table 3.** Example of three statements for one factor that influences nurses' current behavior

---

#### **Awareness about risk factors for malnutrition in older adults**

---

1. Improving awareness of nurses about risk factors for malnutrition is relevant in order to prevent malnutrition.
  2. There is substantial room for improvement in the awareness of nurses about risk factors for malnutrition based on their current awareness.
  3. I am confident that influencing the awareness of nurses about risk factors for malnutrition is feasible.
-

The aim of the second Delphi round was to gain in-depth insight into experts' opinions about statements that did not receive consensus in the first Delphi round and to achieve agreement and consensus among experts on these statements. In the questionnaire, the statements for which no consensus was obtained in the first Delphi round were presented. These statements were equal to the statements from the first round. For these statements, the results of the first Delphi round were summarized and explained. The experts were asked to re-rate these statements and comment on their re-rating.

#### *Translation procedure*

Both questionnaires were written in Dutch and translated into English according to the back-translation procedure.<sup>39</sup> In the Delphi rounds, the care professionals received the Dutch-language version of the questionnaire. Both the Dutch and the non-Dutch academics completed the English-language questionnaire. Dutch academics are used to English in their daily work, whereas Dutch care professionals are more familiar with professional terminology in Dutch.<sup>32</sup>

#### *Pilot study: face validity, readability, and testing*

A nurse and a dietitian established face validity of the Dutch-language version of the questionnaires. One of the study researchers and a linguist assessed face validity of both the Dutch and the English versions of the questionnaires. Readability and testing of the questionnaires were performed by experts and one of the study researchers (Delphi round 1 – Dutch-language version  $n = 4$  and English-language version  $n = 2$ ; Delphi round 2 – Dutch-language version  $n = 2$  and English-language version  $n = 2$ ). None of these experts participated in the expert panel. Based on their feedback, at the levels of language and format, some adjustments were made, resulting in final versions of the Dutch-language and English-language questionnaires for both Delphi rounds.

## **Delphi rounds**

#### *Determination of agreement and definition of consensus*

Based on median scores, a statement was categorized as not relevant/not modifiable/not feasible to influence (median score, 1-3) or relevant/modifiable/feasible to influence (median score, 4-5). The level of consensus between experts was based on an interquartile range (IQR) and a priori defined as an IQR of 1 or less.<sup>40</sup> Statements with an IQR of greater than 1 in the first Delphi round and for which no consensus was obtained were included in the second Delphi round. A “factor that influences current behavior” of nurses was defined as relevant, modifiable, and feasible to influence when all three related statements had a median score of 4 or greater and an IQR of 1 or less.

### *Delphi rounds*

Two Delphi rounds were conducted.<sup>30,31</sup> The questionnaires for each Delphi round were sent to the experts in March 2018 and May 2018, respectively. The experts received a link to the online questionnaires from SurveyMonkey. The experts of this study were included in the second Delphi round if they joined the first Delphi round.

### *Data analysis*

#### Quantitative analysis

Descriptive statistics were used to summarize the quantitative data. Sociodemographic characteristics were presented as frequencies. The level of expert agreement and consensus of each statement were expressed as median with IQR. Statistical analyses were performed using IBM SPSS Statistics for Windows, version 25.0.

#### Qualitative analysis

A qualitative analysis was conducted on the comments provided by the experts in both Delphi rounds. All clarifications were listed and read independently by two of the researchers. One of the researchers coded the clarifications. Two of the researchers held face-to-face meetings to discuss potential themes and to reach consensus. This resulted in a final set of themes, which were defined and named.<sup>41,42</sup>

### **Ethical considerations**

This study was approved by the ethical review board of the University of Applied Sciences Utrecht, the Netherlands. At each Delphi round, participants gave implied consent by sending the completed survey to the researchers.<sup>43</sup>

## **Results**

### **Overview of factors influencing nurses' current behavior from the best available scientific evidence**

The results of the six preparatory studies, regarding the nine identified factors that influence the current behavior of nurses in nutritional care for community-dwelling older adults to prevent malnutrition before, during, and after hospitalization, are presented in Table 4. These nine factors were: 1) lack of sufficient knowledge about topics regarding nutrition and malnutrition, 2) mainly neutral attitude toward nutritional care, 3) low prioritization of nutritional care, 4) lack of sense of responsibility in providing nutritional care, 5) ambiguous motivation to routinely use guidelines on and screening tools for malnutrition, 6) moderate awareness about risk factors for malnutrition, 7) lack of sense of involving informal caregivers

in nutritional care, 8) ambiguous motivation to follow education about and training on nutrition and malnutrition and 9) strong focus on medical nutrition as opposed to normal nutrition.

## **Delphi rounds**

### *Sociodemographic characteristics*

Of the 42 eligible experts, 27 agreed to participate in the study. Twenty-six experts in round 1 (response rate, 96.3%) and 25 experts in round 2 (response rate, 96.2%) completed and returned the questionnaire. Table 5 contains additional sociodemographic characteristics.

### *Delphi round 1*

The experts agreed and reached consensus on all statements relating to five factors that influence current behavior (15 statements in total) and considered these to be relevant, modifiable, and feasible to influence (median score,  $\geq 4$ ; IQR,  $\leq 1$ ). These factors were 1) knowledge about topics regarding nutrition and malnutrition, 2) attitude toward nutritional care, 3) motivation to routinely use guidelines on and screening tools for malnutrition, 4) awareness about risk factors for malnutrition, and 5) motivation to follow education and training on nutrition and malnutrition.

There was no consensus (IQR,  $> 1$ ) on one or more statements within four factors: 1) prioritization of nutritional care (one statement), 2) responsibility in providing nutritional care (two statements), 3) involving informal caregivers in nutritional care (one statement), and 4) focus on medical nutrition versus normal nutrition (three statements). These seven statements were included in the second Delphi round.

One statement about feasibility in relation to responsibility in providing nutritional care was rated infeasible to improve (median score, 3.5) with consensus (IQR, 1). The experts gave no suggestions for complementary factors that influence the current behavior of nurses. The results of Delphi round 1 are presented in Table 6.

**Table 4.** Identification of factors that influence hospital and home care nurses' current behavior in nutritional care for older adults from six preparatory studies

Study	Study characteristics	Study results	Factors that influence nurses' current behavior
1	Literature; n = 5 Hospital	<ul style="list-style-type: none"> <li>Nurses reported lacking sufficient knowledge</li> <li>Nurses' proportion of correct responses from a questionnaire measuring their nutrition knowledge was 51.9% ± 0.1%</li> <li>Nurses' and/or nursing assistants' attitude was mainly neither positive nor negative</li> <li>Nurses' attitude inclined toward more positive</li> </ul>	<ol style="list-style-type: none"> <li>Lack of sufficient knowledge</li> <li>Mainly neutral attitude</li> </ol>
2	Literature; n = 7 Hospital	<ul style="list-style-type: none"> <li>Nurses pointed out they feel responsible for nutritional care</li> <li>Nurses mentioned how they carried out various nutritional care activities</li> <li>Nurses and other professionals involved experienced role unclarity in nutritional care</li> <li>Nurses perceived different levels of responsibility toward numerous nutritional care activities</li> <li>Nurses stated that they do not routinely screen for malnutrition, while other professionals involved in nutritional care indicated that screening is a nursing task</li> <li>Nurses mentioned that nutritional care was given low priority in case of competing care priorities or high workload</li> </ul>	<ol style="list-style-type: none"> <li>Low prioritization</li> <li>Lack of sense of responsibility</li> <li>Ambiguous motivation to routinely use screening tools</li> </ol>
3	Qualitative, structured interviews; n = 15 professional caregivers involved in nutritional care Hospital and home care	<p>The caregivers mentioned that:</p> <ul style="list-style-type: none"> <li>nurses and nursing assistants lack proper knowledge about nutrition</li> <li>nurses are not fully aware of risk factors for malnutrition</li> <li>nutritional care is a shared responsibility, which partly generates a lack of clarity as who is involved, who does what and who is primarily responsible</li> <li>nutritional care receives low priority</li> <li>informal caregivers are commonly not involved in nutritional care</li> </ul> <p>Some caregivers pointed out that:</p> <ul style="list-style-type: none"> <li>standardized screening carried out by nurses and nursing assistants is not necessary</li> </ul>	<ol style="list-style-type: none"> <li>Lack of sufficient knowledge</li> <li>Low prioritization</li> <li>Lack of sense of responsibility</li> <li>Ambiguous motivation to routinely use guidelines and screening tools</li> <li>Moderate awareness about risk factors for malnutrition</li> <li>Lack of sense of involving informal caregivers</li> </ol>
4	Qualitative, focus group interview; n = 5 professional caregivers involved in nutritional care Hospital and primary care	<p>The caregivers mentioned that:</p> <ul style="list-style-type: none"> <li>care providers and organizations do not prioritize nutrition and nutritional care</li> <li>nutritional care is not considered as an integral part of treatment or the care process</li> <li>care professionals focus too much on medical nutrition versus normal/enriched food</li> <li>there is a competition between care providers regarding final responsibility and task allocation</li> <li>hospital nurses routinely screen for malnutrition but home care nurses do not</li> <li>nurses do not structurally identify nutritional problems and risk factors for malnutrition</li> </ul>	<ol style="list-style-type: none"> <li>Low prioritization</li> <li>Lack of sense of responsibility</li> <li>Ambiguous motivation to routinely use guidelines and screening tools</li> <li>Moderate awareness about risk factors for malnutrition</li> <li>Ambiguous motivation to follow education and training</li> </ol>

Table 4. Continued

Study	Study characteristics	Study results	Factors that influence nurses' current behavior
(Study 4 continued)		Nurses pointed out that: <ul style="list-style-type: none"> <li>they got little education about and training on nutrition and nutritional care in the nursing curriculum</li> </ul>	9) Strong focus on medical nutrition
5	Quantitative, descriptive cross-sectional; n = 556 nurses Hospital and home care	<ul style="list-style-type: none"> <li>Most nurses perceived topics about malnutrition as important. A fair number of nurses considered these topics as neutral or unimportant. This group also pointed out that malnutrition is a small or no problem</li> <li>More hospital nurses than home care nurses mentioned they routinely screened for malnutrition, and used and consulted a guideline</li> <li>More than four out of five nurses considered interventions to treat malnutrition important. Hospital nurses valued medical nutrition interventions higher than home care nurses</li> <li>One out of seven nurses took a training on malnutrition in the previous year. Above four-fifths of the nurses pointed out they wanted to follow training in the future</li> </ul>	<ul style="list-style-type: none"> <li>5) Ambiguous motivation to routinely use guidelines and screening tools</li> <li>8) Ambiguous motivation to follow training</li> <li>9) Strong focus on medical nutrition</li> </ul>
6	Qualitative, semi-structured interviews; n = 15 older adults, n = 7 informal caregivers Hospital and community-dwelling	<p>Most older adults and their informal caregivers mentioned that:</p> <ul style="list-style-type: none"> <li>they were mostly not involved in nutritional care during the in-hospital period, but they were before and after hospitalization</li> <li>they sometimes did not know who was involved in or responsible for their nutritional care</li> <li>nurses and room service personnel should not be involved in nutritional care due to high workload, too many duties or incompetency</li> </ul> <p>Some older adults and their informal caregivers pointed out that:</p> <ul style="list-style-type: none"> <li>some caregivers were involved in and responsible for their nutritional care, but others were not</li> <li>they had confidence in some professionals providing adequate nutritional care, but in others, they had not</li> </ul>	<ul style="list-style-type: none"> <li>3) Low prioritization</li> <li>4) Lack of sense of responsibility</li> <li>7) Lack of sense of involving informal caregivers</li> </ul>

**Table 5.** Sociodemographic characteristics of the expert panel (n = 26)

Characteristics	n (%)
Female	21 (80.8)
Age	
20 – 29 y	6 (23.1)
30 – 39 y	8 (30.8)
40 – 49 y	5 (19.2)
50 – 59 y	7 (26.9)
Highest level of education	
EQF level 4	3 (11.5)
EQF level 6	11 (42.3)
EQF level 7	3 (11.5)
EQF level 8	9 (34.6)
Profession	
Home care nurse	4 (15.4)
Hospital nurse	6 (23.1)
Dietitian	4 (15.4)
Medical specialist in geriatrics	1 (3.8)
Medical or nurse scientist	2 (7.7)
Nutritional scientist	2 (7.7)
Intervention scientist	4 (15.4)
Combination	3 (11.5)
Area of focus	
Care practice	12 (46.2)
Education	2 (7.7)
Research	3 (11.5)
Combination of abovementioned areas	9 (34.6)
Work experience	
0 – 5 y	4 (15.4)
6 – 15 y	10 (38.5)
16 – 25 y	5 (19.2)
26 – 35 y	6 (23.1)
> 35 y	1 (3.8)
Country	
the Netherlands	23 (88.5)
Canada	2 (7.7)
Australia	1 (3.8)

*Abbreviation:* EQF = European Qualifications Framework.

### *Delphi round 2*

The experts re-rated seven statements and reached consensus on all statements (IQR,  $\leq 1$ ). One statement moved from a median score of 3 to 4. The other statements had been assessed with a median score of 4 in both Delphi round 1 and round 2.

Three additional factors were considered relevant, modifiable, and feasible in the second Delphi round. These were 1) prioritization of nutritional care, 2) involving informal caregivers in nutritional care, and 3) focus on medical nutrition compared to normal nutrition. The results of Delphi round 2 are presented in Table 6.

### **Qualitative analysis**

Four themes were derived from the comments on the ratings provided by the experts in both Delphi round 1 and round 2. These were 1) nursing activities in nutritional care, 2) nurses' role in nutritional care, 3) education and training, and 4) nutritional care across complex contexts.

#### *Nursing activities in nutritional care*

Most experts commented that nurses have a lack of awareness, insufficient knowledge and skills, and little motivation regarding nursing activities in nutritional care for older adults.

*"... how to recognize malnutrition and what actions to take when a patient is defined malnourished is a black hole [for nurses]." (Expert 19, nutritional scientist)*

Several experts pointed out that in order to perform their tasks properly, nurses must possess awareness, sufficient knowledge and skills, motivation, and a positive attitude. According to the experts, this leads to insights resulting in better and responsible care.

*"When knowledge increases, you as a nurse can better give well-founded arguments and motivate yourself to improve [nutritional care]." (Expert 8, home care nurse)*

The experts mentioned several activities to be performed by nurses, including monitoring and screening, referring to a dietitian, and using normal nutrition as a first-choice intervention.

*"The use of (user-friendly) screening tools is the starting point for signaling malnutrition. Nurses are the professionals who should screen." (Expert 22, dietitian and lecturer)*

Table 6. Level of agreement and consensus on factors that influence current behavior of hospital and home care nurses in Delphi rounds 1 and 2

	Delphi round 1				Delphi round 2							
	Relevant <sup>a</sup>		Modifiable <sup>b</sup>		Feasible <sup>c</sup>		Relevant <sup>a</sup>		Modifiable <sup>b</sup>		Feasible <sup>c</sup>	
	M	IQR (Q <sub>1</sub> , Q <sub>3</sub> )	M	IQR (Q <sub>1</sub> , Q <sub>3</sub> )	M	IQR (Q <sub>1</sub> , Q <sub>3</sub> )	M	IQR (Q <sub>1</sub> , Q <sub>3</sub> )	M	IQR (Q <sub>1</sub> , Q <sub>3</sub> )	M	IQR (Q <sub>1</sub> , Q <sub>3</sub> )
1. Lack of sufficient knowledge about topics regarding nutrition and malnutrition	4	1 (4, 5)	4	0 (4, 4)	4	0 (4, 4)	-	-	-	-	-	-
2. Mainly neutral attitude toward nutritional care	4	1 (4, 5)	4	0 (4, 4)	4	1 (3, 4)	-	-	-	-	-	-
3. Low prioritization of nutritional care	4	1 (4, 5)	4	1 (4, 5)	3	2 (2, 4)	-	-	-	-	4	1 (3, 4)
4. Lack of sense of responsibility in providing nutritional care	4	2 (3, 5)	4	1.5 (3, 4.5)	4	1 (3, 4)	4	0 (4, 4)	4	0 (4, 4)	-	-
5. Ambiguous motivation to routinely use guidelines on and screening tools for malnutrition	4	1 (4, 5)	4	0.5 (3.5, 4)	4	0.5 (3.5, 4)	-	-	-	-	-	-
6. Moderate awareness about risk factors for malnutrition	5	1 (4, 5)	4	0.5 (4, 4.5)	4	0.5 (4, 4.5)	-	-	-	-	-	-
7. Lack of sense of involving informal caregivers in nutritional care	4	1 (4, 5)	4	2 (3, 5)	4	1 (3, 4)	-	-	4	0 (4, 4)	-	-
8. Ambiguous motivation to follow education about and training on nutrition and malnutrition	4	0.5 (4, 4.5)	4	0 (4, 4)	4	1 (3, 4)	-	-	-	-	-	-
9. Strong focus on medical nutrition as opposed to normal nutrition	4	2 (3, 5)	4	2 (3, 5)	4	2 (3, 5)	4	0.5 (4, 4.5)	4	0 (4, 4)	4	0 (4, 4)

Notes: --: statement not included in Delphi round 2 due to consensus IQR ≤ 1 in Delphi round 1.

Abbreviations: IQR = interquartile range; M = median; Q<sub>1</sub> = first quartile; Q<sub>3</sub> = third quartile.

<sup>a</sup> Relevant refers to statement 1: the relevance of improving the factor that influences behavior to optimize nutritional care for preventing malnutrition.

<sup>b</sup> Modifiable refers to statement 2: to what extent this factor that influences the behavior can be modified.

<sup>c</sup> Feasible refers to statement 3: the feasibility to influence this factor.

### *Nurses' role in nutritional care*

Almost all of the experts believed that nurses should be involved in providing nutritional care to older adults, but the opposite appeared to be the case in daily practice. Several explanations were given for little involvement, including nurses' neutral or even negative attitude, lack of knowledge regarding their own role, low feelings of responsibility, and giving low prioritization to nutritional care.

*"I think that nurses ... may not have the knowledge about their role in how to address this issue [providing nutritional care]." (Expert 24, intervention scientist)*

In addition, the experts named various other factors for little involvement, such as organizational standards, work structures, high workload, care complexity, nurses' great responsibility for multiple care tasks, and delegating nutritional tasks to other disciplines.

*"As a nurse, you already have more and more responsibility, due to for example more complex care and ... staff shortage. You are glad when you can transfer care ... to other disciplines such as dietitians." (Expert 5, hospital nurse)*

Most experts suggested role clarification for nurses in nutritional care. The experts indicated that nurses' awareness and attitude change toward their role in nutritional care are essential.

### *Education and training*

Nearly all of the experts expressed that focusing education and training on developing nurses' competencies in nutritional care to prevent malnutrition and their skills to change behavior in care recipients is important.

*"Nutritional care provided by nurses may be more prioritized under the condition that nurses can follow good education and training with focus on their attitude, knowledge [and] behavior." (Expert 21, nurse scientist)*

A few experts indicated that knowledge transfer from education and training to nursing practice is essential. The experts considered motivation to follow education and training a prerequisite but pointed out that nurses were not always motivated as a result of both intrinsic and extrinsic factors.

*"Often, the nurse thinks she knows everything. This, combined with low prioritization [of nutritional care], gives low motivation for training [and] knowledge enhancement." (Expert 12, dietitian)*

*“[When there is] limited or no training budget and [nurses] have to pay it for themselves, they are more likely to opt for another more specialized ... training course than [a training course] about nutrition.”* (Expert 2, home care nurse)

### *Nutritional care across complex contexts*

Several experts outlined that focusing on or changing one factor that influences current behavior of nurses is not sufficient to improve nutritional care to prevent malnutrition in older adults in everyday practice. According to these experts, to change behavior in the first place, nurses must have the capability, opportunity, and motivation.

*“Whatever behavior is encouraged of the nurse, it needs to be supported by their environment. Education, motivation, or awareness alone is not likely to change behavior; they also need the opportunity and capability to change that behavior, and keep it sustained.”* (Expert 24, intervention scientist)

Some experts indicated that every situation is different, which reinforces a different approach. The approach depends on several factors, such as care setting, the organization system, policies and cultural norms, integration of nursing activities, collaboration with other disciplines, type of care recipient, and implementation climate.

*“Overall I don't agree with a ‘one or the other’ approach but rather what is [the] best fit for the local population [in their] context.”* (Expert 25, dietitian and intervention scientist)

## **Discussion**

In this study, the authors gained insight into experts' opinions regarding which factors that influence the behavior of nurses are most relevant, modifiable, and feasible to influence in order to optimize nutritional care for community-dwelling older adults in the periods before, during, and after their hospitalization. In two Delphi rounds, consensus was obtained for eight of nine factors considered relevant, modifiable, and feasible to influence that influence the behavior of hospital and home care nurses. These factors concerned knowledge, attitude, prioritization, motivation to routinely use guidelines and screening tools, awareness about risk factors, involving informal caregivers, motivation to follow education and training, and focus on medical nutrition versus normal nutrition. Consensus was not reached for one factor – lack of sense of responsibility in providing nutritional care.

These findings are broadly consistent with previous studies about nurses providing nutritional care to older adults in several settings and countries. In these studies, the importance of changing factors that influence behavior such as awareness, knowledge, attitude, prioritization, and involvement of informal caregivers in nutritional care was stressed.<sup>24,44,45</sup> The verification by the experts participating in the current study strengthens the evidence and contributes to a solid triangulation with respect to these outcomes.<sup>46</sup> By changing their behavior, nurses can provide essential nursing care regarding both nutrition-related activities and preventive activities for malnutrition to promote the health and well-being of older adults.

The experts from this study considered the factor lack of sense of responsibility relevant and modifiable but not feasible to influence. This may be because although the experts think that hospital and home care nurses have a responsibility and a significant role in providing nutritional care, they describe enhancement of this behavior as potentially being hindered by intrinsic and extrinsic barriers such as nurses' negative attitude toward their own role, an increase of complex care needs, lack of definition of role and responsibility, and lack of organizational standards. These barriers were also described in the literature.<sup>24,47-49</sup> It seems that in current nutritional care, nurses have, in a sense, distanced themselves from their role. Nurses experience ambiguity toward their role, and taking full responsibility does not seem to be reflected sufficiently in daily practice.<sup>23,48,49</sup>

The experts mentioned stimulating nurses' motivation to actively change their behavior as an important prerequisite to optimize nutritional care. A sufficient motivation is also underlined in the literature.<sup>21,47,48</sup> The experts pointed out that besides motivation, capability and opportunity are also important components for changing behavior. This is in line with the Behaviour Change Wheel, an implementation framework that states that capability, opportunity, and motivation interact to generate behavior that in turn influences these components.<sup>29</sup> In addition, to avoid failure regarding changing behavior, the experts suggested not focusing on changing only one factor that influences current behavior. To successfully change nurses' behavior and thus increase the possibility of eliminating their lack of attention regarding nutritional care for older adults to prevent malnutrition, incorporation of all eight factors that influence behavior, on which consensus was reached, is important. Furthermore, the experts from this study highlighted the importance of taking context into consideration when changing nurses' behavior. The literature emphasizes that a fit between a specific context and a complex intervention such as one regarding behavioral change increases the odds of success.<sup>50</sup> It is important to take context into account on policy, organizational, and management levels and

also to engage nursing teams, other healthcare professionals involved in nutritional care, and older adults.<sup>29</sup> Therefore, taking adequate motivation, capability, and opportunity as appropriate factors that influence behavior into account to change nurses' behavior in a specific context requires a comprehensive behavioral analysis and subsequently a proper and complex behavioral change intervention.

### **Strengths and limitations**

Some issues must be considered when interpreting the findings of this study. First, the methodology involved an iterative multistage process, which was conducted as systematically and rigorously as possible. Factors that influence nurses' current behavior were derived from the best available scientific evidence using various research methods.<sup>30,31</sup> The Delphi questionnaires were carefully developed and pilot tested. The use of an IQR of 1 or less to indicate the level of consensus and a 5-point Likert scale was evidence based.<sup>31,37,38,40</sup> The authors held two Delphi rounds. The literature indicates that two or three Delphi rounds are preferred.<sup>30</sup> Because it was not feasible to bring together all of the experts at the same time, the authors held no first face-to-face Delphi round with open-ended questions. For the same reason, the authors did not organize a meeting between the first and second Delphi round to discuss ratings, which is more common to minimize response bias.<sup>30</sup> However, on the questionnaires, the authors included options to give comments on the ratings and provide suggestions for additional factors that influence behavior to gain comprehensive understanding. Furthermore, with this approach, the experts gave their reactions independently and anonymously from each other, indicating a reduction of participant bias.<sup>30</sup> In the second Delphi round, the authors presented only those statements that had not met consensus. This may have generated information bias as a result of omitting data, preventing full analysis of results and increasing the odds of gaining higher ratings for the statements posed in the second round.<sup>30,31</sup> With their approach, however, the authors provided controlled feedback between rounds to avoid a negative effect on consensus because of information overload. This also reduced attrition bias, as experts may drop out when a large amount of information is provided.<sup>31</sup>

Second, the study included a heterogeneous expert panel with proportional representation of care professionals and academics with diverse backgrounds. The sample size was more than sufficient, and the response rate was considered high in both Delphi rounds.<sup>32,35</sup> Although the authors successfully included experts with sound knowledge about this topic,<sup>30</sup> these experts were mainly key individuals working in the context of Dutch health care. If experts from other countries and care delivery systems had participated in this study, the responses may have been

different. Therefore, caution should be exercised when generalizing the results of this study to contexts in other countries.

### **Implications for clinical practice and future research**

The results of this study highlight the need for nurses to change their current behavior in providing nutritional care to older adults to prevent malnutrition before, during, and after hospitalization. Hospital and home care nurses are in an ideal position to perform several activities to improve and prevent the deterioration of the dietary intake of older adults to prevent malnutrition and promote health. They should be fully aware of the importance of their role within nutritional care and should convincingly commit to it. This requires the engagement of leadership and the empowerment of nurses.<sup>20,51</sup>

To create scope for hospital and home care nurses to firmly set their role and assume their responsibility in nutritional care for older adults and to modify their behavior, several interventions should be considered. These involve education and training, using reminders to ensure transfer of education and training into routine practice, receiving audit and feedback on nutritional care practices, and role models.<sup>20,29,47</sup> These interventions should be appropriate for both nursing professionals working in clinical practice and nursing students.<sup>23</sup> Also, structurally facilitating workplace conditions should be supported at the policy and organizational levels. This may increase the likelihood that nurses are accountable for their role in and take responsibility for nutritional care for older adults in their daily practice. These workplace conditions may include reimbursement of nutritional care, organizational restructuring, prioritization and removal of barriers regarding nutritional care within policy and organizational structures, and effective leadership. Other actions may include formally defining responsibilities and roles of nurses and other healthcare professionals involved in nutritional care, supporting coordinated and continuous nutritional care, and creating collective norms and values regarding nutritional care integrated with other nursing care activities. Other strategies may involve creating credible interdisciplinary communication and active collaboration with older adults.<sup>21,29,47,49,52</sup> Furthermore, nurses' role, responsibility, and activities within nutritional care may be theoretically elaborated and incorporated into guidelines, protocols, and the professional profile of nurses and applied in nursing practice and curricula.<sup>29,47</sup>

Future research should include studies focusing on the development of tailored interventions to change the behavior of hospital and home care nurses.<sup>29</sup> To successfully develop and implement interventions, appropriate implementation frameworks should be used.

## **Conclusion**

In this Delphi study, 26 experts established eight of nine factors influencing the behavior of hospital and home care nurses as relevant, modifiable, and feasible to influence in order to optimize nutritional care for community-dwelling older adults in the periods before, during, and after their hospitalization. These were factors regarding knowledge, attitude, prioritization, motivation to routinely use guidelines and screening tools, awareness about risk factors, involving informal caregivers, motivation to follow education and training, and focus on medical nutrition versus normal nutrition. It is important to target these factors to achieve behavioral change that creates an opportunity for nurses to give priority to nutritional care.

## **Acknowledgements**

The authors thank all the experts involved for sharing their knowledge, views, and motivations.

## References

1. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Hooper L, Kiesswetter E, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clin Nutr.* 2022;41(4):958-989.
2. Jensen GJ, Cederholm T, Correia MITD, Gonzales MC, Fukushima R, Higashiguchi T, et al. GLIM criteria for the diagnosis of malnutrition: A consensus report from the global clinical nutrition community. *JPEN J Parenter Enteral Nutr.* 2019;43(1):32-40.
3. Rechel B, Grundy E, Robine JM, Cylus J, Mackenbach JP, Knai C, et al. Ageing in the European union. *Lancet.* 2013;381(9874):1312-1322.
4. Rostgaard T, Glendinning C, Gori C, Kroger T, Osterle A, Szebehely M, et al. LIVINDHOME: Living independently at home: Reforms in home care in 9 European countries. Copenhagen: SFI – The Danish National Centre for Social Research; 2011.
5. Hirose S, Matsue Y, Kamiya K, Kagiya N, Hiki M, Dotare T, et al. Prevalence and prognostic implications of malnutrition as defined by GLIM criteria in elderly patients with heart failure. *Clin Nutr.* 2021;40(6):4334-4340.
6. Pourhassan M, Rommersbach N, Lueg G, Klimek C, Schnatmann M, Liermann D, et al. The impact of malnutrition on acute muscle wasting in frail older hospitalized patients. *Nutrients.* 2020;12(5):1387.
7. Rodríguez – Mañas L, Rodríguez – Sánchez B, Carnicero JA, Rueda R, García – Garcia FJ, Pereira SL, et al. Impact of nutritional status according to GLIM criteria on the risk of incident frailty and mortality in community-dwelling older adults. *Clin Nutr.* 2021;40(3):1192-1198.
8. Sanchez – Rodriguez D, Locquet M, Reginster J, Cavalier E, Bruyère O, Beaudart C. Mortality in malnourished older adults diagnosed by ESPEN and GLIM criteria in the SarcoPhAge study. *J Cachexia Sarcopenia Muscle.* 2020;11(5):1200-1211.
9. Yeung SSY, Chan RSM, Kwok T, Lee JSW, Woo J. Malnutrition according to GLIM criteria and adverse outcomes in community-dwelling Chinese older adults: A prospective analysis. *J Am Med Dir Assoc.* 2021;22(9):1953-1959.e4.
10. Matsumoto Y, Iwai K, Namikawa N, Matsuda S, Wakano C, Heya H, et al. The relationship between existing nutritional indicators and Global Leadership Initiative on Malnutrition (GLIM) criteria: A one-institution cross-sectional analysis. *Clin Nutr.* 2020;39(10):3099-3104.
11. Arenas Moya D, Plascencia Gaitán A, Ornelas Camacho D, Arenas Márquez H. Hospital malnutrition related to fasting and underfeeding: Is it an ethical issue? *Nutr Clin Pract.* 2016;31(3):316-324.
12. Krumholz HM. Post-hospital syndrome – A condition of generalized risk. *N Engl J Med.* 2013;368(2):100-102.
13. Besora – Moreno M, Llauredó E, Tarro L, Solà R. Social and economic factors and malnutrition or the risk of malnutrition in the elderly: A systematic review and meta-analysis of observational studies. *Nutrients.* 2020;12(3):737.
14. Rodríguez – Sánchez B, Sulo S, Carnicero JA, Rueda R, Rodríguez – Mañas L. Malnutrition prevalence and burden on healthcare resource use among Spanish community-living older adults: Results of a longitudinal analysis. *Clinicoecon Outcomes Res.* 2020;12:355-367.
15. Robinson SM. Improving nutrition to support healthy ageing: what are the opportunities for intervention? *Proc Nutr Soc.* 2018;77(3):257-264.
16. World Health Organization. Decade of healthy ageing 2020 – 2030. Geneva: World Health Organization; 2020.
17. ten Cate D, Mellema M, Ettema RGA, Schuurmans MJ, Schoonhoven L. Older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization: A qualitative study. *J Nutr Gerontol Geriatr.* 2021;40(2-3):80-107.

18. World Health Organization. Enhancing nursing and midwifery capacity to contribute to the prevention, treatment and management of noncommunicable diseases in practice: policy and advocacy, research and education. Geneva: World Health Organization; 2012.
19. The Dutch Malnutrition Steering Group. Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2019.
20. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci.* 2013;27(2):440-448.
21. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs.* 2015;24(5-6):696-706.
22. Bachrach – Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff working with older people towards nutritional nursing care. *J Clin Nurs.* 2007;16(11):2007-2014.
23. Boaz M, Rychani L, Barami K, Hourri Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs.* 2013;44(8):357-364.
24. Bell J, Bauer J, Capra S, Pulle CR. Barriers to nutritional intake in patients with acute hip fracture: time to treat malnutrition as a disease and food as a medicine? *Can J Physiol Pharmacol.* 2013;91(6):489-495.
25. Robison J, Pilgrim AL, Rood G, Diaper N, Elia M, Jackson AA, et al. Can trained volunteers make a difference at mealtimes for older people in hospital? A qualitative study of the views and experience of nurses, patients, relatives and volunteers in the Southampton Mealtime Assistance Study. *Int J Older People Nurs.* 2015;10(2):136-145.
26. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs.* 2009;18(3):431-439.
27. Gilboa I. Making better decisions: Decision theory in practice. Chichester: Wiley-Blackwell; 2011.
28. Sundel M, Sundel SS. Behavior change in human services: Behavioral and cognitive principles and applications. 6th ed. Los Angeles: SAGE Publications Inc; 2018.
29. Michie S, Atkins L, West R. The behaviour change wheel. A guide to designing interventions. Sutton: Silverback Publishing; 2014.
30. Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. *J Adv Nurs.* 2000;32(4):1008-1015.
31. Trevelyan EG, Robinson N. Delphi methodology in health research: how to do it?. *Eur J Integr Med.* 2015;7(4):423-428.
32. Fitch K, Bernstein SJ, Aguilar MD, Burnand B, LaCalle JR, Lázaro P, et al. The RAND/UCLA appropriateness method user's manual. Santa Monica: Rand Corp; 2001.
33. Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. *Palliat Med.* 2017;31(8):684-706.
34. ten Cate D, Schoonhoven L, Huisman – de Waal G, Schuurmans MJ, Ettema RGA. Hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition: A cross-sectional study. *J Clin Nurs.* 2021;30(13-14):2079-2092.
35. Manfreda KL, Bosnjak M, Berzelak J, Haas I, Vehovar V. Web surveys versus other survey modes: A meta-analysis comparing response rates. *Int J Mark Res.* 2008;50(1):79-104.
36. Korpershoek YJ, Bruins Slot JCB, Effing TW, Schuurmans MJ, Trappenburg JCA. Self-management behaviors to reduce exacerbation impact in COPD patients: a Delphi study. *Int J Chron Obstruct Pulmon Dis.* 2017;12:2735-2746.
37. Leung SO. A comparison of psychometric properties and normality in 4-, 5-, 6-, and 11-point Likert scales. *J Soc Serv Res.* 2011;37(4):412-421.

38. Preston CC, Colman AM. Optimal number of response categories in rating scales: reliability, validity, discriminating power, and respondent preferences. *Acta Psychol (Amst)*. 2000;104(1):1-15.
39. Maneesriwongul W, Dixon JK. Instrument translation process: a methods review. *J Adv Nurs*. 2004;48(2):175-186.
40. Von der Gracht HA. Consensus measurement in Delphi studies. Review and implications for future quality assurance. *Technol Forecast Soc Change*. 2012;79(8):1525-1536.
41. Boeije H. *Analysis in qualitative research*. 1st ed. London: Sage Publications; 2010.
42. Creswell JW. *Qualitative inquiry and research design: Choosing among five approaches*. 3rd ed. London: Sage Publications; 2013.
43. Fowler FJ. *Survey research methods*. 5th ed. Thousand Oaks: Sage Publications Inc; 2013.
44. Bassola B, Tommasi V, Bonetti L, Bauer S, Lusignani M. Nurses' knowledge about malnutrition in older people: A multicenter cross-sectional study. *Nutrition*. 2020;78:110947.
45. Hestevik CH, Molin M, Debesay J, Bergland A, Bye A. Hospital nurses and home care providers' experiences of participation in nutritional care among older persons and their family caregivers: a qualitative study. *J Hum Nutr Diet*. 2020;33(2):198-206.
46. Polit DF, Beck CT. *Nursing research: Generating and assessing evidence for nursing practice*. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2017.
47. Laur C, McCullough J, Davidson B, Keller H. Becoming food aware in hospital: A narrative review to advance the culture of nutrition care in hospitals. *Healthcare (Basel)*. 2015;3(2):393-407.
48. O'Connell MB, Jensen PS, Andersen SL, Fernbrant C, Nørholm V, Petersen HV. Stuck in tradition – A qualitative study on barriers for implementation of evidence-based nutritional care perceived by nursing staff. *J Clin Nurs*. 2018;27(3-4):705-714.
49. 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(1):41-46.
50. Bleijenberg N, de Man – van Ginkel JM, Trappenburg JCA, Ettema RGA, Sino CG, Heim N, et al. Increasing value and reducing waste by optimizing the development of complex interventions: Enriching the development phase of the Medical Research Council (MRC) Framework. *Int J Nurs Stud*. 2018;79:86-93.
51. Cicolini G, Comparcini D, Simonetti V. Workplace empowerment and nurses' job satisfaction: a systematic literature review. *J Nurs Manag*. 2014;22(7):855-871.
52. Ullrich S, McCutcheon H, Parker B. Nursing practice in nutritional care: a comparison between a residential aged care setting and a hospital setting. *J Adv Nurs*. 2014;70(8):1845-1855.

## Appendix

**Appendix 1.** An overview of the results from four preparatory studies identifying factors that influence nurses' current behavior in nutritional care for older adults admitted to the hospital or living at their homes in the community

### Study 1: literature review about nurses' and nursing assistants' knowledge and attitude

#### *Aim*

The aim of the literature review was to gain insight into nurses' and nursing assistants' knowledge and attitude regarding nutritional care for older adults admitted to the hospital or living at their homes in the community.

#### *Methods*

The databases PubMed, EMBASE and CINAHL were searched for eligible studies in April 2016 and updated in March 2018. The following search terms were used: 'nurs\*', 'knowledge', 'attitude', 'nutrition\*', 'nutritional care', 'food', 'diet', 'old\*', 'ag\*', 'elder\*', 'senior'. The reference lists of included studies were hand searched to identify additional studies. Studies were eligible when these provided insight into nurses' and nursing assistants' knowledge and attitude regarding nutritional care for older adults admitted to the hospital or living in the community. The search was limited to studies written in English language and published between 2001 and 2016 to exclude dated information about this subject. One of the study researchers assessed studies for eligibility by screening studies on title and abstract. Then, full-text articles were evaluated. The study selection and data extraction process was checked by one researcher.

## Results

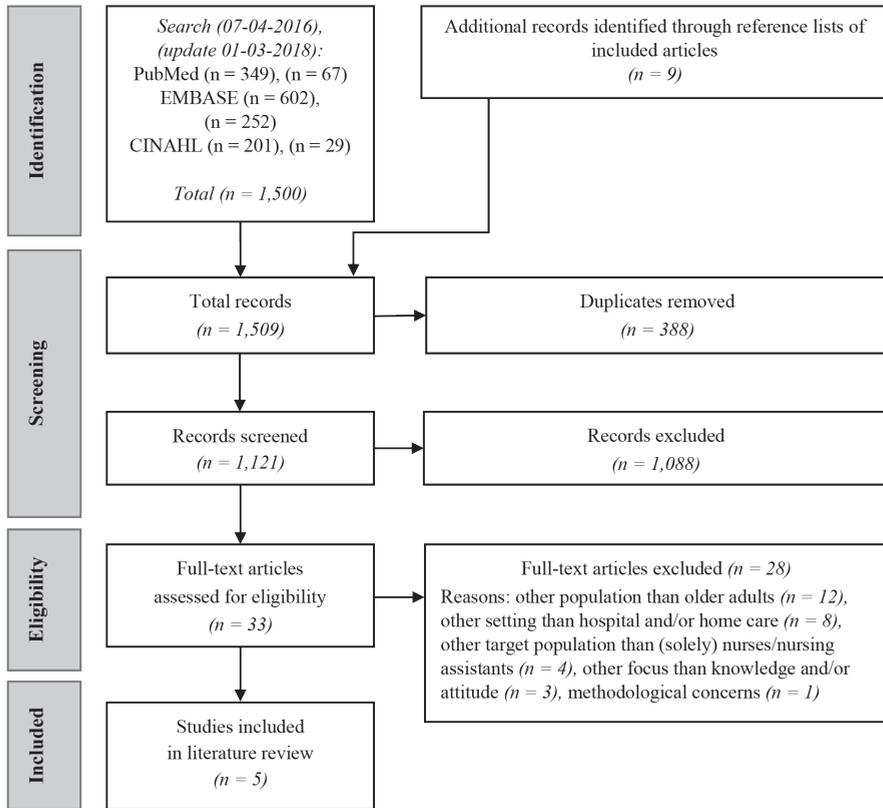


Figure I. Flow diagram of study selection process

The search resulted in 1,509 records. After elimination of duplicates, and screening of titles and abstracts, 33 articles were read in full text. Based on the eligibility criteria, 28 articles were excluded. Five articles were included in the literature review (Figure I). The results relating to nurses' and nursing assistants' knowledge and attitude regarding nutritional care for older adults can be found in Table I.

**Table 1.** Knowledge and attitude of nurses and nursing assistants regarding nutritional care for older adults admitted to the hospital or living at their homes in the community

Concept	Authors (year) Country	Setting; Participants Data collection	Results
Knowledge	Boaz (2013) <sup>1</sup> Israel	Hospital; Nurses (n = 106) KAP questionnaire	Sum of all correct answers: $11.9 \pm 2.03$
			Proportion of correct responses: $51.9\% \pm 0.1\%$ Proportion of correct answers: $\leq 50\%$ (4 questions), $51\%$ – $75\%$ (9 questions), $\geq 76\%$ (5 questions)
	Dahl Eide (2015) <sup>2</sup> Norway	Hospital; Nurses (n = 16) Focus group interviews	The nurses reported lacking sufficient knowledge and skills to evaluate nutritional status, estimate nutritional needs, measure dietary intake, about treatment, risk factors and consequences of malnutrition
Attitude	Bachrach – Lindström (2007) <sup>3</sup> Sweden	Hospital and nursing homes; Subgroup hospital: nurses (n = 80), nursing assistants medical care (n = 39) and geriatric care (n = 65) SANN-G scale	Nurses: Positive attitude on the dimensions: Habits (17.0 (15.0–18.0)), Assessment (16.0 (13.0–18.0)), Intervention (14.0 (13.0–15.0)), Individualization (8.5 (7.0–9.0)), and total score (73.0 (67.0–79.0)); neither positive nor negative attitude on the dimension: Norms (19.0 (17.0–22.0))
			Nursing assistants medical care: Positive attitude on the dimension: Intervention (13.0 (11.0–14.0)); neither positive nor negative attitude on the dimensions: Norms (17.0 (14.0–19.0)), Habits (15.0 (13.0–17.0)), Assessment (13.0 (11.0–16.0)), Individualization (6.0 (5.0–8.0)); and total score (65.0 (59.0–70.0)) Nursing assistants geriatric care: Positive attitude on the dimension: Intervention (13.0 (11.0–14.0)); neither positive nor negative attitude on the dimensions: Norms (16.0 (12.0–19.0)), Habits (15.0 (13.0–18.0)), Assessment (13.0 (11.0–15.0)), Individualization (7.0 (5.0–9.0)); and total score (65.0 (55.5–71.0))
	Boaz (2013) <sup>1</sup> Israel	Hospital; Nurses (n = 106) KAP questionnaire	Proportion of agreement: $\leq 50\%$ (2 items), $51\%$ – $75\%$ (0 items), $\geq 76\%$ (10 items)
	Bonetti (2013) <sup>4</sup> Italy	Hospital; Nurses (n = 33) SANN-G scale	Positive attitude on the dimensions: Intervention (12.0 (10.0–13.5)), Individualization (9.0 (7.0–10.0)); neither positive nor negative attitude on the dimensions: Norms (15.0 (12.5–17.5)), Habits (14.0 (12.0–16.0)), Assessment (12.0 (10.0–13.0)); and total score (60.0 (54.0–66.5))
	Hakli (2013) <sup>5</sup> Turkey	Hospital and nursing homes; Nurses and nursing assistants, sub-group hospital (n = 23) SANN-G scale	Hospital: neither positive nor negative attitude on the dimensions: Norms (15.52 $\pm$ 4.36), Habits (13.3 $\pm$ 2.2), Assessment (14.34 $\pm$ 3.24), Intervention (11.47 $\pm$ 1.37), Individualization (7.08 $\pm$ 1.75); and total score (61.73 $\pm$ 9.57)

Notes: Data are presented as mean  $\pm$  SD or median (first quartile–third quartile).

Abbreviations: KAP = Knowledge, Attitudes and Practices; SANN-G = Staff Attitudes to Nutritional Nursing Care Geriatric.

## References

1. Boaz M, Rychani L, Barami K, Hourì Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs.* 2013;44(8):357-364.
2. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs.* 2015;24(5-6):696-706.
3. Bachrach – Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff working with older people towards nutritional nursing care. *J Clin Nurs.* 2007;16(11):2007-2014.
4. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci.* 2013;27(2):440-448.
5. Hakli G, Çakiroglu FP. Nursing staff's attitudes on the elderly nutrition in Ankara (Turkey). *Pak J Nutr.* 2013;12(7):660-664.

### Study 2: literature review about nurses' and nursing assistants' role and responsibility

#### *Aim*

The aim of the literature review was to gain insight into the role and responsibility of nurses and nursing assistants in nutritional care for older adults admitted to the hospital or living at their homes in the community.

#### *Methods*

The databases PubMed, EMBASE and CINAHL were searched for eligible studies in May 2016, which was updated in March 2018. We used the keywords 'nurs\*', 'role', 'responsibility', 'task', 'function', 'nutrition\*', 'nutritional care', 'old\*', 'ag\*', 'elder\*', 'senior'. The reference lists of included articles were searched manually. Studies were included when these were written in English and published from 2001 and onwards to summarize the current state of knowledge on this topic. One researcher screened studies on title and abstract, then read the full text of articles and extracted data. Studies were included when these provided insight into the role and responsibility of nurses and nursing assistants in nutritional care for older adults in the hospital and home setting. The study selection and data extraction process was checked by one of the researchers.

#### *Results*

The search yielded 1,312 citations. After removing 399 duplicates and excluding 894 articles after screening for eligibility, 19 articles were reviewed full text. Based on the eligibility criteria, 12 articles were excluded and seven articles were included in the literature review (Figure II).

The results about the role and responsibility of nurses and nursing assistants in nutritional care for older adults are described in Table II.

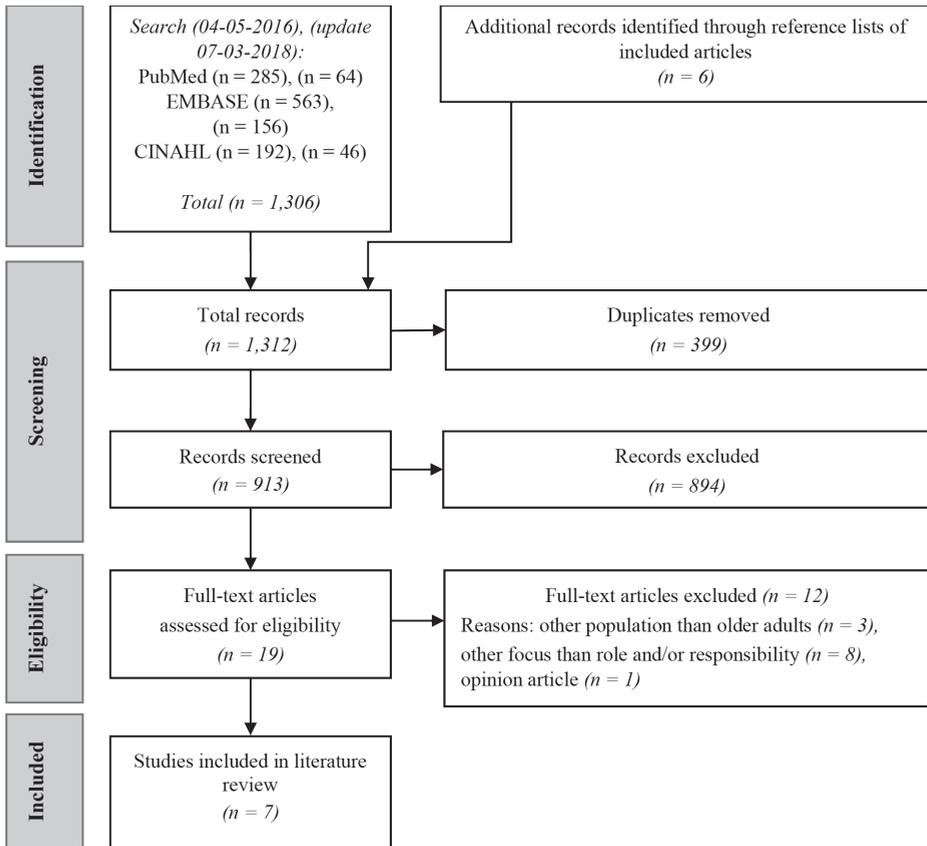


Figure II. Flow diagram of study selection process

Table II. Role and responsibility of nurses and nursing assistants in nutritional care for older adults admitted to the hospital or living at their homes in the community

Authors (year) Country	Setting; Participants Data collection	Results
Boaz (2013) <sup>1</sup> Israel	Hospital; Nurses (n = 106) KAP questionnaire, ranking 11 clinical duties in terms of importance	<i>Role:</i> Most frequent answer given: assess nutritional status to some patients (66%), sometimes weigh patients on admission (51.9%), sometimes discuss nutritional status during medical rounds (56.6%), sometimes assist patients with feeding (78.3%), weigh a patient more than once during hospitalization (64.8%) <i>Responsibility:</i> Most frequent answer given: consult a dietitian in case a patient receives inappropriate nutrition (69.1%), dietitians are the professionals with the most responsibility for nutrition assessment (50.5%); The tasks regarding nutritional care (feeding patients, nutrition assessment, provision of appropriate food to patient) were ranked lowest compared to other nursing tasks
Dahl Eide (2015) <sup>2</sup> Norway	Hospital; Nurses (n = 16) Focus group interviews	<i>Role:</i> Nurses mentioned that they requested information about nutritional issues during transfer from another setting to the hospital, they did not routinely screen nutritional risk on admission and initiate nutritional treatment, they used clinical observations rather than objective measurements to identify malnutrition <i>Responsibility:</i> Nurses pointed out that they considered themselves primarily responsible for nutritional care, they experienced difficulty in raising the priority of nutritional care compared to other nursing activities, they felt less responsible for nutritional care in case a patient was hospitalized for a short period
Lassen (2008) <sup>3</sup> Denmark	Hospital; Older adults (before intervention: n = 25, after intervention: n = 45) Structured interviews; Professionals involved in nutritional care <sup>4</sup> (before intervention: n = 34, after intervention: n = 30) Focus group interviews	<i>Role:</i> Older adults mentioned that professionals (e.g. nurses) recorded food and fluid intake and discussed low food and fluid intake with patients; Professionals (e.g. nurses) communicated the importance of food to health with 33%–67% of the patients <i>Responsibility:</i> Older adults found that offers regarding nutritional care made by nursing staff were insufficient and lacked a focus on nutrition, professionals did not always share the same view of the importance of food for care and treatment; Nurses pointed out that nutritional tasks were given low priority when these tasks were in competition with other nursing tasks; Nurses did not wish to take over the responsibility of nutritional assistants regarding nutritional care tasks, which implied a discontinuation in nutritional care; Nutritional assistants reminded nurses to discuss, plan and carry out nutritional tasks in nursing care and pay attention to patients' nutritional care
Robison (2015) <sup>4</sup> United Kingdom	Hospital; Older adults (before intervention: n = 10, after intervention: n = 15), relatives (before intervention: n = 5, after intervention: n = 5) Interviews; Nursing staff involved in nutritional care <sup>5</sup> (before intervention: n = 9, after intervention: n = 11) Group and individual semi-structured interviews	<i>Role:</i> Nursing staff noted that on admission patients should be weighed and malnutrition risk assessed; Older adults displayed little sense that nurses were routinely monitoring how much they ate, relatives mentioned they were not generally kept informed by nursing staff and were unsure how much patients were eating; Nurses stated that providing assistance at mealtimes encompassed feeding people who could not feed themselves, offering encouragement to those who lacked motivation to eat and supervising the confused <i>Responsibility:</i> Nurses highlighted the time required to help frail and confused patients, the difficulty of coaxing those patients who chose not to eat, and the coincidence of mealtimes with other nursing priorities or responding adequately at mealtimes when many patients needed help

Table II. Continued

Authors (year) Country	Setting; Participants Data collection	Results
Ross (2011) <sup>5</sup> Australia	Hospital; Professionals involved in nutritional care <sup>†</sup> (n = 22) Focus group interviews	<i>Responsibility:</i> Professionals lacked awareness and understanding of their own and others' role in nutritional care; Other professionals than nurses indicated that nurses were mainly responsible for screening, monitoring, assisting and feeding patients, but nurses viewed nutrition-related activities as distinct tasks with varying levels of responsibility; All professionals including nurses stated that nurses experienced competing care priorities at mealtimes, where food provided during mealtimes was not always the focus <i>Role:</i> Nurses named that they obtained information about patient's nutritional needs and problems at admission, they discussed nutritional issues to assess nutritional status, they performed observations and controls as part of a (continuous) nutritional nursing assessment process, they collaborated with other caregivers and professionals, they had a counselling role regarding nutritional nursing, they used a nutritional nursing care plan to highlight the assessment, to follow up interventions and to perform evaluations <i>Responsibility:</i> Nurses stated that in case food and fluid intake of many patients had to be registered simultaneously, it was difficult to control the situation, nutritional observations were given low priority when a patient had a serious acute illness, they felt a responsibility for that the patient had a continuous and proper nutritional intake, having interest and giving time for dialogue and listen to the patient's story regarding nutritional issues were very important aspects
Söderhamn (2009) <sup>6</sup> Sweden	Hospital; Nurses (n = 10) Open-ended interviews	<i>Role and responsibility:</i> Nurses stated that assistance was given to patients before meal delivery; Observations showed that for the patients requiring assistance with position change and bed table adjustments, 91.3% of help with position change and 90.9% of help with bed table adjustments were provided after meal delivery; 48.9% of patients who had difficulty eating received help from nurses when they began eating, 36.2% received help during eating and 95.7% had their eating progress checked by nurses; 60.9% of the patients received nurses' assistance with describing the meal when they began eating, 41.2% were encouraged by nurses during the meal; Most nurses mentioned encouragement during meals; Observations showed that nurses collected 25.0% of meal trays, observed 58.3% of patients who had food left; One nurse pointed out that nurses did not record patients' food intake until serious things happened; Nurses mentioned that workload determined the level of assistance regarding eating
Xia (2005) <sup>7</sup> Australia	Hospital; Older adults (n = 48), Nursing staff <sup>†</sup> (n = 50) Non-participant observation; Older adults (n = 4), nurses (n = 4) Semi-structured interviews	<i>Role and responsibility:</i> Nurses stated that assistance was given to patients before meal delivery; Observations showed that for the patients requiring assistance with position change and bed table adjustments, 91.3% of help with position change and 90.9% of help with bed table adjustments were provided after meal delivery; 48.9% of patients who had difficulty eating received help from nurses when they began eating, 36.2% received help during eating and 95.7% had their eating progress checked by nurses; 60.9% of the patients received nurses' assistance with describing the meal when they began eating, 41.2% were encouraged by nurses during the meal; Most nurses mentioned encouragement during meals; Observations showed that nurses collected 25.0% of meal trays, observed 58.3% of patients who had food left; One nurse pointed out that nurses did not record patients' food intake until serious things happened; Nurses mentioned that workload determined the level of assistance regarding eating

Notes. <sup>†</sup> Among the professionals/nursing staff included are nurses and nursing assistants, or nurses.  
Abbreviation: KAP = Knowledge, Attitudes and Practices.

## References

1. Boaz M, Rychani L, Barami K, Hourri Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs*. 2013;44(8):357-364.
2. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs*. 2015;24(5-6):696-706.
3. Lassen KO, Grinderslev E, Nyholm R. Effect of changed organisation of nutritional care of Danish medical inpatients. *BMC Health Serv Res*. 2008;8:168.
4. Robison J, Pilgrim AL, Rood G, Diaper N, Elia M, Jackson AA, et al. Can trained volunteers make a difference at mealtimes for older people in hospital? A qualitative study of the views and experience of nurses, patients, relatives and volunteers in the Southampton Mealtime Assistance Study. *Int J Older People Nurs*. 2015;10(2):136-145.
5. 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(1):41-46.
6. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs*. 2009;18(3):431-439.
7. Xia C, McCutcheon H. Mealtimes in hospital – who does what?. *J Clin Nurs*. 2006;15(10):1221-1227.

**Study 3: qualitative study with individual, structured, open interviews about experiences, perceptions and preferences of professionals regarding nutritional care**

*Aim*

The aim of this study was to comprehend experiences, perceptions and preferences of professional caregivers regarding nursing nutritional care for older adults to prevent and treat malnutrition in hospital and home care.

*Methods*

We conducted a qualitative study with individual, structured, open interviews. A representative group of professional caregivers providing nutritional care to older adults in hospital and home care was selected for study participation. Six members of the research team approached 19 professionals. In total, 15 professionals were interviewed.

One-time, face-to-face, individual interviews were conducted using a structured topic list.<sup>1,2</sup> Because we wanted to gain further insight into specific aspects of nutritional care provided to older adults in hospital and home care to prevent and treat malnutrition, we formulated a predetermined set of topics and related open-ended questions. These were experiences, perceptions and preferences regarding causes, screening and outcomes of malnutrition, nursing interventions to prevent and treat malnutrition, and the role of nurses and nursing assistants in nutritional care for older adults. The topic list was developed by one researcher and validated by one researcher. The questions were presented in the same sequence for all participants.<sup>1,2</sup>

The interviews were held by five research assistants and supervised by one researcher. During and after the interviews, memos were made. The participants were interviewed in their organization. The duration of the interviews ranged from 12 to 30 minutes. The data were collected between March and May 2017.

All interviews were audio taped and transcribed verbatim. The data were analyzed both quantitatively and qualitatively. The data about causes, screening, outcomes, interventions, and the role of nurses and nursing assistants were categorized and presented as frequency (percentage). In addition, participants elaborated their answers and provided in-depth information. Those data were qualitatively analyzed using an iterative approach, where the data were open, axial and selective coded into themes and subthemes. The analysis was systematic, sequential, verifiable and continuous.<sup>1,3,4</sup> This process was conducted by one researcher and validated by one

researcher. Trustworthiness was enhanced by prolonged engagement with the data, member checking, researcher triangulation, memo writing and the consistent use of the topic list.<sup>3</sup>

### *Results*

Three hospital nurses, two hospital dietitians, one clinical geriatrician, seven home care nurses and two home care nursing assistants were interviewed. Participant characteristics are described in Table III.

**Table III.** Characteristics of participating professional caregivers (n = 15)

<b>Characteristics</b>	<b>n (%)</b>
Female	13 (86.7)
Highest level of education	
EQF level 4	2 (13.3)
EQF level 6	12 (80)
EQF level 7	1 (6.7)
Profession	
Home care nurse	7 (46.7)
Home care nursing assistant	2 (13.3)
Hospital nurse	3 (20)
Hospital dietitian	2 (13.3)
Clinical geriatrician	1 (6.7)

*Abbreviation:* EQF = European Qualifications Framework.

The results are presented in Table IV.

**Table IV.** Professional caregivers' experiences, perceptions and preferences regarding aspects of nutritional care provided to older adults to prevent and treat malnutrition in hospital and home care

Causes of malnutrition, n (%)	Screening and outcomes of malnutrition, n (%)	Interventions, n (%)	Role of nurses and nursing assistants, n (%)	Issues arising from nutritional care
<ul style="list-style-type: none"> <li>- Illness/comorbidity, 7 (46.7)</li> <li>- Pain, 2 (13.3)</li> <li>- Decreased taste, 2 (13.3)</li> <li>- Reduced swallowing function, 1 (6.7)</li> <li>- ADL disability, 3 (20)</li> <li>- Immobility, 6 (40)</li> <li>- Tiredness, 3 (20)</li> <li>- Dentures, 2 (13.3)</li> <li>- Changing metabolism, 2 (13.3)</li> <li>- No appetite, 5 (33.3)</li> <li>- Reduced need for food, 4 (26.7)</li> <li>- Decubitus, 1 (6.7)</li> <li>- Medication, 2 (13.3)</li> <li>- Age, 1 (6.7)</li> <li>- Cognitive problems, 5 (33.3)</li> <li>- Stress, 2 (13.3)</li> <li>- Unable to buy food, 4 (26.7)</li> <li>- Single/loneliness, 8 (53.3)</li> <li>- Changing routine, 1 (6.7)</li> </ul>	<p><i>Screening</i></p> <ul style="list-style-type: none"> <li>- Standardized screening, 10 (66.7)</li> <li>- Instrument:                             <ul style="list-style-type: none"> <li>• MUST, 4 (26.7)</li> <li>• SNAQ, 11 (73.3)</li> <li>• SNAQ<sup>66</sup>, 2 (13.3)</li> </ul> </li> <li>- Outcomes                             <ul style="list-style-type: none"> <li>- Nutritional status, 3 (20)</li> <li>- Body weight, 6 (40)</li> <li>- Weight progress, 2 (13.3)</li> <li>- Energy and protein intake, 2 (13.3)</li> <li>- Macro- and micronutrients, 2 (13.3)</li> <li>- Dietary intake, 10 (66.7)</li> <li>- BMI, 11 (73.3)</li> <li>- Body composition, 1 (6.7)</li> <li>- MUAC, 5 (33.3)</li> <li>- TSF, 1 (6.7)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Clinical reasoning, 1 (6.7)</li> <li>- Protocol/Care pathway, 3 (20)</li> <li>- Examining/Assessment, 6 (40)</li> <li>- Examining underlying causes, 1 (6.7)</li> <li>- Nutritional anamnesis, 2 (13.3)</li> <li>- Make a treatment plan, 1 (6.7)</li> <li>- Anticipate to nutritional problems, 1 (6.7)</li> <li>- Observation dietary intake, 6 (40)</li> <li>- Stimulate dietary intake, 3 (20)</li> <li>- Telemonitoring dietary intake, 1 (6.7)</li> <li>- Supervision of nutrition and nutritional care, 3 (20)</li> <li>- Weighing, 3 (20)</li> <li>- Meal provision, 2 (13.3)</li> <li>- Provide ONS, 2 (13.3)</li> <li>- Ensure a good ambience, 3 (20)</li> <li>- Non-restrictive approach of older adults, 2 (13.3)</li> <li>- Good nurse handover, 9 (60)</li> <li>- Consultation/referral other disciplines, 6 (40)</li> <li>- Ensure a good ambience, 3 (20)</li> <li>- Remind older adult to eat, 2 (13.3)</li> <li>- Respond to needs of older adults, 1 (6.7)</li> <li>- Stimulate to eat together with other people, 1 (6.7)</li> <li>- Non-restrictive approach of older adults, 3 (20)</li> <li>- Involving informal caregivers, 10 (66.7)</li> <li>- Educating older adult and informal caregiver, 5 (33.3)</li> <li>- Motivational interviewing, 1 (6.7)</li> <li>- Stimulate autonomy of older adults, 1 (6.7)</li> <li>- Good handover, 10 (66.7)</li> <li>- Good communication/collaboration between professionals, 9 (60)</li> </ul>	<ul style="list-style-type: none"> <li>- Signaling and screening malnutrition, 4 (26.7)</li> <li>- Contribution to multidisciplinary treatment plan, 1 (6.7)</li> <li>- Observation dietary intake, 6 (40)</li> <li>- Stimulate dietary intake, 3 (20)</li> <li>- Telemonitoring dietary intake, 1 (6.7)</li> <li>- Supervision of nutrition and nutritional care, 3 (20)</li> <li>- Weighing, 3 (20)</li> <li>- Meal provision, 2 (13.3)</li> <li>- Provide ONS, 2 (13.3)</li> <li>- Ensure a good ambience, 3 (20)</li> <li>- Non-restrictive approach of older adults, 2 (13.3)</li> <li>- Good nurse handover, 9 (60)</li> <li>- Consultation/referral other disciplines, 6 (40)</li> </ul>	<p>Professionals stated that:</p> <ul style="list-style-type: none"> <li>- nurses and nursing assistants lack sufficient knowledge about nutrition and malnutrition. They are insufficiently aware of features or risk factors of malnutrition</li> <li>- nutritional care is a shared responsibility. This makes it unclear who is involved, who is responsible for which task and who holds final responsibility. In guidelines, which are not always used by professionals, there is no consistent role description given</li> <li>- there is lack of communication between disciplines within and between organizations about nutritional issues</li> <li>- standardized screening by nurses and nursing assistants is not necessary. Reasons: not all older adults are malnourished, screening is only necessary when there are signals of nutritional deterioration, what is the point when no follow-up actions are taken</li> <li>- nutritional care has low priority. Reasons: no time, work pressure, low valuation, acute illness is prioritized over nutritional care, personal interest of professionals whether or not to give attention to nutritional care, malnutrition is often an invisible process, older adults' autonomy related to nutrition is prioritized over good nutritional care</li> </ul>



Table IV. Continued

Causes of malnutrition, n (%)	Screening and outcomes of malnutrition, n (%)	Interventions, n (%)	Role of nurses and nursing assistants, n (%)	Issues arising from nutritional care
		- Consultation/referral other disciplines; 6 (40) -Involving volunteers; 2 (13.3)		- involvement of informal caregivers or informal network in nutritional issues is desirable. Informal caregivers are often not involved. Reasons: no awareness to involve them, involvement does not fit with the current care process, avoiding overburden of informal caregivers

Notes: Frequency values reflect the number of professional caregivers who reported causes, screening instruments, outcomes, interventions and tasks. Each professional could report multiple causes, screening instruments, outcomes, interventions and tasks.

Abbreviations: ADL = activities of daily living; BMI = body mass index; MUAC = mid-upper arm circumference; MUST = Malnutrition Universal Screening Tool; ONS = oral nutritional supplements; SNAQ = Short Nutritional Assessment Questionnaire; SNAQ<sup>65+</sup> = Short Nutritional Assessment Questionnaire 65+; TSF = triceps skinfold.

## References

1. Boeije H. Analysis in qualitative research. 1st ed. London: Sage Publications; 2010.
2. Holloway IM, Wheeler S. Qualitative research in nursing and healthcare. 3rd ed. West-Sussex: Wiley – Blackwell; 2012.
3. Creswell JW. Qualitative inquiry and research design: Choosing among five approaches. 3rd ed. London: Sage Publications; 2013.
4. Rabiee F. Focus-group interview and data analysis. Proc Nutr Soc. 2004;63(4):655-660.

### Study 4: qualitative study using an one-time focus group interview to explore perceived barriers and facilitators in nutritional care

#### *Aim*

The aim of this study was to explore perceived barriers and facilitators in nutritional care for older adults admitted to the hospital or living at their homes in the community.

#### *Methods*

A qualitative study with a one-time focus group interview was conducted. A heterogeneous group of professional caregivers involved in nutritional care for older adults provided in hospital care and primary care were selected for participation. Subsequently, 16 professionals were approached by five members of the research team and five agreed to participate.

A semi-structured interview guide was developed by one researcher and validated by one researcher.<sup>1-3</sup> The research question was operationalized into relevant topics and corresponding open-ended questions with focus on the perceived barriers and facilitators in nutritional care for older adults.<sup>4</sup> The focus group meeting was held in November 2017. The focus group interview was prepared in advance<sup>2</sup> by six members of the research team. During the interview, the moderator, who also was a research assistant, led the discussion and ensured that everyone had the opportunity to express their view on the topics. Two research assistants and one researcher observed and made field notes. One research assistant handled the technical equipment, collected characteristics of the professionals through a standardized questionnaire and obtained informed consent from all participants at the start of the focus group interview. The duration of the interview was 92 minutes.

The focus group interview was audio recorded and transcribed verbatim prior to data analysis. The systematic and sequential analysis was conducted by one researcher and validated by one researcher. The transcript was studied and coded. Subsequently themes and subthemes and their potential relationships were identified, defined and named.<sup>1,4</sup> Trustworthiness was ensured by prolonged engagement with the data during the research process, member checking, researcher triangulation and using an interview guide with open-ended questions during the focus group interview.<sup>4</sup>

#### *Results*

One clinical geriatrician and one nurse working in the hospital, one dietitian and two home care nurses participated. Characteristics of the professionals are shown in Table V.

**Table V.** Characteristics of participating professional caregivers (n = 5)

Characteristics	n (%)
Female	3 (60)
Age	
20 – 29 y	2 (40)
30 – 39 y	1 (20)
50 – 59 y	2 (20)
Highest level of education	
EQF level 6	4 (80)
EQF level 7	1 (20)
Profession	
Home care nurse	2 (40)
Hospital nurse	1 (20)
Dietitian	1 (20)
Medical specialist in geriatrics	1 (20)

Abbreviation: EQF = European Qualifications Framework.

The results are shown in Table VI.

**Table VI.** Professional caregivers' perceived barriers and facilitators in nutritional care for older adults admitted to the hospital or living at their homes in the community

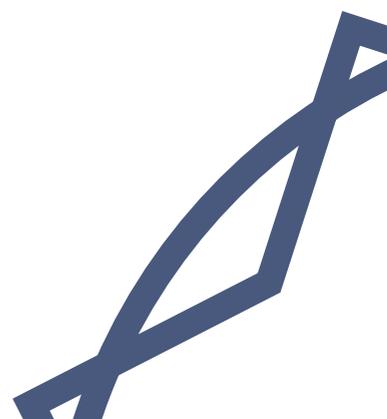
Level	Barriers	Facilitators
Older adult	<ol style="list-style-type: none"> <li>Older adults may have many and various (unrecognized) risk factors for malnutrition (e.g. do not feel like eating, unable to shop for food, decreased appetite or flavor, loneliness)</li> <li>Changing diet and accompanying behavioral change may be difficult for older adults</li> <li>Older adults' autonomy over nutritional issues may be a threat for adequate dietary intake</li> <li>Older adults lack awareness about healthy nutrition and its influence on health and well-being</li> <li>It is unclear what exactly the older adults' responsibility is regarding nutrition and nutritional care</li> <li>During hospitalization, competing care priorities may be a threat for older adults to adequately focus on nutrition and dietary intake</li> </ol>	<ol style="list-style-type: none"> <li>Older adults eat together with fellow patients (hospital) or the informal network (at home) to stimulate dietary intake</li> <li>Food and meals are personal. Nutritional care should be more personalized instead of standardized</li> <li>Older adults should be able to manage their dietary intake during treatment in hospital on the condition that they follow nutritional advice from professionals</li> <li>Older adults should eat together with other people in their network to change behavior to eat healthily</li> <li>Older adults should receive personalized education about healthy nutrition</li> </ol>

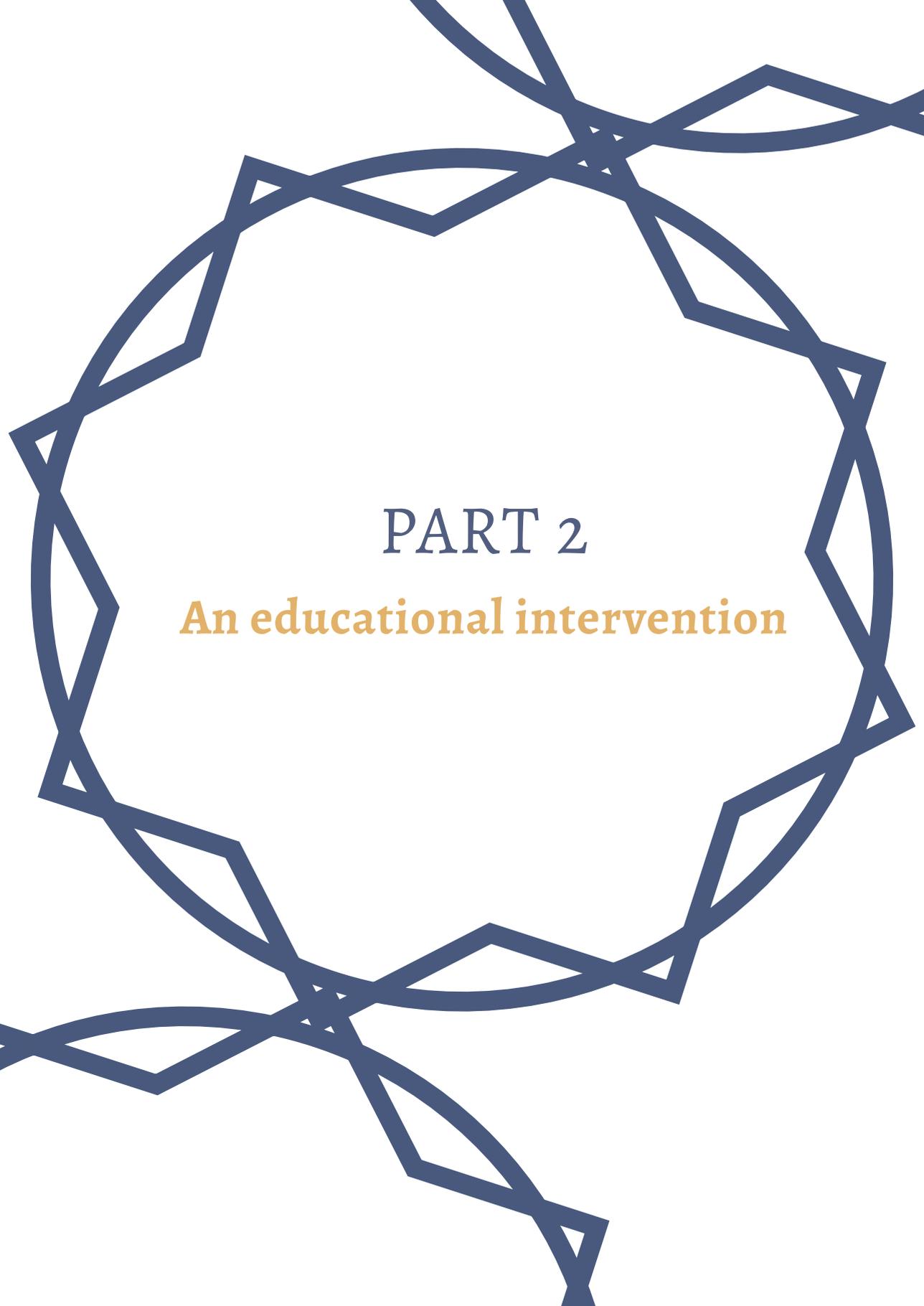
Table VI. Continued

Level	Barriers	Facilitators
Professional caregiver	<ol style="list-style-type: none"> <li>1. Nurses routinely screen for malnutrition in hospital but not in home care. Home care nurses screen if indicators of nutritional deterioration are present</li> <li>2. Nurses do not always structurally signal nutritional problems and risk factors for malnutrition or monitor dietary intake</li> <li>3. Professionals face the challenge of dealing with the tension between older adults' autonomy in nutrition and nutritional care, and nutritional treatment</li> <li>4. There is a competition between professionals regarding nutritional care: who is primarily responsible for nutritional care and who performs which task</li> <li>5. Nutrition and nutritional care are not part of treatment or the care process (nutrition and nutritional care are not discussed, the process of nutritional care is not systematically and routinely provided by professionals, guidelines are not always used)</li> <li>6. There is little communication between professionals in the hospital and home care setting. As a consequence, there is a lack of overview on nutritional care provided to older adults</li> <li>7. Professionals quickly provide oral nutritional supplements or tube feeding instead of exploring options to increase dietary intake by normal and/or enriched food</li> <li>8. Professionals do not prioritize nutritional care in the care process.</li> <li>9. Nurses receive little training regarding (mal)nutrition and nutritional care in the nursing curriculum</li> </ol>	<ol style="list-style-type: none"> <li>1. Professionals should routinely screen all older adults in the hospital and home care setting</li> <li>2. Professionals should give education to older adults about protein-enriched food that older adults can buy themselves</li> <li>3. Professionals should have sufficient knowledge about nutrition and nutritional care to properly provide quality nutritional care</li> <li>4. Professionals and older adults should actively collaborate in nutritional care</li> </ol>
Organization	<ol style="list-style-type: none"> <li>1. Nutrition and nutritional care is not given priority in the care and organizational process (it is not a serious topic of conversation, treatment of malnutrition is not urgent, considerable amount of work and lack of time, competing care activities, less facilities and money for nutrition available, little appreciation for spending extra time and care on nutritional issues)</li> <li>2. Organizational rules, which hinder adequate nutritional care</li> </ol>	<ol style="list-style-type: none"> <li>1. Organizations should structurally coordinate and organize moments where older adults can eat together with fellow patients, informal caregivers or the informal network</li> <li>2. Organizations should improve the quality of food and meals (e.g. high-quality meals, healthy nutrient-rich snacks)</li> </ol>

## References

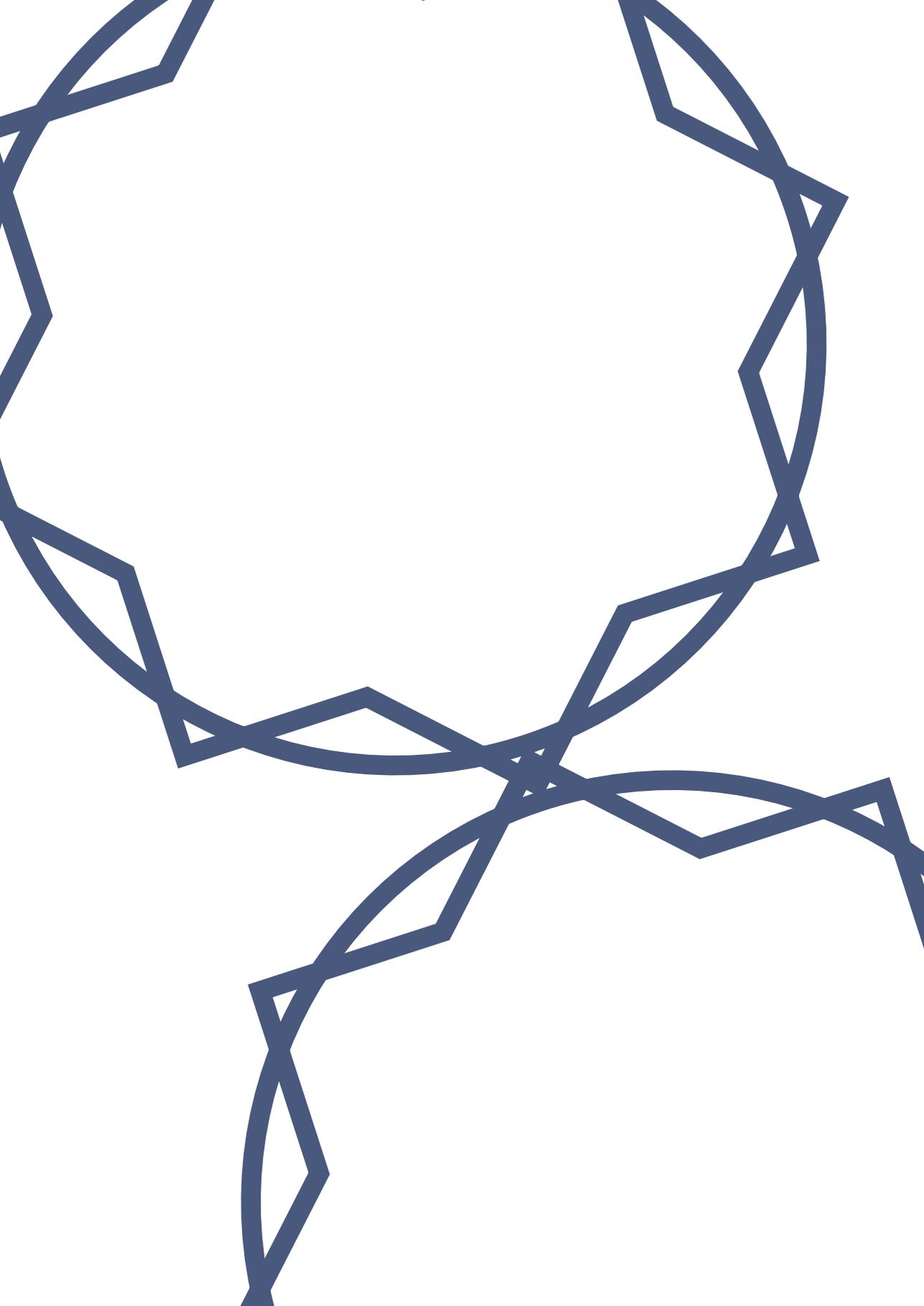
1. Boeije H. Analysis in qualitative research. 1st ed. London: Sage Publications; 2010.
2. Dutch IHI. Handleiding focusgroep onderzoek. [Manual focus group research]. Dutch IHI; 2004.
3. Holloway IM, Wheeler S. Qualitative research in nursing and healthcare. 3rd ed. West-Sussex: Wiley – Blackwell; 2012.
4. Creswell JW. Qualitative inquiry and research design: Choosing among five approaches. 3rd ed. London: Sage Publications; 2013.





PART 2

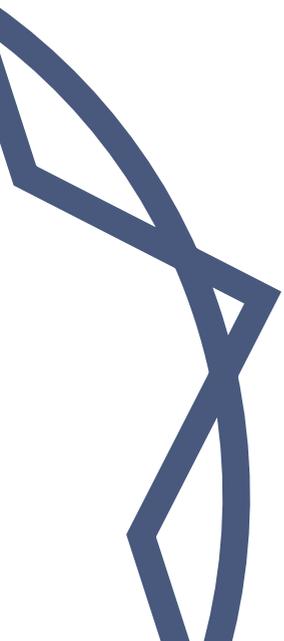
**An educational intervention**



# 6

## Development of a microlearning intervention regarding nursing nutritional care for older adults: A multi-methods study

Debbie ten Cate, Jeroen Dikken, Roelof G.A. Ettema,  
Lisette Schoonhoven, Marieke J. Schuurmans



## Abstract

**Background:** Nutritional care for older adults provided by hospital and home care nurses and nursing assistants is suboptimal. This is due to several factors including professionals' lack of knowledge and low prioritisation. Affecting these factors may promote nurses' and nursing assistants' behavioral change and eventually improve nutritional care. To increase the likelihood of successfully targeting these factors, an evidence-based educational intervention is needed.

**Objectives:** To develop an educational intervention for hospital and home care nurses and nursing assistants to promote behaviour change by affecting factors that influence current behaviour in nutritional care for older adults. In this paper, we describe the intervention development process.

**Design:** A multi-methods approach using literature and expert input.

**Settings:** Hospital and home care.

**Participants:** Older adults, nurses, nursing assistants, experts, and other professionals involved in nutritional care.

**Methods:** The educational intervention was based on five principles: 1) interaction between intervention and users, 2) targeting users on both individual and team level, 3) supporting direct and easy transfer to the workplace, and continuous learning, 4) facilitating learning within an appropriate period, and 5) fitting with the context. Consistent with these principles, the research team focussed on developing a microlearning intervention and they established consensus on seven features of the intervention: content, provider, mode of delivery, setting, recipient, intensity, and duration.

**Results:** The intervention consisted of 30 statements about nursing nutritional care for older adults, which nurses and nursing assistants were asked to confirm or reject, followed by corresponding explanations. These can be presented in a snack-sized way, this means one statement per day, five times a week over a period of six weeks through an online platform.

**Conclusions:** Based on a well-founded and comprehensive procedure, the microlearning intervention was developed. This intervention has the potential to contribute to nursing nutritional care for older adults.

## Introduction

Nutrition and nursing activities regarding nutritional care for older adults in the hospital and home care setting are part of essential nursing care.<sup>1,2</sup> Hospital and home care nurses and nursing assistants have the ideal position to maintain continuity and coordination of nutritional care in their everyday practice.<sup>2,3</sup> This enables them to promote health and well-being, prevent deterioration of nutritional status by early recognition and risk assessment, and identify and treat potential malnutrition.<sup>2,4-6</sup>

The provision of good quality care and continuity of nursing nutritional care in daily hospital practice is however moderate.<sup>7,8</sup> Previous studies have demonstrated that numerous factors influencing hospital nurses' and nursing assistants' current behaviour are at issue. Several examples of factors are lack of knowledge, moderate awareness of the importance, low prioritisation and partial absence of sense of responsibility.<sup>7-14</sup> Here, behaviour is defined as "any observable or measurable movement or activity of an individual. Behaviour can be verbal or nonverbal, overt or covert. Covert responses are private or unobservable events that can be cognitive, emotional, or physiological".<sup>15</sup>

To successfully impact factors influencing hospital and home care nurses' and nursing assistants' current behaviour in nutritional care for older adults and hence their behaviour, an optimal fit with a suitable intervention in a specific context is essential.<sup>16-19</sup> Therefore, we did a comprehensive analysis in the context of Dutch hospital and home care. In a Delphi study, we conducted six preparatory studies,<sup>20-22</sup> where we identified nine factors that influence nurses' and nursing assistants' current behaviour in nutritional care for older adults. Subsequently, these nine factors were presented to an expert panel in two Delphi rounds. Experts rated eight out of nine factors that influence current behaviour as relevant, modifiable and feasible to influence.<sup>22</sup> These eight factors are presented in Table 1.

**Table 1.** Eight factors that influence current behaviour of hospital and home care nurses and nursing assistants in nutritional care for older adults

1. Lack of sufficient knowledge about topics regarding nutrition and malnutrition
2. Mainly neutral attitude towards nutritional care
3. Low prioritisation of nutritional care
4. Ambiguous motivation to routinely use guidelines on and screening tools for malnutrition
5. Moderate awareness about risk factors of malnutrition
6. Lack of sense of involving informal caregivers in nutritional care
7. Ambiguous motivation to follow education about and training on nutrition and malnutrition
8. Strong focus on medical nutrition as opposed to normal nutrition

A solid and supportive way to target these eight factors and eventually promote behaviour change is through education.<sup>18,23</sup> There are studies that describe educational interventions for nurses providing nutritional care for older adults in hospital.<sup>24-27</sup> However, these interventions do not fit with aforementioned eight factors (Table 1), which can then potentially lead to ineffectiveness of the intervention.<sup>17-19</sup> Therefore, we developed a new educational intervention targeting all these eight factors simultaneously.<sup>18</sup> In this paper, we describe the development process of this educational intervention for hospital and home care nurses and nursing assistants to promote behaviour change by affecting factors that influence current behaviour in nutritional care for older adults.

## Methods

For the development of our educational intervention, we followed a comprehensive and systematic approach<sup>18</sup> and used a multi-methods approach utilising literature and expert input.<sup>28</sup> The Template for Intervention Description and Replication (TIDieR) checklist and guide was followed for reporting.<sup>29</sup>

### Key principles of the educational intervention

We based our intervention on five key principles regarding active learning and learning support, which are set out in relevant literature. The research team (DtC, JD, RE, MS) agreed on these five key principles to optimise the impact of the intervention on behaviour change by affecting factors that influence nurses' and nursing assistants' current behaviour in nutritional care for older adults.

First, emphasis was put on the interaction between the intervention and nurses and nursing assistants. Second, in line with Michie and colleagues,<sup>18</sup> we sought to reach a large group of nurses and nursing assistants, who could be targeted individually and through their nursing team. Third, we aimed that the transfer of education in the workplace would be direct and easy. This in order to support continuous learning and motivation to follow education over an extended period. An extended period increases the chance of affecting factors that influence current behaviour and behaviour change.<sup>30-32</sup> Fourth, we intended to facilitate learning within an appropriate period. Appropriate meaning not too long neither too short to enhance successful learning and enable successful change of factors influencing current behaviour but to avoid negative influences on learning motivation.<sup>33,34</sup> Fifth, we considered it important to ensure a maximum fit between the intervention and nurses' and nursing assistants' everyday work in the Dutch hospital and home care

setting. Here, we kept in mind that nurses and nursing assistants must deal daily with a high workload and little time.<sup>35,36</sup>

### **Features of the educational intervention**

Consistent with the abovementioned five principles, the research team decided to focus on a microlearning intervention. Microlearning refers to “short forms of learning and consists of short, fine-grained, inter-connected and loosely-coupled learning activities with microcontent”.<sup>37</sup> Furthermore, the research team established consensus regarding seven features of the intervention to enhance the quality of the development of our intervention and select the most appropriate intervention features.<sup>18</sup> These features are: 1) content, 2) provider, 3) mode of delivery, 4) setting, 5) recipient, 6) intensity, and 7) duration.<sup>18,29,38</sup>

### **Design of the intervention content**

For the microlearning intervention, we developed statements and corresponding explanations about nutritional care for older adults provided by nurses and nursing assistants in the hospital and home care setting. In this process, we used elements of the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) Study Design checklist for Patient-reported outcome measurement instruments.<sup>39,40</sup> This comprised development by 1) generating themes, 2) generating statements and 3) assessing content validity of the statements by measuring relevance and comprehensiveness, and assessing clear language. In addition, we 4) formulated explanations corresponding to statements and 5) established readability and face validity of both statements and explanations (Figure 1). Additional information regarding the steps is given in Appendix 1.

#### *Step 1: generating themes*

Within this step, the goal was to generate themes about nutrition and nursing nutritional care for older adults.<sup>39,40</sup> First, these themes were identified in relevant literature published between 2000 and 2018.

Second, an overview of these themes was presented to experts with work experience regarding nutrition and nutritional care for older adults in hospital and home care. They were asked to answer four questions regarding the overview of themes about 1) completeness, 2) missing themes and 3) ranking of the themes. In addition, the experts were requested to 4) formulate themes relating to nursing, and behaviour and professional attitude of nurses and nursing assistants towards nutrition and nutritional care. The four questions can be found in Appendix 1.

## Development of statements and corresponding explanations

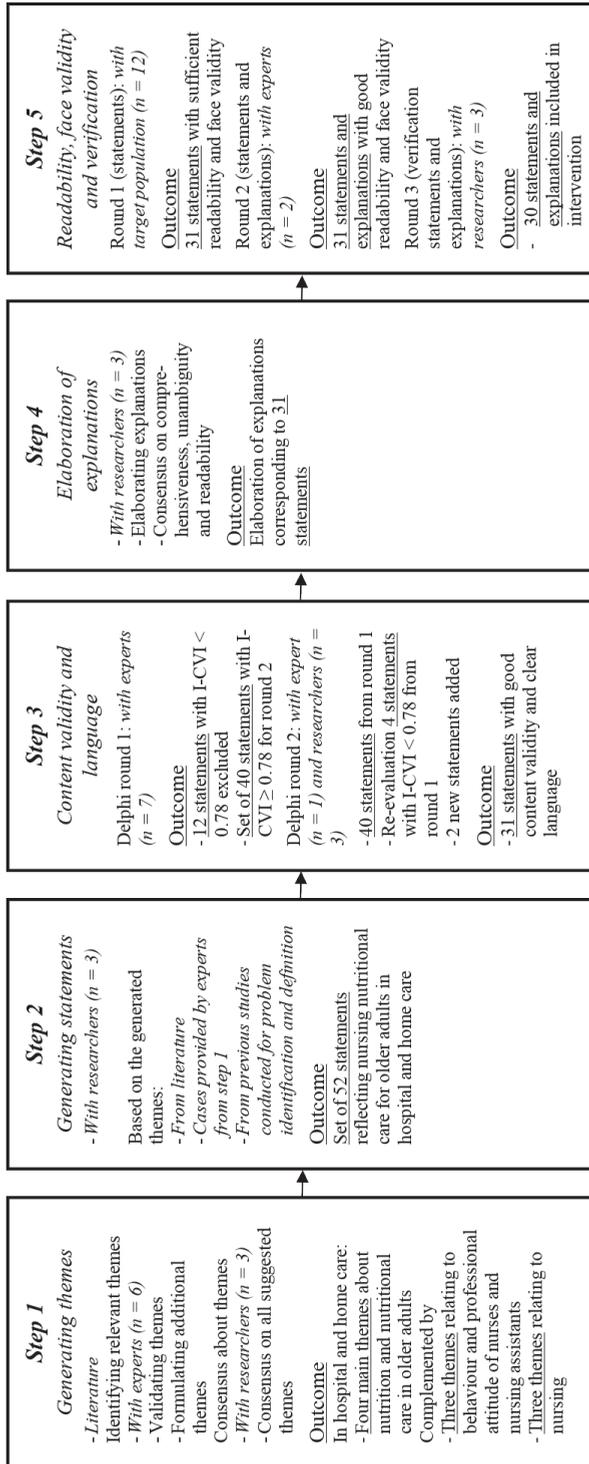


Figure 1. Development of the statements and corresponding explanations for the educational intervention

Third, in a consensus meeting, three researchers with a substantial background within nursing practice, education and (nutritional) research (DtC, JD, LvV), discussed and reached agreement about theme suggestions by the experts. They also verified the nursing themes with associated frameworks and theories used in the nursing domain. After this consensus meeting, an updated list of themes was derived. Finally, the experts were asked to approve this list by email. This resulted in a definitive overview of themes about nursing nutritional care for older adults in the hospital and home care setting.

### *Step 2: generating statements*

The objective was to select and formulate statements based on the overview from step 1.<sup>39,40</sup> Three researchers (DtC, JD, LvV) generated these statements from the literature used in step 1 and examples of cases provided by the experts and the research team.

In addition, to stimulate active learning, we used the revised Bloom's Taxonomy Model to incorporate different levels of learning for statement development.<sup>33</sup> This model categorises four knowledge dimensions and six categories of the cognitive process dimension, which are important aspects for learning. Statements were constructed in such a way that they emphasised the more abstract levels of knowledge, i.e. conceptual and procedural knowledge, and those cognitive processes that enhance transfer of knowledge, i.e. understanding, applying, analysing, evaluating and creating. With this, an attempt was made to maximally promote transfer of knowledge to new situations, and meaningful learning, thinking and problem solving.<sup>33</sup> In this way, factors that influence nurses' and nursing assistants' current behaviour were positively affected and consequently behaviour change was stimulated. The researchers agreed to dichotomise the response option to a single statement<sup>40</sup> as true or false.<sup>41</sup> All answers were based on literature and therefore formulated as absolutely true or false. Because the literature was not always consistent with situations in daily nursing practice, one could argue that some answers were not always absolutely true or false. By formulating answers as absolute, we aimed to stimulate discussion and self-reflection.<sup>33</sup>

The researchers formulated statements and these were discussed until consensus was reached on content and objective. The outcome was a full set of statements, which was a depiction of the list of themes about nursing nutritional care for older adults.

### *Step 3: content validity and language*

The aim of this step was to assess content validity and language of the statements and come to reduction of statements in two Delphi rounds. The outcome was a final

selection of statements, which adequately represents nursing nutritional care.<sup>39,40</sup> In the first round, experts were contacted for participation. These were older adults and professionals working in clinical practice, research or education and with expertise regarding nutrition and nutritional care for older adults in hospital and home care. The experts were independently asked to rate relevance and comprehensiveness of the statements<sup>42,43</sup> by email. The experts appraised the relevance on a 4-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). They evaluated comprehensiveness by assessing whether the statements comprised the assumed construct (yes/no).<sup>40</sup> In addition, experts were requested to assess clarity of language (yes/no).<sup>44</sup> The Item-level Content Validity Index (I-CVI) was computed for each statement to assess the proportion in agreement about relevance. A priori it was decided that statements with an I-CVI  $\geq 0.78$  were determined relevant<sup>43</sup> and included in the second round. Data were analysed using SPSS version 25.0 (IBM Corp., Armonk, NY). Statements were considered comprehensive and written in clear language when at least 70% of the experts agreed with the assumed construct and that the statements were written in clear language respectively. Statements were not yet excluded when these were considered incomprehensive and not written in clear language (< 70% agreement), but were re-evaluated in the next round. In addition, experts were able to add new statements.

In the second round, a face-to-face consensus meeting was organised with three researchers (DtC, JD, LvV) and all the experts from the first round (step 3) were invited to participate. The goal of this meeting was to (re-)evaluate all statements which were judged in the first round with an I-CVI  $\geq 0.78$  on relevance, comprehensiveness, clear language, and potentially add new statements. Another goal was to confirm that the total number of statements proportionally represented the themes and sub-themes. All statements, including potentially new statements, were judged relevant when the statements had I-CVI values of 0.78 and higher. The statements were considered comprehensive and written in clear language when at least 70% of the experts and researchers agreed. This resulted in a set of statements, which showed good content validity, clear wording<sup>40</sup> and was based on the themes about nursing nutritional care for older adults from step 1.

### *Step 4: elaboration of explanations*

The goal was to provide an explanation for each statement. Three researchers each formulated explanations related to a number of statements and underpinned the explanations by using leading guidelines, reference books and scientific articles. Consistent with microlearning, the essence of each explanation should be presented in a maximum of eight sentences, so that it could be read in approximately 3 min.

Every explanation was subsequently reviewed by the two other researchers. Next, the three researchers discussed all explanations and consensus was reached on comprehensiveness (yes/no), unambiguity (yes/no) and readability (yes/no).<sup>40,44</sup>

#### *Step 5: readability, face validity and verification*

The purpose of this step was to assess readability and face validity of the statements and explanations and to verify these to establish a final set.<sup>40,44</sup> First, nurses and nursing assistants working with older adults were approached by email and asked to answer the statements using SurveyMonkey (SurveyMonkey Inc., San Mateo, California, USA). Furthermore, they were asked if the statements were readable (yes/no) and if all the statements covered nursing nutritional care for older adults (10-point Likert scale; 1 = totally unsuitable and 10 = totally suitable). Coverage was assessed to be acceptable when the score was  $\geq 5.5$ .<sup>45</sup> Second, two experts with work experience in health care, research and education, were asked if the statements and explanations were comprehensive (yes/no), unambiguous (yes/no) and readable (yes/no).<sup>40,44</sup>

Third, three researchers (DtC, JD, LvV) verified the statements and corresponding explanations, which resulted in a final set of statements and explanations. To determine the relevance of the whole set of statements, the Scale Content Validity Index (S-CVI/Ave), was evaluated by one researcher (DtC). The S-CVI/Ave was calculated by averaging I-CVI across statements derived in step 3. We considered the whole set of statements as having excellent content validity, when each statement had an I-CVI of  $\geq 0.78$  and the whole set a S-CVI/Ave of  $\geq 0.90$ .<sup>43</sup> Based on the proportion well-answered statements by the nurses and nursing assistants, the statements were divided into easy (proportion  $\geq 0.83$ ), moderate (proportion between 0.5 and 0.83) and difficult (proportion  $\leq 0.5$ ).

This study was approved by the Medical Research Ethics Committee of the University Medical Center Utrecht, the Netherlands (18-236/C). In all phases of the study, the experts gave implied consent by sending their input to the researchers after being informed completely.<sup>44</sup>

## Results

### **Features of the educational intervention**

The content of the microlearning intervention consisted of 30 statements and corresponding explanations about nursing nutritional care for older adults in hospital and home care. The intervention was delivered by a company providing

an online platform to certify healthcare professionals (Redgrasp B.V., Utrecht, the Netherlands) (provider, mode of delivery). Teams of hospital and home care nurses and nursing assistants participated in the intervention (setting, recipient). Each participant individually received one statement per day by email from the online platform and was then redirected to the platform to receive the right answer and corresponding explanation along with positive rewards expressed in points. The intervention was delivered in a snack-sized way, this means one statement per day, five times a week in a time frame of six weeks (intensity, duration). A detailed overview of the seven features of our intervention is presented in Table 2.

**Table 2.** Overview of the features of the microlearning intervention

<b>Intervention feature</b>	<b>Information</b>
Content	<i>Material:</i> 30 statements and corresponding explanations about nursing nutritional care for older adults in hospital and home care <i>Procedure:</i> A statement was sent by email (Today's question). Each participant read the statement and answered if the statement was true or false by clicking on the appropriate button. Then, the participant was redirected to the online platform where the right answer and corresponding explanation was given. In addition, a link to background literature about the topic was given. Also, a participant received information about the average response of all participants on the statement and an individual total response score for all statements answered until that time point. If desired, a participant could contribute to the discussion forum
Provider	Redgrasp company
Mode of delivery	Digitally by email and subsequently redirection to the online platform (individual)
Setting	Hospital and home care
Recipients	Established teams of hospital and home care nurses and nursing assistants in the Netherlands
Intensity	Snack sized: five times a week, one statement on each weekday. For each statement, the total time investment of reading and answering the statement and reading the corresponding explanation was approximately 3 min
Duration	Total time frame of six weeks

## **Design of the intervention content**

### *Step 1: generating themes*

First, themes about nutrition and nursing nutritional care were extracted from six guidelines, three reference books and fourteen scientific articles. The references of this literature can be found in Appendix 1. This led to the formulation of four main themes: 1) normal nutrition; 2) nutrition and disease; 3) food preferences and eating behaviour; and 4) cultural and social influences, and including sub-themes.

Second, six experts participated, i.e. a nurse specialist in clinical geriatrics, a clinical geriatrician/professor in clinical geriatrics, three researchers/lecturers with either a nursing background in hospital or home care, or background in nutrition science and a representative of the local Network Care for Older Adults. The experts suggested adding nine new sub-themes to the themes and sub-themes. The experts ranked the theme 'nutrition and disease' and particularly the sub-theme 'malnutrition' the highest. They suggested three general themes in nursing and three themes relating to behaviour and professional attitude of nurses and nursing assistants regarding nutritional care for older adults.

Third, the researchers included the experts' suggestions in the overview of themes. They reformulated or added some words and agreed with the ranking of the themes as suggested by the experts. Also, they verified the nursing themes with nursing frameworks and theories.<sup>4,46-49</sup> The experts approved with the updated list of themes. This resulted in a final overview of themes reflecting nursing nutritional care for older adults in hospital and home care (Figure 2).

#### *Step 2: generating statements*

In total, 52 statements were generated (see Table II in Appendix 1). The original statements were written in the Dutch language. Themes were weighted<sup>40</sup> based on ranking of the themes as indicated by the experts in step 1 (Figure 3).

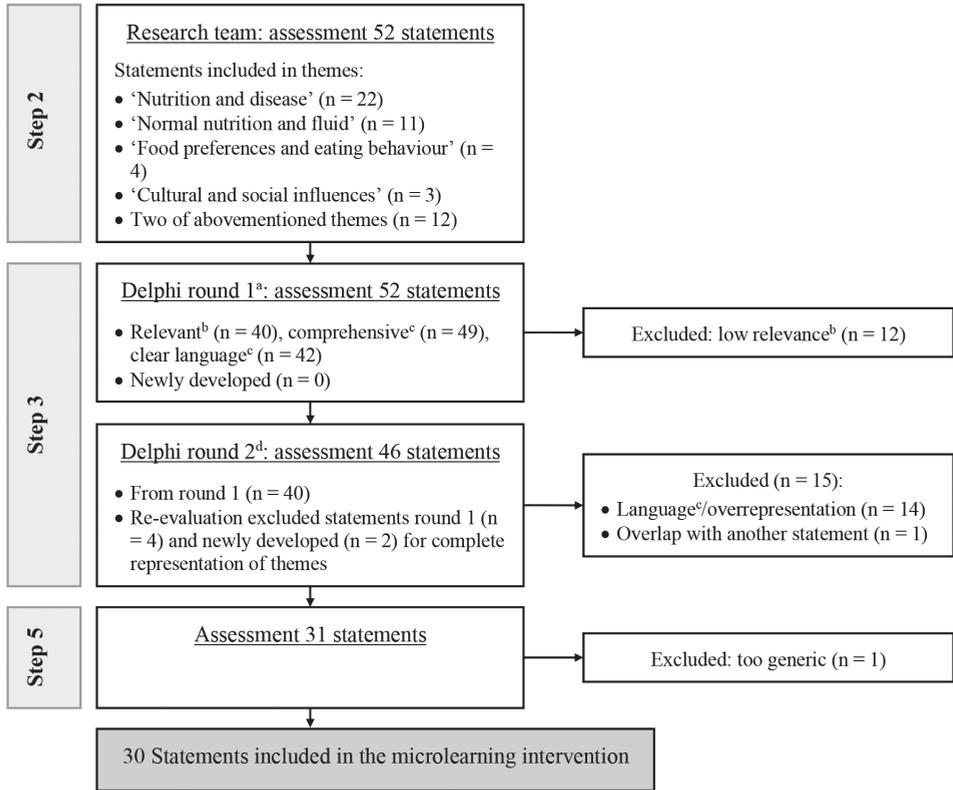
#### *Step 3: content validity and language*

In the first round, seven experts participated. They judged 40 out of 52 statements as relevant ( $I-CVI \geq 0.78$ ), which were included in the second round and they did not add new statements (Figure 3 and see Table II in Appendix 1). In the second round, the expert who is a researcher and lecturer with a background in nutrition science and three researchers assessed 40 statements from round 1, re-evaluated four statements and added two new statements (total of 46 statements). They excluded 15 statements and reached consensus for 31 statements on relevance, comprehensiveness and clear language. They considered that the themes and sub-themes about nursing nutritional care were reflected solidly in the statements (Figure 3 and see Table III in Appendix 1).

*Hospital and home care nurses' and nursing assistants' nutritional care for older adults*

<i>Nutrition and nutritional care themes and sub-themes</i>		<i>Nursing themes</i>
<b>Nutrition and disease</b>	<ul style="list-style-type: none"> <li>a. Malnutrition</li> <li>b. Nutrition and medicines</li> <li>c. Nutrition and oral health</li> <li>d. Nutrition and cognitive impairment</li> <li>e. Nutrition and chronic diseases</li> <li>f. Nutrition and obesity</li> <li>g. Nutrition and surgical treatment (including fasting policy)</li> <li>h. Nutrition, and sarcopenia and micronutrient abnormalities</li> <li>i. Nutrition in the palliative phase</li> </ul>	<ol style="list-style-type: none"> <li>1. Phases of the nursing process</li> <li>2. Continuity of care (in the care chain)</li> <li>3. Clinical reasoning</li> <li>4. Desired behaviour and professional attitude of nurses and nursing assistants regarding nutritional care</li> <li>5. Responsibilities of nurses and nursing assistants / nursing leadership</li> <li>6. Confidence in own expertise regarding nutritional care</li> </ol>
<b>Normal nutrition and fluid</b>	<ul style="list-style-type: none"> <li>a. Nutrition, and function and sources of nutrients:               <ul style="list-style-type: none"> <li>i. Energy and protein requirements</li> <li>ii. Macro- and micronutrients (carbohydrates, fibre, fats, vitamins, minerals)</li> <li>iii. Gastrointestinal tract, digestion and absorption</li> </ul> </li> <li>b. Physiological changes with ageing (including problems with swallowing, risk for aspiration, obstipation)</li> <li>c. Nutritional needs (energy and metabolic) of older adults (recommended daily allowance)</li> <li>d. Nutrition and physical exercise</li> <li>e. Fluid intake</li> <li>f. Functionality/functional limitations</li> </ul>	
<b>Food preferences and eating behaviour</b>	<p>Causes of change:</p> <ul style="list-style-type: none"> <li>a. Sensory perception</li> <li>b. Sense of hunger and satiety</li> <li>c. Reduced oral food processing</li> <li>d. Personal food preferences</li> <li>e. Changes in social factors</li> </ul>	
<b>Cultural and social influences</b>	<ul style="list-style-type: none"> <li>a. Food culture (eating habits in general)</li> <li>b. Social functions of food (eating together versus eating alone)</li> <li>c. Moral aspects (e.g. refusal behaviour)</li> </ul>	

**Figure 2.** Overview of the themes and sub-themes about hospital and home care nurses' and nursing assistants' nutritional care for older adults (step 1)



<sup>a</sup> Seven experts (of whom four also participated in step 1) participated: a nurse specialist in clinical geriatrics, a clinical geriatrician/professor in clinical geriatrics, two researchers/lecturers with either a nursing background in the home care setting or background in nutrition science, one nurse specialist in geriatrics working in primary care and two older adults.

<sup>b</sup> Statements with I-CVI  $\geq 0.78$  were determined relevant (I-CVI = Item-level Content Validity Index: the proportion in agreement about relevance).<sup>43</sup>

<sup>c</sup> Statements were comprehensive and written in clear language when at least 70% of the experts agreed.

<sup>d</sup> One expert (who also participated in step 1 and step 2, round 1) who is a researcher/lecturer with a background in nutrition science and three researchers participated.

**Figure 3.** Flow diagram of the process of including and excluding statements of the microlearning intervention (steps 2, 3 and 5)

*Step 4: elaboration of explanations*

The three researchers formulated explanations relating to 31 statements, which were written in Dutch. Next, they reached consensus on comprehensiveness, unambiguity and readability for all explanations. An example is displayed in Table 3.

**Table 3.** Example of a statement with corresponding explanation<sup>a</sup> (step 4)

Statement	Explanation
It is the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan)	The nursing profession aims at promoting well-being and health of the care recipient. This takes into account personal factors, wishes and needs. Food preferences have a significant impact on food choice, which in turn determines dietary intake. If an older care recipient has a specific diet (e.g. halal, kosher, vegan) and this diet is not available, it is likely that an older care recipient will have insufficient dietary intake. To read more about food preferences, read <a href="#">here</a> .

<sup>a</sup> The original statement and explanation are written in the Dutch language.

*Step 5: readability, face validity and verification*

First, twelve nurses and nursing assistants filled in the 31 statements and the mean score of right answers was 20.5 (range 15-27). They considered the statements readable and acceptable with a mean score of 6.8 (range 1-10). Second, the two experts, who were a researcher/lecturer with a background in nursing and a medical doctor with teaching experience, assessed that the statements and explanations were comprehensive, unambiguous and readable. This validation of the nurses, nursing assistants and experts did not lead to changes in the statements and explanations.

Third, the researchers deleted one statement, which they considered too generic and wide in scope. A total of 30 statements and corresponding explanations were included in our intervention. The relevance of the total set of 30 statements was established as excellent with S-CVI/Ave of 0.97. Based on the proportion well-answered statements by the twelve nurses and nursing assistants, eleven statements were regarded as easy, twelve statements as moderate and seven statements as difficult. In sequencing the statements, we built up complexity from easy to moderate to difficult twice for statements 1 till 15 (1 till 5: easy, 6 till 10: moderate, 11 till 15: difficult) and statements 16 till 30 (16 till 21: easy, 22 till 28: moderate, 29 and 30: difficult). The rationale was to stimulate continuous learning and support motivation over the period of six weeks.<sup>30-32</sup> The 30 statements can be found in Table 4.

## Discussion

In this study, we described the evidence-based development of a microlearning intervention for hospital and home care nurses and nursing assistants to promote behaviour change by affecting factors that influence their current behaviour in nutritional care for older adults. The intervention includes a total of 30 statements and corresponding explanations about nursing nutritional care for older adults in the hospital and home care setting. These statements can be presented to hospital and home care nurses and nursing assistants in a snack-sized way, this means one statement daily, five times a week for a total duration of six weeks through an online platform.

We considered a number of key principles to facilitate learning and learning support important to provide a well-founded basis for our microlearning intervention.<sup>30-32</sup> One of the most important of these was incorporation of different levels of learning for statement development to stimulate active learning and deep understanding.<sup>33</sup> The foundation of these levels of learning was also covered in other educational interventions for nurses about nutritional care for older adults with different didactic approaches.<sup>27,52,53</sup> Mainly, we put strong emphasis on strengthening of self-reflection by formulating answers as absolute.<sup>33</sup> Reflection is a key ingredient of effective learning, but not always integrated in learning material leading to failure in learning.<sup>54</sup> Also, with the statements, we had a particular focus on targeting conceptual and procedural knowledge and cognitive processes that enhance transfer of knowledge.<sup>33</sup> To our knowledge, generating statements based on this principle to encourage learning instead of using for example for assessment to test knowledge is a relatively new approach.

In our intervention, we focussed on impacting nurses' and nursing assistants' behaviour. From previous studies, it was evident that behaviour change was essential.<sup>20,21,55,56</sup> Targeting behaviour change through education was also integrated in multicomponent interventions, which were developed to improve multiple outcomes in multidisciplinary nutritional care.<sup>24-26</sup> These are complex interventions that clearly reflect how challenging the provision of good nutritional care to older adults on a daily basis is. However, although these interventions are well developed, the downside is that with these interventions too many aspects may be tackled simultaneously, potentially leading to lack of impact.<sup>17,18</sup> In our decision-making process, we made the choice to only address behavioral aspects, which in itself is already complex<sup>18,23</sup> and particularly, because we selected multiple factors that influence behaviour. Although education is a sufficient way to target behaviour, other interventions, such as involving role models and receiving audit and feedback

**Table 4.** Statements about nurses' and nursing assistants' nutritional care for older adults

No.	Difficulty <sup>a</sup>	Statement in English language <sup>b</sup>
1.	Easy	For a nurse/nursing assistant, an important intervention is always to monitor what and how much a frail older care recipient has eaten (T)
2.	Easy	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse/nursing assistant (F)
3.	Easy	It is the task of the nurse/nursing assistant to set up the environment in such a way that the older care recipient can eat well (T)
4.	Easy	At admission/intake, nurses/nursing assistants must provide information to older care recipients about the importance of protein intake through normal food (T)
5.	Easy	As a nurse/nursing assistant, you barely have influence on changing eating patterns resulting from a form of dementia (F)
6.	Moderate	During the anamnesis/intake, it is undesirable to ask supplementary questions about personal eating habits and food preferences, because it compromises the older care recipient's privacy (F)
7.	Moderate	The best way of screening for malnutrition is to keep checking with the older care recipient himself/herself if he/she has lost weight in the past month (F)
8.	Moderate	It is good to advise a malnourished older adult on a protein-enriched diet to exercise less to prevent weight loss (F)
9.	Moderate	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern (F)
10.	Moderate	It is primarily the dietitian's job to prescribe interventions for malnutrition (F)
11.	Difficult	It is the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan) (T)
12.	Difficult	When it has been determined that an older adult is malnourished, the first priority is to start with energy- and protein-enriched drinks (F)
13.	Difficult	The older care recipient always carries prime responsibility for his/her nutrition (F)
14.	Difficult	Older people chew less well than younger people, causing them to feel saturation earlier (T)
15.	Difficult	It is important to let older care recipients take their medicines with a glass of water before meals (F)
16.	Easy	Physical recovery following hospital treatment is more important than sufficient dietary intake (F)
17.	Easy	An older care recipient eats less when a nurse/nursing assistant is present at the scene, because this disturbs the older care recipient in his/her eating ritual (F)
18.	Easy	In older care recipients of, for example, Turkish or Moroccan descent, providing information about medication is more important than about nutrition, because they are by nature susceptible to type 2 diabetes mellitus (F)
19.	Easy	Only when there is weight loss can we speak of malnutrition (F)
20.	Easy	It is the task of the nurse/nursing assistant to stimulate a single older care recipient to eat together, for example, with family, friends or at an association (T)

**Table 4.** Continued

No.	Difficulty <sup>a</sup>	Statement in English language <sup>b</sup>
21.	Easy	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation (F)
22.	Moderate	When an older care recipient is malnourished, it is important to recommend sweet snacks, as desired, so that they at least consume something (F)
23.	Moderate	Measuring the albumin blood level is the most reliable method to identify malnutrition (F)
24.	Moderate	It is conducive to the general health of an older adult with a BMI > 25 kg/m <sup>2</sup> that he/she loses 5 kg of weight in a short period of time due to disease (F)
25.	Moderate	The main cause of malnutrition is poor oral health (F)
26.	Moderate	Also in the palliative phase it is important for older care recipients to maintain current dietary restrictions to ensure that this situation will not be worsened (F)
27.	Moderate	It is important always to follow the protocol to keep older care recipients fasting before surgery (F)
28.	Moderate	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake (F)
29.	Difficult	Because the sense of smell and taste diminishes in older adults, they can enjoy food less (F)
30.	Difficult	Older people should drink more than younger people, among other things, because it reduces the risk of obstipation (T)

Abbreviations: F = false; T = true.

<sup>a</sup> Difficulty of statements was set at: easy (proportion well-answered statements  $\geq 0.83$ ), moderate (proportion well-answered statements between 0.5 and 0.83) and difficult (proportion well-answered statements  $\leq 0.5$ ).

<sup>b</sup> The original statements are written in the Dutch language. The statements were translated into English according to the back-translation procedure.<sup>50,51</sup>

on nutritional care practices are important as well.<sup>18,57</sup> Also, despite the fact that nutritional care provided to older adults mainly requires a multidisciplinary approach,<sup>2</sup> we only targeted nursing professionals. For an optimal approach, changing nurses' and nursing assistants' behaviour by affecting factors that influence their current behaviour in nutritional care for older adults was a prerequisite<sup>18</sup> before dealing with additional significant issues to optimise nutritional care.

In an extensive process, we developed our microlearning intervention systematically and replicable, taking into account its users, i.e. nurses and nursing assistants, and the context of the hospital and home care setting. Furthermore, we incorporated constant discussion loops with important stakeholders ensuring validation and transparently reported the development process. In addition, essential nursing care and in particular nursing nutritional care is still mainly characterised by sparsity of

evidence and devaluation of this care.<sup>6,58</sup> With our intervention, we may contribute to better appreciation and subsequently enhancement and sustainability of this significant and key part of nursing.

### **Strengths and limitations**

This study has several strengths. To thoroughly study intervention development from different perspectives and to maximise the chance of a good fit between the intervention with its users, we involved various stakeholders including experts and most importantly the end users.<sup>16,17</sup> Also, the intervention was based on a multi-methods approach using literature and expert input providing data triangulation and ensuring a solid evidence base for the intervention.<sup>17,28,59</sup> Another strength is that we took the hospital and home care context of the intervention into account. This may increase the likelihood of successful implementation in the daily workplace of hospital and home care nurses and nursing assistants where they provide complex care to several care recipients concurrently.<sup>16,18,35</sup>

There are also some limitations to discuss. First, although we aimed to constantly involve hospital and home care nurses in the intervention development process, we did not achieve this for all steps. Although we assume that we have received sufficient input from nurses and nursing assistants, this may have led to some missing information. Second, we used a convenience sample for including nurses, nursing assistants, older adults, experts and other healthcare professionals involved in nutritional care in the development process. This may be a limiting factor due to probability of including participants who were unrepresentative of the population.<sup>59</sup> However, inclusion of our participants was based on accurate judgement of several members of the research team.

### **Future research**

Future research should include a feasibility study<sup>17</sup> to assess the feasibility our educational intervention in the daily work practice of its users, i.e. hospital and home care nurses and nursing assistants. In a subsequent phase of the development and evaluation process, it should be considered if the intervention development needs refinement or if the pilot, evaluation and/or implementation phase can be initiated.<sup>17,19</sup>

### **Implications for researchers and intervention developers**

The results of our study can be used by researchers and intervention developers in two ways. First, the actual content may be of interest for educational development projects. Researchers and intervention developers should be aware on which theory

and evidence our intervention is based, who the end users are and in which context the intervention was build. It should be considered that a mismatch on one or more of these elements may reduce the likelihood of success.<sup>16,17</sup> Second, the systematic approach and complete description of the process of our intervention development enhancing replication may constitute an example for building well-founded educational interventions. Besides, it may illustrate how to contribute to increasing quality of evidence in the complex area of behaviour change within essential nursing care.<sup>16,17,60</sup> In the development of future educational interventions, it is important to make appropriate methodological choices, including anticipation of subsequent phases, such as piloting, evaluation and implementation, and estimate what is specifically needed to improve the intervention.<sup>17,19</sup>

## Conclusions

In this study, we extensively and transparently presented the robust development of a microlearning intervention for hospital and home care nurses and nursing assistants. The intervention is provided by an online platform, over time and integrated in their workplace. The intervention includes a total of 30 statements, which nurses and nursing assistants are asked to confirm or reject, followed by corresponding explanations about nursing nutritional care for older adults. The intervention can be provided in a snack-sized way, where one statement is presented every day for five times a week over a total period of six weeks. The intervention development is an important first step to eventually make an essential contribution to improve nursing nutritional care to enhance well-being, health and adequate dietary intake of older adults.

## Acknowledgements

We thank all the nurses, nursing assistants and experts for participating in this study. We appreciate their involvement and contributions. Our special recognition goes to Lidia van Veenendaal MSc for her substantial involvement in the development of the intervention content.

## References

1. Kitson AL, Conroy T, Kuluski K, Locock L, Lyons R. Reclaiming and redefining the Fundamentals of Care: Nursing's response to meeting patients' basic human needs. Adelaide: University of Adelaide; 2013.
2. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Hooper L, Kiesswetter E, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clin Nutr.* 2022;41(4):958-989.
3. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr.* 2017;36(1):49-64.
4. Schuurmans M. Beroepsprofiel verpleegkundige. In: *Leren van de toekomst, Verpleegkundigen en verzorgenden 2020*. [Professional profile of nursing. In: Lambregts J, Grotendorst A, editors. *Learning from the future, V&V 2020*]. Houten: Bohn Stafleu van Loghum; 2012.
5. World Health Organization. Enhancing nursing and midwifery capacity to contribute to the prevention, treatment and management of noncommunicable diseases in practice: policy and advocacy, research and education. Geneva: World Health Organization; 2012.
6. Zwakhalen S, Hamers J, Metzethin S, Ettema R, Heinen M, de Man – van Ginkel, J., et al. Basic nursing care: The most provided, the least evidence based – A discussion paper. *J Clin Nurs.* 2018;27(11-12):2496-2505.
7. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci.* 2013;27(2):440-448.
8. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs.* 2015;24(5-6):696-706.
9. Bachrach – Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff working with older people towards nutritional nursing care. *J Clin Nurs.* 2007;16(11):2007-2014.
10. Boaz M, Rychani L, Barami K, Hourzi Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs.* 2013;44(8):357-364.
11. Lassen KO, Grinderslev E, Nyholm R. Effect of changed organisation of nutritional care of Danish medical inpatients. *BMC Health Serv Res.* 2008;8:168.
12. Robison J, Pilgrim AL, Rood G, Diaper N, Elia M, Jackson AA, et al. Can trained volunteers make a difference at mealtimes for older people in hospital? A qualitative study of the views and experience of nurses, patients, relatives and volunteers in the Southampton Mealtime Assistance Study. *Int J Older People Nurs.* 2015;10(2):136-145.
13. 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(1):41-46.
14. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs.* 2009;18(3):431-439.
15. Sundel M, Sundel SS. Behavior change in human services: Behavioral and cognitive principles and applications. 6th ed. Los Angeles: SAGE Publications Inc; 2018.
16. Bleijenberg N, de Man – van Ginkel JM, Trappenburg JCA, Ettema RGA, Sino CG, Heim N, et al. Increasing value and reducing waste by optimizing the development of complex interventions: Enriching the development phase of the Medical Research Council (MRC) Framework. *Int J Nurs Stud.* 2018;79:86-93.
17. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M, et al. Developing and evaluating complex interventions: the new medical research council guidance. *BMJ.* 2008;337:979-983.
18. Michie S, Atkins L, West R. The behaviour change wheel. A guide to designing interventions. Sutton: Silverback Publishing; 2014.
19. Skivington K, Matthews L, Simpson SA, Craig P, Baird J, Blazeby JM, et al. A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. *BMJ.* 2021;374:n2061.

20. ten Cate D, Schoonhoven L, Huisman – de Waal G, Schuurmans MJ, Ettema RGA. Hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition: A cross-sectional study. *J Clin Nurs*. 2021;30(13-14):2079-2092.
21. ten Cate D, Mellema M, Ettema RGA, Schuurmans MJ, Schoonhoven L. Older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalization: A qualitative study. *J Nutr Gerontol Geriatr*. 2021;40(2-3):80-107.
22. ten Cate D, Schuurmans MJ, van Eijk J, Bell JJ, Schoonhoven L, Ettema RGA. Factors influencing nurses' behavior in nutritional care for community-dwelling older adults before, during, and after hospitalization: A Delphi study. *J Contin Educ Nurs*. 2022;53(12):545-556.
23. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42.
24. Bell J, Bauer J, Capra S, Pulle R. Multidisciplinary, multi-modal nutritional care in acute hip fracture inpatients – Results of a pragmatic intervention. *Clin Nutr*. 2014;33(6):1101-1107.
25. Keller H, Laur C, Valaitis R, Bell J, McNicholl T, Ray S, et al. More-2-Eat: evaluation protocol of a multi-site implementation of the Integrated Nutrition Pathway for Acute Care. *BMC Nutr*. 2017;3:13.
26. Laur C, Keller H. Implementing best practice in hospital multidisciplinary nutritional care: an example of using the knowledge-to-action process for a research program. *J Multidiscip Healthc*. 2015;8:463-472.
27. Silver H, Pratt K, Bruno M, Lynch J, Mitchell K, McCauley S. Effectiveness of the malnutrition quality improvement initiative on practitioner malnutrition knowledge and screening, diagnosis, and timeliness of malnutrition-related care provided to older adults admitted to a tertiary care facility: A pilot study. *J Acad Nutr Diet*. 2018;118(1):101-109.
28. Hesse – Biber SN, Johnson RB, editors. *The Oxford handbook of multimethod and mixed methods research inquiry*. London: Oxford University Press; 2015.
29. Hoffmann T, Glasziou P, Boutron I, Milne R, Perera R, Moher D, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ*. 2014;348:g1687.
30. Bates R. A critical analysis of evaluation practice: the Kirkpatrick model and the principle of beneficence. *Eval Program Plann*. 2004;27(3):341-347.
31. Chiaburu D, Tekleab A. Individual and contextual influences on multiple dimensions of training effectiveness. *J Eur Ind Train*. 2005;29(8):604-626.
32. Holton EF, Baldwin TT. *Improving learning transfer in organizations*. San Francisco: Jossey-Bass/Pfeiffer; 2003.
33. Anderson LW, Krathwohl DR, editors. *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York: Addison Wesley Longman, Inc; 2001.
34. Tze VM, Daniels LM, Klassen RM. Evaluating the relationship between boredom and academic outcomes: A meta-analysis. *Educ Psychol Rev*. 2016;28(1):119-144.
35. Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Sermeus W for the RN4CAST Consortium. Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. *Int J Nurs Stud*. 2013;50(2):143-153.
36. Hegney DG, Rees CS, Osseiran – Moisson R, Breen L, Eley R, Windsor C, et al. Perceptions of nursing workloads and contributing factors, and their impact on implicit care rationing: A Queensland, Australia study. *J Nurs Manag*. 2019;27(2):371-380.
37. Buchem I, Hamelmann H. Microlearning: a strategy for ongoing professional development. *eLearning Papers*. 2010;21:1-15

38. Davidson KW, Goldstein M, Kaplan RM, Kaufmann PG, Knatterud GL, Orleans T, et al. Evidence-based behavioral medicine: What is it and how do we achieve it? *Ann Behav Med.* 2003;26(3):161-171.
39. Terwee CB, Prinsen CAC, Chiarotto A, Westerman MJ, Patrick DL, Alonso J, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. *Qual Life Res.* 2018;27(5):1159-1170.
40. de Vet HCW, Terwee CB, Mokkink LB, Knol DL. *Measurement in medicine: A practical guide.* Cambridge: Cambridge University Press; 2011.
41. de Gruijter D. *Toetsing en toetsanalyse. [Testing and test analysis].* Leiden: Rijksuniversiteit Leiden; 2008.
42. Lynn MR. Determination and quantification of content validity. *Nurs Res.* 1986;35(6):382-385.
43. Polit D, Beck C, Owen S. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health.* 2007;30(4):459-467.
44. Fowler F. *Survey research methods.* 5th ed. Thousand Oaks: Sage Publications Inc; 2013.
45. Dikken J, Hoogerduijn J, Schuurmans M. Construct development, description and initial validation of the Knowledge about Older Patients Quiz (KOP-Q) for nurses. *Nurse Educ Today.* 2015;35:e54-e59
46. International Council of Nurses. *Nursing care continuum framework and competencies.* Geneva: International Council of Nurses; 2008.
47. George JB, editor. *Nursing theories: The base for professional nursing practice.* 6th edition. London: Pearson; 2010.
48. Sherman R, Pross E. Growing future nurse leaders to build and sustain healthy work environments at the unit level. *Online J Issues Nurs.* 2010;15(1).
49. World Health Organization. *Innovative care for chronic conditions: building blocks for action: global report.* Geneva: World Health Organization; 2002.
50. Brislin RW. Back-translation for cross-cultural research. *J Cross Cult Psychol.* 1970;1(3):185-216.
51. Maneesriwongul W, Dixon JK. Instrument translation process: a methods review. *J Adv Nurs.* 2004;48(2):175-186.
52. Arroyo M, Rocandio A, Ansotegui L, Pascual E, Martínez de la Pera, C. Cooperative learning strategies to teach nutrition to geriatric nursing staff. *Arch Latinoam Nutr.* 2008;58(1):27-32.
53. Berggren E, Orrevall Y, Olin A, Strang P, Szulkin R, Törnkvist L. Evaluation of a continuing educational intervention for primary health care professionals about nutritional care of patients at home. *J Nutr Health Aging.* 2016;20(4):428-438.
54. Edwards R, Hanson A, Ragatt P. *Boundaries of adult learning.* 5th ed. Abingdon: Routledge; 2013.
55. Bassola B, Tommasi V, Bonetti L, Bauer S, Lusignani M. Nurses' knowledge about malnutrition in older people: A multicenter cross-sectional study. *Nutrition.* 2020;78:110947.
56. Ziylan C, Haveman – Nies A, van Dongen E, Kremer S, de Groot L. Dutch nutrition and care professionals' experiences with undernutrition awareness, monitoring, and treatment among community-dwelling older adults: a qualitative study. *BMC Nutr.* 2015;1:1-11.
57. Laur C, McCullough J, Davidson B, Keller H. Becoming food aware in hospital: A narrative review to advance the culture of nutrition care in hospitals. *Healthcare (Basel).* 2015;3(2):393-407.
58. Richards D, Hilli A, Pentecost C, Goodwin V, Frost J. Fundamental nursing care: A systematic review of the evidence on the effect of nursing care interventions for nutrition, elimination, mobility and hygiene. *J Clin Nurs.* 2018;27(11-12):2179-2188.
59. Polit DF, Beck CT. *Nursing research: Generating and assessing evidence for nursing practice.* 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2017.
60. Richards DA, Borglin G. Complex interventions and nursing: Looking through a new lens at nursing research. *Int J Nurs Stud.* 2011;48(5):531-533.

## Appendix

**Appendix 1.** Additional information regarding the development of statements and corresponding explanations about nutritional care for older adults provided by nurses and nursing assistants in the hospital and home care setting

### *Step 1: Conceptual model: generating themes*

#### Identifying relevant themes in literature

Themes and sub-themes about nutrition and nutritional care were identified in six guidelines,<sup>1-6</sup> three reference books<sup>7-9</sup> and fourteen scientific articles.<sup>10-23</sup> The themes are displayed in Table I.

#### Validating themes and formulating additional themes by experts (n = 6)

The experts were asked the following four questions:

1. Is this overview of themes about nutrition and nutritional care for (frail) older adults provided by nurses and nursing assistants complete or do you think there are themes missing?
2. If you think there are themes missing, which themes and why?
3. Can you give a ranking of the (sub-)themes in order of importance?
4. What desired behaviour and professional attitude do you think nurses and nursing assistants should have towards nutrition and nutritional care?

**Table I.** Outcomes from sub-steps to generate themes (step 1)

<b>a. Identified themes and sub-themes from literature</b>		
1. Normal nutrition ( <i>second<sup>a</sup></i> ) a. Nutrition, and function and sources of nutrients: i. Energy and protein requirements ii. Macro- and micronutrients (carbohydrates, fibre, fats, vitamins, minerals) iii. Gastrointestinal tract, digestion, and absorption b. Physiological changes with ageing c. Nutritional needs (energy and metabolic) of older adults (recommended daily allowance) d. Nutrition and physical exercise	2. Nutrition and disease ( <i>first<sup>a</sup></i> ) a. Nutrition and medicines b. Nutrition and dental diseases c. Nutrition and cognitive impairment d. Nutrition and chronic diseases e. Nutrition and obesity f. Nutrition and surgical treatment g. Nutrition and sarcopenia h. Nutrition in the palliative phase i. Malnutrition (definition, prevalence, aetiology, risk factors, screening/assessment, symptoms, diagnosis, treatment and interventions, complications)	
3. Food preferences and eating behaviour ( <i>third<sup>a</sup></i> ) Causes of change: a. Sensory perception b. Sense of hunger and satiety c. Reduced oral food processing d. Personal food preferences e. Changes in social factors	4. Cultural and social influences ( <i>fourth<sup>a</sup></i> ) a. Food culture b. Social functions of food c. Moral aspects	
<b>b. Addition of sub-themes by experts<sup>b</sup> (n = 6)</b>		
1. Swallowing difficulties 2. Obstipation 3. Risk for aspiration	4. Fluid intake 5. Functional limitations 6. Fasting prior to surgery or examination	7. Religious instructions about food 8. Eating together versus alone 9. Avoidance of food
<b>c. Addition of nursing themes by experts<sup>b</sup> (n = 6)</b>		
Three themes relating to attitude and behaviour of nurses and nursing assistants regarding nutritional care in older adults:		
1. Desired behaviour and professional attitude 2. Responsibility and nursing leadership 3. Confidence in own expertise		
Three additional nursing themes:		
1. The nursing process 2. Continuity of care (in the care chain) 3. Clinical reasoning		
<b>d. Reformulation and addition of words and phrases by researchers (n = 3)</b>		
1. 'Functionality' in addition to 'functional limitations' 2. Change 'dental diseases' into 'oral health' 3. Add 'micronutrient abnormalities' to 'nutrition and sarcopenia' 4. Change 'religious instructions about food' into 'eating habits in general' 5. Change 'avoidance of food' into 'refusal behaviour'		

<sup>a</sup> Ranking of the themes in order of importance according to the six experts.

<sup>b</sup> These experts were a nurse specialist in clinical geriatrics; a clinical geriatrician/professor in clinical geriatrics; three researchers/lecturers with either a nursing background in hospital or home care, or background in nutrition science; and a representative of the local Network Care for Older Adults.

**Step 2: Conceptual model: generating statements**

Members of the research team (DtC, JD, LvV) generated 52 statements reflecting the conceptual model, which are included in Table II.

**Table II.** 52 statements relating to themes and sub-themes about nurses' and nursing assistants' nutritional care for older adults<sup>a</sup>, and assessment on content validity and language by experts (n = 7) (step 2 and round 1 of step 3)

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
1.	At admission/intake, nurses/nursing assistants must provide information about the importance of protein intake through normal food	Normal nutrition and fluid / protein requirements, nutritional needs	.86	100%	100%	No
2.	All older adults need vitamin supplements	Normal nutrition and fluid / vitamins, nutritional needs	.71	85.7%	85.7%	Yes
3.	Older people should drink more than younger people, among other things, because it reduces the risk of obstipation	Normal nutrition and fluid / gastrointestinal tract, obstipation, fluid intake	1	100%	85.7%	No
4.	Vitamin B12 deficiency may lead to incontinence	Normal nutrition and fluid / vitamins, functional limitations	.71	85.7%	100%	Yes
5.	Older people have different nutritional needs and food preferences than younger people	Normal nutrition and fluid / nutritional needs; Food preferences	.86	100%	71.4%	No
6.	For a nurse/nursing assistant, it is important always to control what and how much a frail older care recipient has eaten	Normal nutrition and fluid / nutrition, nutritional needs; Cultural and social influences / moral aspects	1	100%	57.1%	No
7.	In the nursing care plan, nutrition is not a standard component on which actions must/can be taken	Normal nutrition and fluid	1	85.7%	57.1%	No
8.	The older care recipient always carries prime responsibility for his/her nutrition	Normal nutrition and fluid	1	100%	100%	No

Table II. Continued

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
9.	A nurse/nursing assistant is not responsible for nutrition, because they have too little knowledge of nutrients	Normal nutrition and fluid	.71	57.1%	28.6%	Yes
10.	It is undesirable that the dietitian and nurses/nursing assistants draw up a joint nutritional care plan for older care recipients, because the dietitian does not work nearby the nurses/nursing assistants	Normal nutrition and fluid	.86	85.7%	28.6%	No
11.	It is the task of nurses/nursing assistants to give good advice on nutrition to older care recipients	Normal nutrition and fluid	1	85.7%	85.7%	No
12.	In hospital, it is important that a nurse/nursing assistant is present during mealtimes of the older care recipient	Normal nutrition and fluid	.86	85.7%	71.4%	No
13.	Malnutrition is just as difficult to correct in older people as in young people	Nutrition and disease / malnutrition	.83	100%	100%	No
14.	It is important always to follow the protocol to keep older care recipients fasting before surgery	Nutrition and disease / nutrition and surgical treatment (fasting policy)	1	100%	100%	No
15.	In case of malnutrition, the most important nursing intervention is consulting a dietitian	Nutrition and disease / malnutrition	1	100%	85.7%	No
16.	It is the dietitian's job to prescribe interventions for malnutrition	Nutrition and disease / malnutrition	1	100%	57.1%	No
17.	Malnutrition in older care recipients is more often caused by poor oral care	Nutrition and disease / nutrition and oral health, malnutrition	1	42.9%	57.1%	No
18.	It is important to let older care recipients take their medicines with a glass of water before meals	Normal nutrition and fluid / fluid intake; Nutrition and disease / nutrition and medicines	.86	85.7%	71.4%	No

Table II. Continued

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
19.	The most effective way to treat obese older care recipients is to let them drink more and increase their fibre intake	Normal nutrition and fluid / nutrition, fluid intake; Nutrition and disease / nutrition and obesity	1	85.7%	85.7%	No
20.	In palliative care for older care recipients, it is important to prescribe a diet to relieve suffering	Nutrition and disease / nutrition in the palliative phase; Cultural and social influences / moral aspects	1	100%	71.4%	No
21.	The dietitian should always be consulted for issues regarding nutrition	Normal nutrition and fluid; Nutrition and disease	.86	85.7%	100%	No
22.	Malnutrition is an indirect risk factor for the development of dementia	Nutrition and disease / nutrition and cognitive impairment, malnutrition	.57	85.7%	71.4%	Yes
23.	In an older care recipient with sarcopenia, surgery is preferred over the prescription of a protein-enriched diet	Nutrition and disease / nutrition and sarcopenia	.71	85.7%	71.4%	Yes
24.	When an older care recipient is malnourished, he/she is by definition frail	Nutrition and disease / malnutrition	.57	100%	100%	Yes
25.	Measuring the albumin blood level is the most reliable method to identify malnutrition	Nutrition and disease / malnutrition	.86	100%	100%	No
26.	A poor diet can be both a cause and effect of depression	Nutrition and disease / nutrition and cognitive impairment	.86	100%	100%	No
27.	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern	Nutrition and disease / nutrition and obesity, nutrition and cognitive impairment	.86	85.7%	100%	No
28.	The best way of screening for malnutrition is to keep checking with the older care recipient herself/himself if she/he has lost weight in the past month	Nutrition and disease / malnutrition	1	100%	100%	No

Table II. Continued

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
29.	Screening for malnutrition is particularly important at the start of hospital admission	Nutrition and disease / malnutrition	.86	85.7%	100%	No
30.	Only the dietitian is responsible for setting goals for nutritional problems in relation to other problems	Nutrition and disease	.86	100%	100%	No
31.	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation	Nutrition and disease / malnutrition	1	71.4%	85.7%	No
32.	When an older care recipient experiences nausea, it is important that he/she eats again after two days, when nausea is gone	Nutrition and disease	.86	85.7%	57.1%	No
33.	It is conducive to the health of an older adult with a BMI > 25 kg/m <sup>2</sup> that he/she loses 5 kg of weight in a short period of time due to disease	Nutrition and disease / malnutrition	1	100%	100%	No
34.	Physical recovery following hospital treatment is more important than sufficient dietary intake	Normal nutrition and fluid / functional limitations; Nutrition and disease / nutrition and surgical treatment	1	71.4%	85.7%	No
35.	Weight loss in an older care recipient with COPD is more severe than in an older care recipient with another chronic disease	Nutrition and disease / chronic diseases, malnutrition	1	71.4%	71.4%	No
36.	When an older care recipient is malnourished, the first priority is to start with energy- and protein-enriched drinks	Nutrition and disease / malnutrition	1	100%	85.7%	No
37.	When an older care recipient is malnourished, it is important to recommend additional snacks, as desired	Nutrition and disease / malnutrition	1	85.7%	85.7%	No

Table II. Continued

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
38.	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse/nursing assistant	Nutrition and disease / malnutrition	1	100%	85.7%	No
39.	Only when there is weight loss can we speak of malnutrition	Nutrition and disease / malnutrition	1	100%	100%	No
40.	During transfers from hospital to home care and vice versa, nutrition and nutritional habits should always be reported	Food preference and eating behaviour	1	85.7%	100%	No
41.	Because the sense of smell and taste diminishes in older adults, they cannot enjoy food any longer	Food preference and eating behaviour / sensory perception	.86	100%	100%	No
42.	It is the task of nurses/nursing assistants to encourage the older care recipient to quit smoking in order to prevent reduced dietary intake	Food preference and eating behaviour / sensory perception, sense of hunger and satiety	.57	85.7%	100%	Yes
43.	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake	Normal nutrition and fluid / nutritional needs; Food preference and eating behaviour / sense of hunger and satiety	1	85.7%	85.7%	No
44.	Older people chew less well than younger people, causing them to feel saturation earlier	Food preference and eating behaviour / sense of hunger and satiety, reduced oral food processing	1	100%	100%	No
45.	Nurses/nursing assistants should inform older care recipients about the fact that their personal food preferences are a risk factor for obesity, in case they eat more sweet and fatty products	Nutrition and disease / nutrition and obesity; Food preference and eating behaviour / sensory perception, personal food preferences	.57	100%	71.4%	Yes

Table II. Continued

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
46.	It is the task of the nurse/nursing assistant to stimulate a single older care recipient to eat together, for example, with family, friends, or at a community centre or an association	Food preference and eating behaviour / changes in social factors; Cultural and social influences / social functions of food	.86	85.7%	100%	No
47.	During the anamnesis/intake, it is undesirable to talk about personal eating habits and food preferences, because it compromises the older care recipient's privacy	Food preference and eating behaviour / personal food preferences; Cultural and social influences / food culture, moral aspects	.86	85.7%	85.7%	No
48.	Older care recipients eat less when a nurse/nursing assistant is present at the scene, because this disturbs older care recipients in their eating ritual	Cultural and social influences / food culture	.71	71.4%	85.7%	Yes
49.	It is the task of the nurse/nursing assistant to set up the environment in such a way that the older care recipient can eat well	Cultural and social influences / food culture	1	85.7%	71.4%	No
50.	It is important that the nurse/nursing assistant informs older care recipients of Turkish or Moroccan descent with type 2 diabetes mellitus about medication, because this type 2 diabetes mellitus is caused by a congenital metabolic disorder	Nutrition and disease / chronic diseases; Cultural and social influences / food culture	.71	85.7%	57.1%	Yes
51.	Presence of the informal caregiver during mealtimes in hospital is impossible due to busy work of nurses during these moments	Cultural and social influences / food culture, social functions of food	.71	85.7%	57.1%	Yes

**Table II.** Continued

No.	Statement	Theme / sub-theme	I-CVI <sup>b</sup>	Construct <sup>c</sup>	Language <sup>d</sup>	Exclusion <sup>e</sup>
52.	For a single older care recipient who eats ready-to-eat meals every day, privacy and autonomy are more important than the nurse's/nursing assistant's responsibility for the well-being of the patient/client	Food preference and eating behaviour / changes in social factors; Cultural and social influences / social functions of food, moral aspects	.71	57.1%	42.9%	Yes

<sup>a</sup> The original statements are written in the Dutch language.

<sup>b</sup> I-CVI = Item-level Content Validity Index: the proportion in agreement about relevance.<sup>24</sup>

<sup>c</sup> Construct: whether the statements comprised the assumed construct (yes/no). Data are presented in percentage of experts, who agreed with the assumed construct (out of 7 experts).

<sup>d</sup> Language: whether the statements were written in clear language (yes/no). Data are presented in percentage of experts, who agreed that the statement was written in clear language (out of 7 experts).

<sup>e</sup> Statements with an I-CVI < 0.78 were excluded.

### *Step 3: Content validity and reducing statements*

#### Round 1: Assessment of relevance, comprehensiveness and language by experts

(n = 7)

For 52 statements, the experts assessed relevance, comprehensiveness and language. They considered 40 statements relevant, 49 statement comprehensive and 42 statements were written in clear language. They did not add new items. After this round, 40 statements with an I-CVI  $\geq$  0.78 were included in the next round (Table II).

#### Round 2: Assessment of relevance, comprehensiveness and language by an expert

(n = 1) and researchers (n = 3)

The expert and researchers assessed 40 statements from the previous round and agreed on the relevance (I-CVI  $\geq$  0.78) and comprehensiveness as rated by the experts from the first round. They excluded 14 out of 40 statements, mainly due to language, overrepresentation of certain sub-themes or too much focus on the hospital setting. For another 11 of the 40 statements, the experts and researchers reformulated words or word combinations. For a complete representation of all themes and sub-themes, they re-evaluated four statements with an I-CVI < 0.78 from the first round and added two new statements. They excluded one statement due to too much overlap with another included statement. In conclusion, in total, 46 statements were (re-) evaluated and consensus was reached for 31 statements, which were included in the next steps (Table III).

**Table III.** Assessment of 46 statements about nurses and nursing assistants' nutritional care for older adults<sup>a</sup> on content validity and language by an expert (n = 1) and researchers (n = 3) (round 2 of step 3)

No.	Statement	Exclusion (reason)	Final statement
Statements with I-CVI <sup>b</sup> $\geq 0.78$ , and $\geq 70\%$ agreement on comprehensiveness and language <sup>c</sup>			
1.	At admission/intake, nurses/nursing assistants must provide information about the importance of protein intake through normal food	No	At admission/intake, nurses/nursing assistants must provide information about the importance of protein intake through normal food
2.	Older people should drink more than younger people, among other things, because it reduces the risk of obstipation	No	Older people should drink more than younger people, among other things, because it reduces the risk of obstipation
3.	Older people have different nutritional needs and food preferences than younger people	Yes (overlap statements 2 and 31, older versus younger people, general formulation)	-
4.	The older care recipient always carries prime responsibility for his/her nutrition	No	The older care recipient always carries prime responsibility for his/her nutrition
5.	It is the task of nurses/nursing assistants to give good advice on nutrition to older care recipients	Yes (relevance and construct: overlap with statement 1; general formulation)	-
6.	In hospital, it is important that a nurse/nursing assistant is present during mealtimes of the older care recipient	Yes (focus solely on hospital setting, not home care setting)	-
7.	Malnutrition is just as difficult to correct in older people as in young people	Yes (overlap statements 2 and 31, older versus younger people, general formulation)	-
8.	It is important always to follow the protocol to keep older care recipients fasting before surgery	No	It is important always to follow the protocol to keep older care recipients fasting before surgery
9.	In case of malnutrition, the most important nursing intervention is consulting a dietitian	Yes (relevance and construct: overlap with statement 38)	-
10.	It is important to let older care recipients take their medicines with a glass of water before meals	No	It is important to let older care recipients take their medicines with a glass of water before meals
11.	The most effective way to treat obese older care recipients is to let them drink more and increase their fibre intake	Yes (theme: sufficient representation, see statement 16)	-
12.	In palliative care for older care recipients, it is important to prescribe a diet to relieve suffering	No	Also in the palliative phase it is important for older care recipients to maintain current dietary restrictions to ensure that this situation will not be worsened

Table III. Continued

No.	Statement	Exclusion (reason)	Final statement
13.	The dietitian should always be consulted for issues regarding nutrition	Yes (relevance and construct: overlap with statement 38)	-
14.	Measuring the albumin blood level is the most reliable method to identify malnutrition	No	Measuring the albumin blood level is the most reliable method to identify malnutrition
15.	A poor diet can be both a cause and effect of depression	Yes (theme: sufficient representation, see statement 16)	-
16.	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern	No	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern
17.	The best way of screening for malnutrition is to keep checking with the older care recipient herself/himself if she/he has lost weight in the past month	No	The best way of screening for malnutrition is to keep checking with the older care recipient herself/himself if she/he has lost weight in the past month
18.	Screening for malnutrition is particularly important at the start of hospital admission	Yes (focus solely on hospital setting, not home care setting)	-
19.	Only the dietitian is responsible for setting goals for nutritional problems in relation to other problems	Yes (relevance and construct: overlap with statement 38)	-
20.	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation	No	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation
21.	It is conducive to the health of an older adult with a BMI > 25 kg/m <sup>2</sup> that he/she loses 5 kg of weight in a short period of time due to disease	No	It is conducive to the general health of an older adult with a BMI > 25 kg/m <sup>2</sup> that he/she loses 5 kg of weight in a short period of time due to disease
22.	Physical recovery following hospital treatment is more important than sufficient dietary intake	No	Physical recovery following hospital treatment is more important than sufficient dietary intake
23.	Weight loss in an older care recipient with COPD is more severe than in an older care recipient with another chronic disease	Yes (no comprehensibility regarding prevalence numbers in literature)	-

Table III. Continued

No.	Statement	Exclusion (reason)	Final statement
24.	When an older care recipient is malnourished, the first priority is to start with energy- and protein-enriched drinks	No	When it has been determined that an older adult is malnourished, the first priority is to start with energy- and protein-enriched drinks
25.	When an older care recipient is malnourished, it is important to recommend additional snacks, as desired	No	When an older care recipient is malnourished, it is important to recommend sweet snacks, as desired, so that they at least consume something
26.	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse/nursing assistant	No	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse/nursing assistant
27.	Only when there is weight loss can we speak of malnutrition	No	Only when there is weight loss can we speak of malnutrition
28.	During transfers from hospital to home care and vice versa, nutrition and nutritional habits should always be reported	No	During transfers from hospital to home care and vice versa, nutrition should always be reported
29.	Because the sense of smell and taste diminishes in older adults, they cannot enjoy food any longer	No	Because the sense of smell and taste diminishes in older adults, they can enjoy food less
30.	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake	No	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake
31.	Older people chew less well than younger people, causing them to feel saturation earlier	No	Older people chew less well than younger people, causing them to feel saturation earlier
32.	It is the task of the nurse/nursing assistant to stimulate a single older care recipient to eat together, for example with family, friends, or at a community centre or an association	No	It is the task of the nurse/nursing assistant to stimulate a single older care recipient to eat together, for example, with family, friends or at an association
33.	During the anamnesis/intake, it is undesirable to talk about personal eating habits and food preferences, because it compromises the older care recipient's privacy	No	During the anamnesis/intake, it is undesirable to ask supplementary questions about personal eating habits and food preferences, because it compromises the older care recipient's privacy
34.	It is the task of the nurse/nursing assistant to set up the environment in such a way that the older care recipient can eat well	No	It is the task of the nurse/nursing assistant to set up the environment in such a way that the older care recipient can eat well

Table III. Continued

No.	Statement	Exclusion (reason)	Final statement
Statements with I-CVI <sup>b</sup> $\geq$ 0.78 and < 70% agreement on comprehensiveness and/or language <sup>c</sup>			
35.	For a nurse/nursing assistant, it is important always to control what and how much a frail older care recipient has eaten	No	For a nurse/nursing assistant, an important intervention is always to monitor what and how much a frail older care recipient has eaten <sup>d</sup>
36.	In the nursing care plan, nutrition is not a standard component on which actions must/can be taken	Yes (language: ambiguous)	-
37.	It is undesirable that the dietitian and nurses/nursing assistants draw up a joint nutritional care plan for older care recipients, because the dietitian does not work nearby the nurses/nursing assistants	Yes (language: ambiguous)	-
38.	It is the dietitian's job to prescribe interventions for malnutrition	No	It is primarily the dietitian's job to prescribe interventions for malnutrition <sup>d</sup>
39.	Malnutrition in older care recipients is more often caused by poor oral care	No	The main cause of malnutrition is poor oral health <sup>d</sup>
40.	When an older care recipient experiences nausea, it is important that he/she eats again after two days, when nausea is gone	Yes (theme: sufficient representation of statements about malnutrition)	-
Re-evaluation of statements with I-CVI <sup>b</sup> < 0.78			
41.	Malnutrition is an indirect risk factor for the development of dementia	No	As a nurse/nursing assistant, you barely have influence on changing eating patterns resulting from a form of dementia <sup>d</sup>
42.	Older care recipients eat less when a nurse/nursing assistant is present at the scene, because this disturbs older care recipients in their eating ritual	No	An older care recipient eats less when a nurse/nursing assistant is present at the scene, because this disturbs the older care recipient in her/his eating ritual <sup>d</sup>
43.	It is important that the nurse/nursing assistant informs older care recipients of Turkish or Moroccan descent with type 2 diabetes mellitus about medication, because this type 2 diabetes mellitus is caused by a congenital metabolic disorder	No	In older care recipients of, for example, Turkish or Moroccan descent, providing information about medication is more important than about nutrition, because they are by nature susceptible to type 2 diabetes mellitus <sup>d</sup>

Table III. Continued

No.	Statement	Exclusion (reason)	Final statement
44.	For a single older care recipient who eats ready-to-eat meals every day, privacy and autonomy are more important than the nurse's/nursing assistant's responsibility for the well-being of the patient/client	Yes (relevance and construct: overlap with statement 33)	-
New statements			
45.	It is good to advise a malnourished older adult on a protein-enriched diet to exercise less to prevent weight loss	No	It is good to advise a malnourished older adult on a protein-enriched diet to exercise less to prevent weight loss <sup>d</sup>
46.	It is not the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan)	No	It is the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan) <sup>d</sup>

<sup>a</sup> The original statements are written in the Dutch language.

<sup>b</sup> I-CVI = Item-level Content Validity Index: the proportion in agreement about relevance.<sup>24</sup>

<sup>c</sup> Outcome of assessment on relevance, comprehensiveness and language by experts (n = 7) (step 3, round 1).

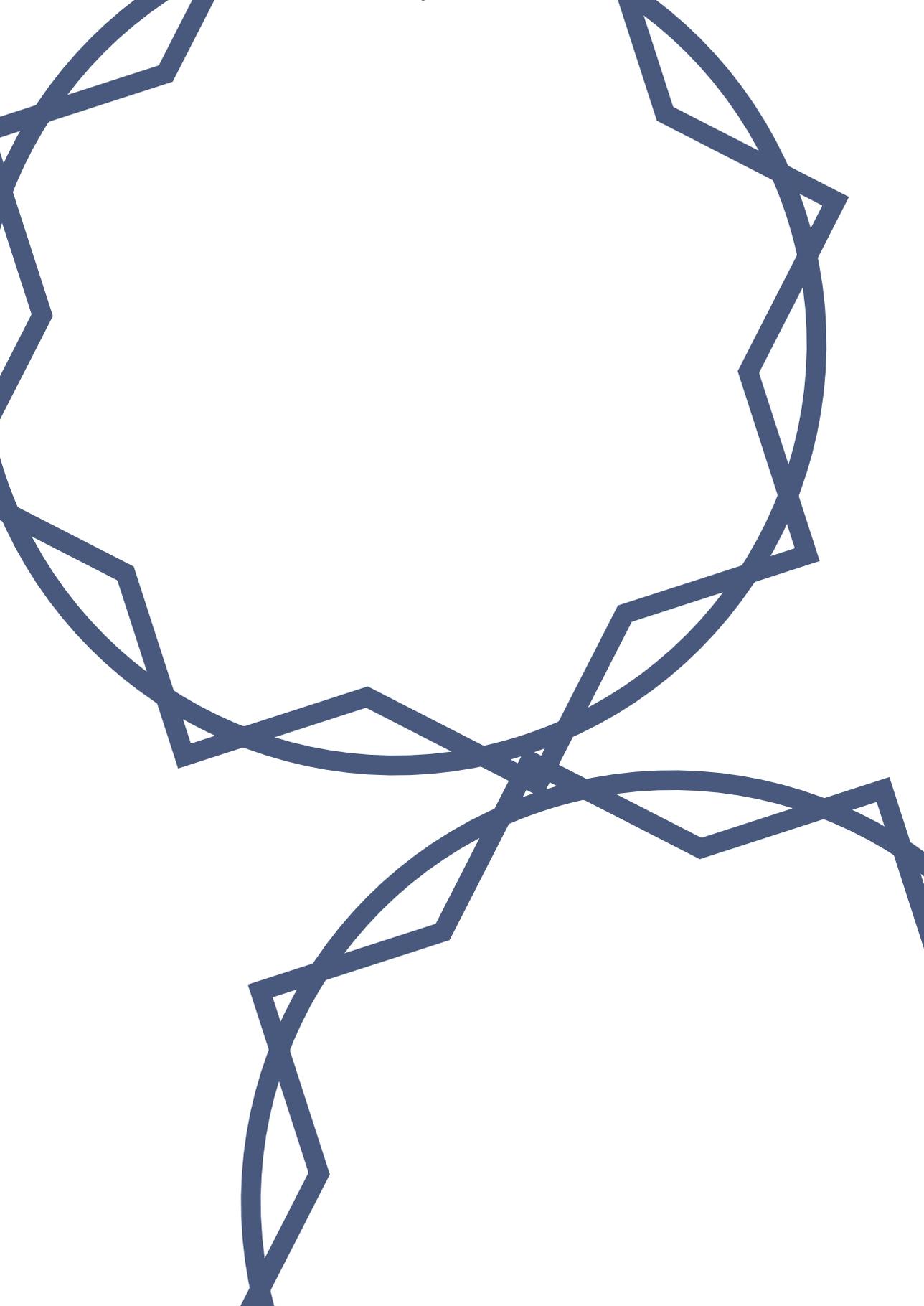
<sup>d</sup> One expert and three researchers (re)assessed statements with I-CVI  $\geq 0.78$  and  $< 70\%$  agreement on comprehensiveness and/or language, statements with I-CVI  $< 0.78$  from the previous round, and new statements. This resulted in statements with I-CVI  $\geq 0.78$ , and  $\geq 70\%$  agreement on comprehensiveness and language (round 2 of step 3).

## References

1. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr.* 2017;36(1):49-64.
2. Deerenberg – Kessler W, Nieuwlands T, Vreeburg E, Brevé M, Hazen J, Koel E, et al. *Mondzorg & de rol van verzorgenden en verpleegkundigen [Oral care & the role of nursing assistants and nurses]*. Utrecht: NVVA; 2007.
3. Dutch Geriatrics Society. *Richtlijn ondervoeding bij de geriatrische patiënt [Guideline malnutrition in the geriatric patient]*. Dutch Geriatrics Society; 2013.
4. The Dutch Malnutrition Steering Group. *Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]*. The Dutch Malnutrition Steering Group; 2017.
5. ten Hoor – Aukema N. *Dieetbehandelingsrichtlijn 47: Voeding voor ouderen in Nederland [Dietary treatment guideline: Nutrition for older adults in the Netherlands]*. Rotterdam: 2010 Uitgevers; 2014.
6. Mueller C, Compher C, Ellen D, American Society for Parenteral and Enteral Nutrition (ASPEN) Board of Directors. *ASPEN clinical guidelines: Nutrition screening, assessment, and intervention in adults. JPEN J Parenter Enteral Nutr.* 2011;35(1):16-24.
7. Former M, editor. *Informatorium Voeding en Diëtetiek – Voedingsleer [Informatorium Nutrition and Dietetics – Nutrition]*. Houten: Bohn Stafleu van Loghum; 2013.
8. Former M, editor. *Informatorium Voeding en Diëtetiek – Dieetleer [Informatorium Nutrition and Dietetics – Dietetics]*. Houten: Bohn Stafleu van Loghum; 2013.
9. Kruizenga H, Wierdsma N. *Zakboek diëtetiek [Dietetic pocket guide]*. Amsterdam: VU uitgeverij; 2014.
10. Ahn J, Park J, Kim C. Effects of an individualised nutritional education and support programme on dietary habits, nutritional knowledge and nutritional status of older adults living alone. *J Clin Nurs.* 2018;27(9-10):2142-2151.
11. Arroyo M, Rocandio A, Ansotegui L, Pascual E, Martínez de la Pera, C. Cooperative learning strategies to teach nutrition to geriatric nursing staff. *Arch Latinoam Nutr.* 2008;58(1):27-32.
12. Bauer S, Halfens R, Lohrmann C. Knowledge and attitudes of nursing staff towards malnutrition care in nursing homes: A multicentre cross-sectional study. *J Nutr Health Aging.* 2015;19(7):734-740.
13. Beattie E, O'Reilly M, Strange E, Franklin S, Isenring E. How much do residential aged care staff members know about the nutritional needs of residents? *Int J Older People Nurs.* 2014;9(1):54-64.
14. Berggren E, Orrevall Y, Olin A, Strang P, Szulkin R, Törnkvist L. Evaluation of a continuing educational intervention for primary health care professionals about nutritional care of patients at home. *J Nutr Health Aging.* 2016;20(4):428-438.
15. Boaz M, Rychani L, Barami K, Houry Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs.* 2013;44(8):357-364.
16. Christensson L, Unosson M, Bachrach – Lindström M, Ek AC. Attitudes of nursing staff towards nutritional nursing care. *Scand J Caring Sci.* 2003;17(3):223-231.
17. Crogan N, Shultz J, Massey L. Nutrition knowledge of nurses in long-term care facilities. *J Contin Educ Nurs.* 2001;32(4):171-176.
18. Crogan N, Evans B. Nutrition assessment: Experience is not a predictor of knowledge. *J Contin Educ Nurs.* 2001;32(5):219-222.
19. Endevelt R, Werner P, Goldman D, Karpati T. Nurses knowledge and attitudes regarding nutrition in the elderly. *J Nutr Health Aging.* 2009;13(6):485-489.
20. Penland K. *The relationship between nurse nutrition knowledge and unintentional weight loss in nursing home residents*. Tucson: The University of Arizona; 2010.

21. Reijnierse E, de van der Schueren M, Trappenburg M, Doves M, Meskers C, Maier A. Lack of knowledge and availability of diagnostic equipment could hinder the diagnosis of sarcopenia and its management. *PLoS one*. 2017;12(10):e0185837.
22. Schönherr S, Halfens R, Lohmann C. Development and psychometric evaluation of the Knowledge of Malnutrition - Geriatric (KoM-G) questionnaire to measure malnutrition knowledge among nursing staff in Australian Nursing Homes. *Scand J Caring Sci*. 2015;29(1):193-202.
23. Silver H, Pratt K, Bruno M, Lynch J, Mitchell K, McCauley S. Effectiveness of the malnutrition quality improvement initiative on practitioner malnutrition knowledge and screening, diagnosis, and timeliness of malnutrition-related care provided to older adults admitted to a tertiary care facility: A pilot study. *J Acad Nutr Diet*. 2018;118(1):101-109.
24. Polit D, Beck C, Owen S. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health*. 2007;30(4):459-467.

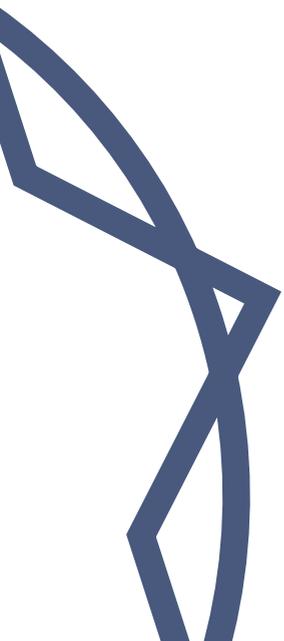




# 7

## Feasibility of a microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants: A mixed-methods study

Debbie ten Cate, Jeroen Dikken, Roelof G.A. Ettema, Lidia van Veenendaal,  
Marieke J. Schuurmans, Lisette Schoonhoven



## Abstract

**Background and objective:** Hospital and home care nurses and nursing assistants do not provide optimal nutritional care to older adults, which is due to several factors that influence their current behaviour. To successfully target these factors, we developed a microlearning intervention. The next step is to assess its feasibility to achieve the best fit with nursing practice. The aim of this study was to test the feasibility of the microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants.

**Methods:** In a multicentre study, we used a mixed-methods design. Feasibility was determined by assessing 1) recruitment and retention of the participants and 2) the acceptability, compliance and delivery of the intervention. Data about the use of the intervention (consisting of 30 statements), and data from a standardised questionnaire and two focus group interviews were used to measure the feasibility outcomes.

**Results:** Fourteen teams with a total of 306 participants (response rate: 89.7%) completed the intervention and the median (Q1, Q3) score for completed statements per participant was 23 (12, 28). The mean proportion of correct answers was 72.2%. Participants were both positive and constructive about the intervention. They confirmed that they mostly learned from the intervention. Overall, the intervention was acceptable to the participants and compliance and delivery was adequate.

**Conclusions:** The microlearning intervention is mostly feasible for hospital and home care nurses and nursing assistants. Based on participants' constructive feedback, we consider that the intervention needs refinement to improve its feasibility.

## Introduction

Hospital and home care nurses and nursing assistants have a crucial role in the coordination and delivery of continuous and high-quality nutritional care to the growing number of older adults with multiple long-term health conditions.<sup>1-4</sup> These nurses and nursing assistants can stimulate intake of good nutrition in older adults, prevent them from deterioration of nutritional status and development of malnutrition by early recognition and risk assessment, and identify and treat potential malnutrition.<sup>3,5-7</sup> In this way, they essentially contribute to reducing disease risk, promoting good health and well-being, preserving functionality and independence of older adults.<sup>3,5,8,9</sup>

In current practice however, hospital and home care nurses and nursing assistants do not manage to provide proper nutritional care and hence affect the quality of nutritional care older adults receive.<sup>10-12</sup> Previous studies have shown that suboptimal nutritional care is the result of, among other things, various factors that influence nurses' and nursing assistants' current behaviour including moderate awareness of the importance, lack of fundamental knowledge and predominantly neutral attitudes.<sup>10,12-14</sup> As a result, they give nutritional care lower priority, undervalue nutritional care activities and lack to take their full responsibility.<sup>10,11,15,16</sup> Here, behaviour can be defined as "any observable or measurable movement or activity of an individual. Behaviour can be verbal or nonverbal, overt or covert. Covert responses are private or unobservable events that can be cognitive, emotional, or physiological".<sup>17</sup>

To promote behaviour change, the key emphasis is on affecting the factors that influence nurses' and nursing assistants' current behaviour in nutritional care and education is suitable for this purpose.<sup>18,19</sup> This can eventually enhance nutritional care and impact older adults' health and well-being.<sup>11,12</sup> To increase the likelihood of successfully targeting these factors in the specific context of the Dutch hospital and home care setting,<sup>19-22</sup> we developed an evidence-based microlearning intervention consisting of 30 statements about nursing nutritional care for older adults.<sup>23</sup> Microlearning is defined as "short forms of learning and consists of short, fine-grained, inter-connected and loosely-coupled learning activities with microcontent".<sup>24</sup>

In accordance with the Medical Research Council (MRC) framework, an essential next step in the research process is assessing feasibility of our microlearning intervention to achieve the best fit with routine practice. Besides estimating recruitment and retention of participants for following the microlearning intervention, this also includes determining the acceptability, compliance and delivery of the intervention.<sup>21</sup>

Conducting a feasibility study allows us to gain insight into the extent to which our microlearning intervention is a sufficient strategy to promote nurses' and nursing assistants' behaviour change. Also, it increases the chance of successful implementation of the microlearning intervention in nursing practice.<sup>19,21</sup> The aim of this study was to test the feasibility of our microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants. Therefore, we assessed 1) recruitment and retention of the participants for following the microlearning intervention and 2) the acceptability, compliance and delivery of the intervention.

## Methods

### Study design

In a multicentre study, we used a mixed-methods design to evaluate the feasibility of our microlearning intervention in the hospital and home care setting. The design of this feasibility study and overview of this intervention is depicted in Figure 1. The reporting of this study was based on the checklist with items to include when reporting a pilot study, which is adopted from the CONSORT statement.<sup>25</sup>

### Participants and setting

Nurses and nursing assistants, working in two hospitals and two home care organisations in the central region of the Netherlands, participated in this study and received our microlearning intervention. The nurses and nursing assistants were selected using a purposive sampling method<sup>26</sup> on team level. Nursing teams of two general nursing wards (geriatrics and internal medicine) of a university hospital, two general nursing wards (both general surgical and internal medicine) and an outpatient department for preoperative preparation for hospital admission of a general hospital were included. In addition, nine nursing teams from two home care organisations participated. Overall, fourteen nursing teams with a total of 341 nurses and nursing assistants participated in the study. Inclusion of these nursing teams ensured a representation of hospital and home care nurses and nursing assistants providing nutritional care for older adults, including those with (risk for) malnutrition.<sup>26</sup> Members of the research team (DtC, MS) recruited the nursing teams between February and first half of April 2018 by contacting the head of the nursing teams in the hospital, or district manager or nurse team coordinator in the home care organisation. Subsequently, these persons invited the nurses and nursing assistants of their team to participate in our microlearning intervention sending an email to inform their team about the intervention and the study.

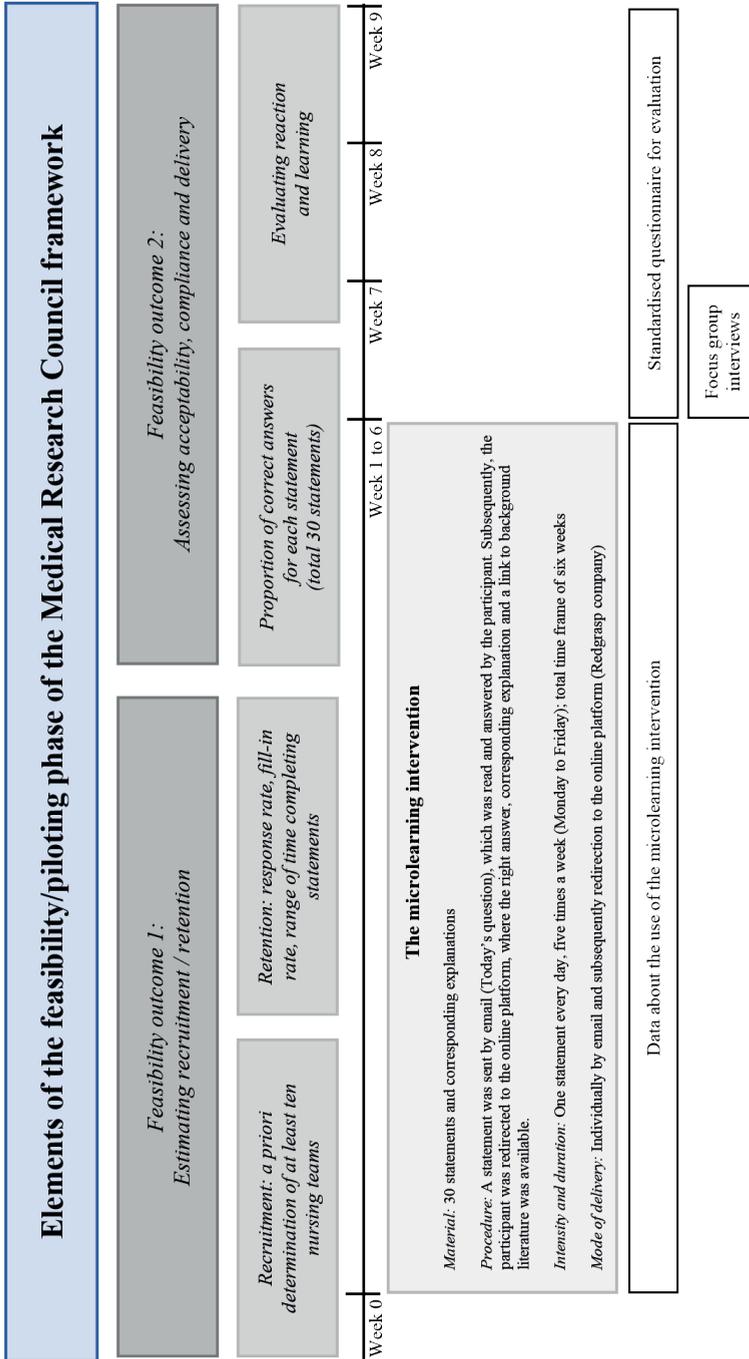


Figure 1. Design of the feasibility study and overview of the microlearning intervention

### **The microlearning intervention**

Our microlearning intervention is aimed to promote nurses' and nursing assistants' behaviour change by affecting factors that influence current behaviour in nutritional care for older adults. The microlearning intervention included 30 statements and corresponding explanations about nursing nutritional care for older adults. The statements were presented in a snack-sized way, one statement per day, five times a week from Monday to Friday for a total duration of six weeks (16 April till 25 May 2018). Daily, each participant received one statement by email individually (Today's question). The statement was read and answered (true or false) in the email. The participant was subsequently redirected to an online platform from Redgrasp B.V. (Utrecht, the Netherlands), a company providing an online platform to certify healthcare professionals, where the right answer and corresponding explanation was given together with positive rewards expressed in points. For each statement, the total time investment was circa three minutes. Also, a link to background literature and a discussion forum was made available. In addition, each participant received weekly updates about the average response of all participants on the statements and an individual total response score for all statements up until that time point.

The development of the 30 statements comprised generating themes and statements, assessing content validity and language, elaborating explanations corresponding to statements, and establishing readability and face validity of both statements and explanations.<sup>27,28</sup> The 30 statements reflect a full range of nutrition and nursing themes covering nursing nutritional care for older adults in hospital and home care. To stimulate active learning, we constructed the statements in a manner to raise the level of conceptual and procedural knowledge, and stimulate cognitive processes that promote transfer of learning, such as understanding, applying, analysing, evaluating and creating. This was based on the revised Bloom's Taxonomy Model and our goal was to stimulate transfer of knowledge to new situations, and meaningful learning, thinking and problem solving.<sup>29</sup> In this way, factors that influence nurses' and nursing assistants' current behaviour were positively affected and as a consequence, behaviour change was promoted. Furthermore, the response option to a single statement was dichotomised<sup>28</sup> into 'true' or 'false'.<sup>30</sup> All answers were based on literature and therefore formulated as absolutely true or false. Because there may be a discrepancy between literature and situations in routine nursing practice, one could argue that some answers were not always absolutely true or false. This enabled us to promote discussion and self-reflection.<sup>29</sup> Also, in ordering the statements, we build up the difficulty level to stimulate continuous learning.<sup>31</sup> The 30 statements can be found in Appendix 1.

## Feasibility outcomes

The first feasibility outcome was recruitment and retention of participants for following the microlearning intervention.<sup>21</sup> Estimating recruitment of at least ten nursing teams was a priori determined to provide useful information regarding our feasibility outcomes.<sup>25</sup> Estimating retention was established with data about the use of the microlearning intervention collected from the online platform. These included the response rate (overall, per statement), completing statements (total, per participant) and the range of time in which statements were completed.

The second feasibility outcome was the acceptability, compliance and delivery of our educational intervention.<sup>21</sup> We defined this outcome as 1) the proportion of correct answers given on each statement (total 30 statements) and 2) assessing reaction and learning of nurses and nursing assistants using the first two levels of Kirkpatrick's four-level training evaluation model.<sup>32,33</sup>

The proportion of correct answers was calculated as a percentage from data about the use of the microlearning intervention collected from the online platform where a statement was answered correctly or incorrectly. Reaction and learning were measured with 1) a standardised self-reported questionnaire for evaluation of the intervention from the online platform Redgrasp and 2) focus group interviews.

### *Standardised self-reported questionnaire for evaluation of the intervention*

A standardised questionnaire for evaluation of the intervention from the online platform Redgrasp was distributed among all participants. They received an email from the online platform with an invitation to fill in the questionnaire together with a link to the questionnaire, which was available on the online platform. The questionnaires were collected for a period of three weeks from three days after the last statement (statement 30) was sent (between May 28 and June 18, 2018). The questionnaire consisted of a set of twenty questions: thirteen questions assessing nurses' and nursing assistants' reaction to the intervention, five questions assessing their learning from intervention and two questions combining reaction and learning. Three questions were open ended and seventeen questions were multiple choice with a five-point Likert scale as answer option (see Appendix 2).

### *Focus group interviews*

Two focus group interviews were conducted and held within one week after the last statement of our intervention was sent (between May 25 and June 1, 2018) to increase the probability of recalling solid information about the intervention.<sup>34</sup> Due to nurses' and nursing assistants' busy and irregular work schedule, two focus groups were held

at two different time points to increase the chance of participation.<sup>35</sup> All nurses and nursing assistants who took part in the intervention were approached to establish a representative sample of the total group. We aimed to include five till twelve participants per focus group.<sup>26</sup> They were invited by one researcher (DtC) via the head of the nursing teams in the hospital, or district manager or nurse team coordinator in the home care organisation through the work email of each nurse and nursing assistant.

We developed a protocol including a semi-structured interview guide.<sup>35,36</sup> Participants' perceptions regarding reaction and learning towards our microlearning intervention were operationalised into open-ended questions.<sup>34</sup> Moderation of the focus group session was done by MvW and two members of the research team (LvV, IH) observed the discussion and took field notes and made audio recordings. The duration of each focus group interview was 69 minutes and 58 minutes respectively.

### **Feasibility criteria**

A priori, we set no criteria for assessing success of the feasibility objectives.<sup>25</sup> With several researchers from our team, we critically reflected on the study results and agreed consensus on success factors and key considerations.

### **Data analysis**

We quantitatively analysed 1) response rate, fill-in rate and range of time in which statements were completed, 2) the proportion of correct answers of each statement, 3) questions with multiple-choice options from the standardised questionnaire for evaluation of the intervention and 4) demographic characteristics of the participants of the focus groups. The quantitative data were reported as frequency (percentage) for categorical variables. Continuous variables were expressed as mean (SD) or median (Q1, Q3) in case of normal or skewed distribution respectively. The data from the open-ended questions of the standardised questionnaire were categorised and displayed as frequency (percentage). Data analyses were performed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp, Armonk, NY).

Qualitative data from the focus group interviews were transcribed verbatim. The focus group interviews were analysed using thematic analysis.<sup>37</sup> Therefore, QSR International's NVivo 12 qualitative data analysis software (NVivo qualitative data analysis software version 12, QSR International Pty Ltd., 2018) was used. Both focus group interviews were analysed independently by two members of the research team (DtC, IH). After each focus group, they held a face-to-face meeting to discuss the codes. Also, one additional consensus meeting was held with two other members of the research team (JD, LvV), after the second focus group, to discuss and confirm

codes, themes and sub-themes, and their potential relationships. Also, the themes were defined and named. The analysis process was data driven, but the research question was kept in mind.<sup>37</sup>

### **Trustworthiness**

Trustworthiness of both focus group interviews was ensured by writing a protocol with a semi-structured interview guide, collaboration with participants, prolonged engagement with the data during the data collection and data analysis, member checking and researcher triangulation.<sup>34</sup>

### **Ethical aspects**

This study was approved by the Medical Research Ethics Committee of the University Medical Center Utrecht, the Netherlands (18-236/C) and the local Ethics Committee of the St. Antonius Hospital Nieuwegein, the Netherlands (P18.009). All participants gave implied consent for the use of their data from the intervention and standardised questionnaire for evaluation of the intervention from the online platform Redgrasp after being informed completely. Implied consent was sufficient because the data was not traceable to specific participants and the potential risk of participating in this study was estimated low.<sup>38</sup> The collected data was treated with appropriate confidentiality. For the focus group interviews, nurses and nursing assistants obtained written informed consent at the start of data collection.<sup>34</sup>

7

## **Results**

### **Participant flow and characteristics**

Of the 341 nurses and nursing assistants who received the statements daily in their mail, (hospital: n = 252; home care: n = 89), 306 (89.7%) actively participated (hospital: n = 227; home care: n = 79). Of these participants, 87.9% was female and 73% worked as a nurse (see Table 1).

### **Feasibility outcome 1: Retention of participants**

The overall response rate was 89.7% (response rate hospital: 90.1%; home care: 88.8%). In total, 6,096 out of 9,180 (66.4%) of the statements were completed. The lowest response rate was 60.5% for statement 28 and the highest response rate was 72.9% for statement 19 (see Table 2). The median (Q1, Q3) score for completed statements per participant was 23 (12, 28), with a minimum of 1 statement and a maximum of 30 statements. Of all the participants, 78.8% replied to the statements within three days (median (Q1, Q3): 1 (1, 3) days).

**Table 1.** Demographic characteristics of participants

Characteristics	Total (n = 306)	Hospital (n = 227)	Home care (n = 79)
Female, n (%)	269 (87.9)	199 (87.7)	70 (88.6)
Position, n (%)			
Nurse <sup>†</sup>	222 (73.0)	187 (83.1) <sup>‡</sup>	35 (44.3)
Nursing assistant	40 (13.2)	0 (0)	40 (50.6)
Nurse student	42 (13.8)	38 (16.9)	4 (5.1)
Setting, n (%)			
University hospital	51 (16.7)		
Geriatrics department		29 (56.9)	
Internal medicine department		22 (43.1)	
General hospital	176 (57.5)		
General surgical/Internal medicine department 1 <sup>§</sup>		96 (54.6)	
General surgical/Internal medicine department 2 <sup>¶</sup>		68 (38.6)	
Outpatient department preoperative preparation		12 (6.8)	
Home care organisation A	45 (14.7)		
Nursing team 1			9 (20.0)
Nursing team 2			8 (17.8)
Nursing team 3			9 (20.0)
Nursing team 4			7 (15.6)
Nursing team 5			7 (15.6)
Nursing team 6			5 (11.1)
Home care organisation B	34 (11.1)		
Nursing team 1			10 (29.4)
Nursing team 2			10 (29.4)
Nursing team 3			14 (41.2)

<sup>†</sup> Educational level of the nurses was either EQF level 4, EQF level 6 or EQF level 7 (*Abbreviation:* EQF = European Qualifications Framework).

<sup>‡</sup> Eight nurses combined their work as a nurse with the function of coordinator of the nursing department.

<sup>§</sup> This department is specialised in Gastro-intestinal surgery, and Gastroenterology and liver disease.

<sup>¶</sup> This department is specialised in Haematology and Nephrology.

## **Feasibility outcome 2: The acceptability, compliance and delivery of our microlearning intervention**

### *The proportion of correct answers*

The proportion of correct answers ranged from 22.3% to 98.5% with a mean of 72.2% (see Table 2).

### *Evaluating reaction and learning*

#### **Standardised self-reported questionnaire for evaluation of the intervention**

Of the 306 participants, 94 filled in the questionnaire (hospital: n = 57; home care: n = 37), which is a response rate of 30.7% (hospital: 25.1%; home care: 46.8%). More than 90% of the participants was female and 75.5% worked as a nurse. Of all the participants, 66% was (very) satisfied with the microlearning intervention. More than 69% of the participants (totally) agreed that they learned something new and 70.2% (totally) agreed that they refreshed their knowledge with the intervention. Over 45% of the participants stated they usually or always discussed a question with a colleague and 71% (totally) agreed that the intervention can contribute to improve quality of care. More than 57% explained they thought it was a pity that the intervention was over and 64.1% underlined they would continue filling in statements when these were asked daily.

As positive aspects of the intervention, 12.8% of the participants pointed out that the intervention was a fun way to gain knowledge and 12.8% stated that they appreciated that a good explanation was given immediately. As key considerations, 22.3% of the participants reported that statements were not always well formulated or unambiguous, 5.3% indicated that statements were too much focused on the hospital setting and 4.3% mentioned that the total time frame of six weeks was too long or too many statements were presented. Over 8% of the participants underlined that answers of particular statements were not always absolutely true or false and 3.2% stated that statements were too simple. More results from the questionnaire can be found in Appendix 2.

**Table 2.** Fill-in rate and proportion of correct answers for the 30 statements of the microlearning intervention

No.	Difficulty <sup>a</sup>	Statement <sup>b</sup> (correct answer)	Response rate, n (%)	Proportion correct answers, n (%)
1.	Easy	For a nurse / nursing assistant, an important intervention is always to monitor what and how much a frail older care recipient has eaten (T)	188 (64.4) <sup>†</sup>	176 (93.6)
2.	Easy	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse / nursing assistant (F)	206 (70.5) <sup>†</sup>	201 (97.6)
3.	Easy	It is the task of the nurse / nursing assistant to set up the environment in such a way that the older care recipient can eat well (T)	202 (69.2) <sup>†</sup>	189 (93.6)
4.	Easy	At admission / intake, nurses / nursing assistants must provide information to older care recipients about the importance of protein intake through normal food (T)	208 (71.2) <sup>†</sup>	167 (80.3)
5.	Easy	As a nurse / nursing assistant, you barely have influence on changing eating patterns resulting from a form of dementia (F)	197 (67.5) <sup>†</sup>	185 (93.9)
6.	Moderate	During the anamnesis / intake, it is undesirable to ask supplementary questions about personal eating habits and food preferences, because it compromises the older care recipient's privacy (F)	204 (69.9) <sup>†</sup>	201 (98.5)
7.	Moderate	The best way of screening for malnutrition is to keep checking with the older care recipient himself / herself if he / she has lost weight in the past month (F)	200 (65.4)	124 (62.0)
8.	Moderate	It is good to advise a malnourished older adult on a protein-enriched diet to exercise less to prevent weight loss (F)	204 (66.7)	193 (94.6)
9.	Moderate	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern (F)	202 (66.0)	148 (73.3)
10.	Moderate	It is primarily the dietitian's job to prescribe interventions for malnutrition (F)	207 (67.6)	149 (72.0)
11.	Difficult	It is the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan) (T)	192 (62.7)	133 (69.3)
12.	Difficult	When it has been determined that an older adult is malnourished, the first priority is to start with energy- and protein-enriched drinks (F)	211 (69.0)	47 (22.3)
13.	Difficult	The older care recipient always carries prime responsibility for his / her nutrition (F)	198 (64.7)	78 (39.4)
14.	Difficult	Older people chew less well than younger people, causing them to feel saturation earlier (T)	199 (65.0)	81 (40.7)
15.	Difficult	It is important to let older care recipients take their medicines with a glass of water before meals (F)	199 (65.0)	129 (64.8)
16.	Easy	Physical recovery following hospital treatment is more important than sufficient dietary intake (F)	210 (68.6)	198 (94.3)

Table 2. Continued

No.	Difficulty <sup>a</sup>	Statement <sup>b</sup> (correct answer)	Response rate, n (%)	Proportion correct answers, n (%)
17.	Easy	An older care recipient eats less when a nurse / nursing assistant is present at the scene, because this disturbs the older care recipient in his / her eating ritual (F)	213 (69.6)	180 (84.5)
18.	Easy	In older care recipients of, for example, Turkish or Moroccan descent, providing information about medication is more important than about nutrition, because they are by nature susceptible to type 2 diabetes mellitus (F)	211 (69.0)	204 (96.7)
19.	Easy	Only when there is weight loss can we speak of malnutrition (F)	223 (72.9)	195 (87.4)
20.	Easy	It is the task of the nurse / nursing assistant to stimulate a single older care recipient to eat together, for example, with family, friends or at an association (T)	209 (68.3)	185 (88.5)
21.	Easy	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation (F)	213 (69.6)	158 (74.2)
22.	Moderate	When an older care recipient is malnourished, it is important to recommend sweet snacks, as desired, so that they at least consume something (F)	210 (68.6)	128 (61.0)
23.	Moderate	Measuring the albumin blood level is the most reliable method to identify malnutrition (F)	210 (68.6)	171 (81.4)
24.	Moderate	It is conducive to the general health of an older adult with a BMI > 25 kg/m <sup>2*</sup> that he / she loses 5 kg of weight in a short period of time due to disease (F)	208 (68.0)	191 (91.8)
25.	Moderate	The main cause of malnutrition is poor oral health (F)	198 (64.7)	159 (80.3)
26.	Moderate	Also in the palliative phase it is important for older care recipients to maintain current dietary restrictions to ensure that this situation will not be worsened (F)	201 (65.7)	147 (73.1)
27.	Moderate	It is important always to follow the protocol to keep older care recipients fasting before surgery (F)	196 (64.1)	57 (29.1)
28.	Moderate	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake (F)	185 (60.5)	121 (65.4)
29.	Difficult	Because the sense of smell and taste diminishes in older adults, they can enjoy food less (F)	200 (65.4)	53 (26.5)
30.	Difficult	Older people should drink more than younger people, among other things, because it reduces the risk of obstipation (T)	192 (62.7)	69 (35.9)

Abbreviations: F = false; T = true.

<sup>a</sup> Difficulty of statements was a priori set at: easy (proportion well-answered statements  $\geq 0.83$ ), moderate (proportion well-answered statements between 0.5 and 0.83) and difficult (proportion well-answered statements  $\leq 0.5$ ).

<sup>b</sup> The statements were presented to the participants in the Dutch language (see Appendix 1).

<sup>†</sup> For statement 1 through 6, a total of 292 participants filled in these statements. One home care team (n = 14) participated in the study from statement 7.

<sup>\*</sup> In the Netherlands, BMI cut-off point for normal weight and overweight in adults is 25 kg/m<sup>2</sup>. This may differ between countries or populations.

### Focus group interviews

A total of seven participants (five nurses, one nursing assistant and one nurse student) were engaged in the focus group interviews. Their median age was 28 years and 57.1% was female. The median duration of the participants' current employment was 2.4 years (see Table 3).

**Table 3.** Demographic characteristics of participants of the focus group interviews

Characteristics	Participants (n = 7)
Age (years), median (Q1, Q3)	28 (23, 29)
Female, n (%)	4 (57.1)
Position, n (%)	
Nurse	5 (71.4)
Nursing assistant	1 (14.3)
Nurse student	1 (14.3)
Setting, n (%)	
Hospital	2 (28.6)
Home care	5 (71.4)
Highest level of education, n (%)	
NLQF/EQF level 4	3 (42.9)
NLQF/EQF level 6	4 (57.1)
Work experience (years), median (Q1, Q3)	
In current employment	2.4 (0.8, 4.7)
In nursing (total)	3.2 (0.8, 8.8)

*Abbreviations:* EQF = European Qualifications Framework; NLQF = Netherlands National Qualifications Framework; Q1 = first quartile; Q3 = third quartile.

Two key themes (with sub-themes) emerged from the focus group interviews: reaction (two sub-themes: 'positive response' and 'constructive criticism') and learning (two sub-themes: 'way of learning' and 'acquired knowledge'). A complete overview of the themes, sub-themes and explanations are presented in Appendix 3.

### Reaction

The participants gave both positive responses and constructive criticism to our intervention. Examples of positive responses were that the intervention was fun, it took little (time) investment and was easily accessible. The participants valued the rewarding, game element and competition of the online platform. Furthermore, they pointed out that the statements were relevant, concrete, diverse and educational.

*"In the team ... everyone really enjoyed doing it [participate in the intervention]. [It was] easily accessible, [it] takes little time."* (home care nursing assistant)

Examples of constructive criticism were that a few participants considered the intervention caused too much strain and that the total time frame of the intervention was too long. Also, they pointed out that non-rewarding cues and failing intervention technology were demotivating. They mentioned that statements were not always well formulated or matched with the corresponding explanations.

*"... The question [statement] was not always logical. ... And the answer to that was sometimes, was not quite right."* (hospital nurse)

## **Learning**

The participants expressed how and what they learned from the intervention. They stated that they learned individually but also within the team by scheduling time and filling in the statements together, discussion, and evaluation of the content of the statements.

*"At some moment, ... there was a question [statement] about responsibility. And my colleague who is home care nurse, ... yes that the older care recipient carries prime responsibility. She had filled in 'yes' while the answer was 'no'. ... It ... is a debatable point. But the nice thing is that we discussed it with each other."* (home care nurse)

Furthermore, they pointed out that they learned from the content, formulation and careful reading of the statements and corresponding explanations, and through the kind of learning via the online platform.

*"Well, I think with the questions [statements] you answered wrong, it triggers to read the key [corresponding explanation] anyway. Because then you want to read why you made the mistake."* (home care nurse)

The participants mentioned they learned about all the themes included in the intervention or specific topics regarding nutritional care for older adults.

*"There was also a question [statement] about a palliative care recipient for example. ... About the amount of food I think. Whether it was important or not. ... I considered that educational."* (home care nurse)

The participants stated that they were more aware and increased self-reflection about nutritional care for older adults and enhanced their own expertise.

*“It makes you a bit aware of nutrition and ... how important it is in the disease process. You already knew it, but now ... it just makes you aware and more alert about it.”* (hospital nurse)

## Discussion

In this study, we assessed the feasibility of our microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants in fourteen nursing teams using a mixed-methods approach. First, a total of 306 nurses and nursing assistants participated actively and retention, which was operationalised in response rate, completion of statements and time of filling in statements, was satisfactory. Second, the proportion of correct answers was overall more than sufficient. Reaction on the intervention was both positive and constructive and nurses and nursing assistants confirmed they mostly learned from the intervention and that they learned in different ways. Overall, the intervention was acceptable to the participants and compliance and delivery was adequate.

We found a proportion of correct answers of 72.2%. This percentage is higher than in other studies, where, although other measurements used, the percentage of correct answers was between 51.9% and 61.9%.<sup>11,39</sup> Furthermore, the proportion of correct answers for nine statements scored above 90%. In addition, although the majority of the nurses and nursing assistants stated that they had learned something new or at least refreshed their knowledge, this was not the case for some participants. On the one hand, we used dichotomous answer options in our intervention and compared to the other studies, where multiple answer options were used,<sup>11,39</sup> this increases the guessing percentage and may explain the high percentage of correct answers. Furthermore, some statements may have been too easy for one or more subgroups of the participants with specific characteristics. For our sample, we did not collect this data, but from the literature it is known that the proportion of correct answers is unrelated to work experience,<sup>39,40</sup> but is related to higher education<sup>41</sup> and following additional training in nutrition.<sup>40,41</sup> On the other hand, previous studies have shown that nurses and nursing assistants lack to provide appropriate nutritional care to older adults in daily practice, even if it concerns easily accessible or small-time activities.<sup>10-12,15</sup> Evidently, their knowledge applied in practice may to some extent be absent.<sup>29</sup> In our study, participants' knowledge about nursing nutritional care in theoretical context through the 30 statements of our intervention seems to be present,

as well as their ability to remember information, explaining the high proportion of correct answers. However, it is inconclusive how their knowledge applied in practice is, because measuring participants' behaviour in providing nutritional care to older adults was outside the scope of this feasibility study.

An interesting finding from our study was that nurses and nursing assistants mentioned that statements and explanations did not always correspond and answers were not always absolutely true or false. Concerning the statements and explanations, this may be the case and is a point of reflection for the research team. Indeed, some answers to individual statements were not always absolutely true or false, but we aimed to promote discussion and self-reflection, which we regarded as adequate strategies to enhance active learning.<sup>29</sup> On the one hand, in some nursing teams, statements and corresponding answers and explanations were indeed discussed and that some answers were not absolutely true or false may have contributed to the discussion. On the other hand, it may be that participants were not fully aware that answers were not absolutely true or false, which resulted in that they insufficiently demonstrated self-reflection.<sup>29</sup> This may imply that nurses and nursing assistants were not fully able to comprehensively learn and that additional strategies may be required.

The participating nurses and nursing assistants in our study were largely positive towards the online and snack-sized delivery of the intervention, which they considered easily accessible. This in turn facilitated incorporation of the intervention into their workplace. When developing the intervention, we addressed high workload as one of the priorities to realise an optimal fit between the intervention and its context of the hospital and home care setting. Surely, in their daily work, nurses and nursing assistants are confronted with a high workload mainly due to complex care activities to be performed in a short period of time and shortage of staff.<sup>42,43</sup> As a result, there is a lack of time to take staff off their workplace to educate them.<sup>19,44</sup> It seems confirmed that our intervention made it possible that nurses and nursing assistants spent only three minutes approximately a day on one statement, at a time that suited them. At the same time, they had the opportunity to learn about nutritional care for older adults in the busy hours of their routine practice.

We found that besides learning on an individual level through content and careful reading, several nursing teams scheduled joint time to focus on the statements to learn in different ways on team level. The participants mentioned they filled in the statements together, they discussed and evaluated statements, corresponding answers and explanations, and the weekly score update of their and other participating teams. We may conclude that the participating nurses and nursing

assistants adequately learned in different ways in different situations. But also, evidently, several environmental and team factors, such as workplace culture supporting learning, social support and support from the management may have enhanced learning.<sup>44-46</sup> It seems that these nursing teams both actively learned and contributed to successful integration of the intervention in their daily practice.

Participating hospital and home care nurses and nursing assistants also mentioned some barriers in delivering our intervention, such as non-rewarding cues, failing intervention technology and ambiguity towards the total time frame of six weeks. Most participants were satisfied with this time frame, but some mentioned it was too long. We chose six weeks and for some participants, this may be a suitable period, but for others this may be too much time. What is important is to deliver the intervention in a reasonable period of time to facilitate successful learning but to avoid learning demotivation due to longevity.<sup>29,47</sup> Furthermore, all these barriers are important to consider and should be evaluated and dealt with in collaboration between the research team, nursing teams and other stakeholders. Further fine-tuning to overcome these barriers is necessary to prevent nurses and nursing assistants from dropping out and that further implementation becomes a challenge.<sup>21,22</sup>

### **Strengths and limitations**

A strength of our study is that we systematically and vigorously conducted a feasibility study by using the MRC framework and following a mixed-methods approach to gain insight into the feasibility of our microlearning intervention.<sup>21</sup> Another strength is that our study included a large sample of 306 nurses and nursing assistants from fourteen teams who participated actively and response rates were high. Also, we applied methodological triangulation using multiple data collection methods resulting in increasing validity of the study results.<sup>26</sup>

This study had several limitations. First, we used a purposive sampling method. This could have led to researcher bias due to assessing subjectively during inclusion and consequently for an adequate representation of the hospital and home care nurses and nursing assistants providing nutritional care to older adults.<sup>26</sup> However, study inclusion of the fourteen nursing teams was based on the judgement of multiple researchers of this study increasing validity. Also, the number of included participants exceeded what was necessary for a feasibility study.<sup>25</sup> During recruitment, we approached quite some nursing teams and contrary to expectation, more teams participated. Second, validation of the used standardised self-reported questionnaire was unclear. However, the questionnaire gave us more insight into one of the feasibility outcomes of our study and subsequently contributed to

methodological triangulation by complementing the other data collection methods used in this study.<sup>26</sup> Third, the number of participants in both focus group interviews was relatively low. This possibly led to an underrepresentation of participants and hence the results from the two focus groups interviews should be interpreted with caution.<sup>26,34</sup> However, the data from the standardised questionnaire showed similar results, which may suggest that the data from the focus group interviews are valid.

### **Future research**

First, we suggest that some of the statements, their explanations and answer options need to be reconsidered and in addition the number of statements about nursing nutritional care for older adults specifically tailored to subgroups within the nursing teams may be expanded. Second, additional strategies to further stimulate self-reflection should be explored. Third, eliminating non-rewarding cues, optimisation of the intervention technology and an appropriate time frame for delivering the statements for all participants should be addressed. Then, focus should be on re-examining feasibility outcomes and even nurse-related outcomes in a feasibility or pilot study emphasising implementation, context and system fit through a hybrid feasibility or pilot – implementation design.<sup>21,22</sup> An iterative approach in the development – evaluation – implementation process of complex interventions such as our educational intervention is also recommended by the MRC framework.<sup>21</sup> Fourth, for legitimising the standardised questionnaire, it should be further validated to ensure that it measures reaction to and learning from the intervention.<sup>28</sup>

### **Conclusion**

In this study, we demonstrated that our microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants is mostly feasible. Feasibility outcomes regarding recruitment and retention for following the microlearning intervention, and acceptability, compliance and delivery were generally satisfying. There were some constraints to take into account such as statement formulation and explanation, stimulating self-reflection, non-rewarding cues, failing technology and the length of the total time frame. This means that the intervention needs refinement to improve feasibility by repeating the development phase and subsequently the feasibility phase concurrently considering implementation, context and system fit during both phases. This microlearning intervention holds the promise to successfully promote hospital and home care nurses' and nursing assistants' behaviour change in nutritional care eventually supporting older adults' health, well-being and nutritional status.

## Acknowledgements

We thank all the nurses, nursing assistants and experts for participating in this study. We also thank Irma Hoekstra and Marjolein van Wijk for their contribution to the focus group interviews. Our special recognition goes to Canan Ziylan for her enthusiastic and valuable involvement during the intervention period.

## References

1. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *Lancet*. 2012;380(9836):37-43.
2. Lai FTT, Wong SYS, Yip BHK, Guthrie B, Mercer SW, Chung RY, et al. Multimorbidity in middle age predicts more subsequent hospital admissions than in older age: A nine-year retrospective cohort study of 121,188 discharged in-patients. *Eur J Intern Med*. 2019;61:103-111.
3. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Hooper L, Kiesswetter E, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clin Nutr*. 2022;41(4):958-989.
4. World Health Organization. Multimorbidity: Technical series on safer primary care. Geneva: World Health Organization; 2016.
5. Schuurmans M. Beroepsprofiel verpleegkundige. Lambregts J, Grotendorst A, editors. *Leren van de toekomst, Verpleegkundigen en verzorgenden 2020*. [Professional profile of nursing. Lambregts J, Grotendorst A, editors. *Learning from the future, V&V 2020*]. Houten: Bohn Stafleu van Loghum; 2012.
6. World Health Organization. Enhancing nursing and midwifery capacity to contribute to the prevention, treatment and management of noncommunicable diseases in practice: policy and advocacy, research and education. Geneva: World Health Organization; 2012.
7. Zwakhalen S, Hamers J, Metzethin S, Ettema R, Heinen M, de Man – van Ginkel J, et al. Basic nursing care: The most provided, the least evidence based – A discussion paper. *J Clin Nurs*. 2018;27(11-12):2496-2505.
8. Shlisky J, Bloom DE, Beaudreault AR, Tucker KL, Keller HH, Freund – Levi Y, et al. Nutritional considerations for healthy aging and reduction in age-related chronic disease. *Adv Nutr*. 2017;8(1):17-26.
9. World Health Organization. Decade of healthy ageing 2020 – 2030. Geneva: World Health Organization; 2020.
10. ten Cate D, Schuurmans MJ, van Eijk J, Bell JJ, Schoonhoven L, Ettema RGA. Factors influencing nurses' behavior in nutritional care for community-dwelling older adults before, during, and after hospitalization: A Delphi study. *J Contin Educ Nurs*. 2022;53(12):545-556.
11. Boaz M, Rychani L, Barami K, Houry Z, Yosef R, Siag A, et al. Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs*. 2013;44(8):357-364.
12. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci*. 2013;27(2):440-448.
13. Bachrach – Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff working with older people towards nutritional nursing care. *J Clin Nurs*. 2007;16(11):2007-2014.
14. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs*. 2014;24(5-6):696-706.
15. Bell J, Bauer J, Capra S, Pulle CR. Barriers to nutritional intake in patients with acute hip fracture: time to treat malnutrition as a disease and food as a medicine? *Can J Physiol Pharmacol*. 2013;91(6):489-495.
16. 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(1):41-46.
17. Sundel M, Sundel S. *Behavior change in human services: Behavioral and cognitive principles and applications*. 6th ed. Los Angeles: SAGE Publications, Inc; 2018.
18. Michie S, van Stralen M, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42.

19. Michie S, Atkins L, West R. The behaviour change wheel. A guide to designing interventions. Sutton: Silverback Publishing; 2014.
20. Bleijenberg N, de Man – van Ginkel JM, Trappenburg JCA, Ettema RGA, Sino CG, Heim N, et al. Increasing value and reducing waste by optimizing the development of complex interventions: Enriching the development phase of the Medical Research Council (MRC) Framework. *Int J Nurs Stud.* 2018;79:86-93.
21. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new medical research council guidance. *BMJ.* 2008;337:979-983.
22. Skivington K, Matthews L, Simpson SA, Craig P, Baird J, Blazeby JM, et al. A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. *BMJ.* 2021;374:n2061.
23. ten Cate D, Dikken J, Ettema RGA, Schoonhoven L, Schuurmans MJ. Development of a microlearning intervention regarding nursing nutritional care for older adults: A multi-methods study. *Nurse Educ Today.* 2023;120:105623.
24. Buchem I, Hamelmann H. Microlearning: a strategy for ongoing professional development. *eLearning Papers.* 2010;21:1-15
25. Thabane L, Ma J, Chu R, Cheng J, Ismaila A, Rios LP, et al. A tutorial on pilot studies: the what, why and how. *BMC Med Res Methodol.* 2010;10:1.
26. Polit DF, Beck CT. *Nursing research: Generating and assessing evidence for nursing practice.* 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2017.
27. Terwee CB, Prinsen CAC, Chiarotto A, Westerman MJ, Patrick DL, Alonso J, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. *Qual Life Res.* 2018;27(5):1159-1170.
28. de Vet HCW, Terwee CB, Mokkink LB, Knol DL. *Measurement in medicine: A practical guide.* Cambridge: Cambridge University Press; 2011.
29. Anderson LW, Krathwohl DR, editors. *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives.* New York: Addison Wesley Longman, Inc; 2001.
30. de Gruijter D. *Toetsing en toetsanalyse. [Testing and test analysis].* Leiden: Rijksuniversiteit Leiden; 2008.
31. Chiaburu D, Tekleab A. Individual and contextual influences on multiple dimensions of training effectiveness. *J Eur Ind Train.* 2005;29(8):604-626.
32. Kirkpatrick DL. Evaluation of training. Craig RL, editor. *Training and development handbook: A guide to human resource development.* New York: McGraw Hill; 1976.
33. Kirkpatrick D, Kirkpatrick J. *Evaluating training programs.* San Francisco: Berrett-Koehler Publishers; 1994.
34. Creswell JW. *Qualitative inquiry and research design: Choosing among five approaches.* 3rd ed. London: SAGE Publications; 2013.
35. Boeije H. *Analysis in qualitative research.* 1st ed. London: SAGE Publications; 2010.
36. Dutch IHI. *Handleiding focusgroep onderzoek. [Manual focus group research].* Dutch IHI; 2004.
37. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol.* 2006;3(2):77-101.
38. Fowler F. *Survey research methods.* 5th ed. Thousand Oaks: Sage Publications Inc; 2013.
39. Bassola B, Tommasi V, Bonetti L, Bauer S, Lusignani M. Nurses' knowledge about malnutrition in older people: A multicenter cross-sectional study. *Nutrition.* 2020;78:110947.
40. Bauer S, Halfens R, Lohrmann C. Knowledge and attitudes of nursing staff towards malnutrition care in nursing homes: A multicentre cross-sectional study. *J Nutr Health Aging.* 2015;19(7):734-740.
41. Schönherr S, Halfens R, Lohrmann C. Development and psychometric evaluation of the Knowledge of Malnutrition - Geriatric (KoM-G) questionnaire to measure malnutrition knowledge among nursing staff in Australian Nursing Homes. *Scand J Caring Sci.* 2015;29(1):193-202.

42. Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Sermeus W for the RN4CAST Consortium. Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. *Int J Nurs Stud*. 2013;50(2):143-153.
43. Hegney DG, Rees CS, Osseiran – Moisson R, Breen L, Eley R, Windsor C, et al. Perceptions of nursing workloads and contributing factors, and their impact on implicit care rationing: A Queensland, Australia study. *J Nurs Manag*. 2019;27(2):371-380.
44. Nevalainen M, Lunkka N, Suhonen M. Work-based learning in health care organisations experienced by nursing staff: A systematic review of qualitative studies. *Nurse Educ Pract*. 2018;29:21-29.
45. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci*. 2017;12(1):77.
46. Bates R. A critical analysis of evaluation practice: the Kirkpatrick model and the principle of beneficence. *Eval Program Plann*. 2004;27(3):341-347.
47. Tze VM, Daniels LM, Klassen RM. Evaluating the relationship between boredom and academic outcomes: A meta-analysis. *Educ Psychol Rev*. 2016;28(1):119-144.
48. Brislin RW. Back-translation for cross-cultural research. *J Cross Cult Psychol*. 1970;1(3):185-216.
49. Maneesriwongul W, Dixon JK. Instrument translation process: a methods review. *J Adv Nurs*. 2004;48(2):175-186.

## Appendix

## Appendix 1. Statements about hospital and home care nurses' and nursing assistants' nutritional care for older adults

No.	Difficulty <sup>a</sup>	Statement in Dutch <sup>b</sup>	Statement in English <sup>b</sup>
1.	Easy	Het is een belangrijke interventie om als verpleegkundige / verzorgende altijd te monitoren hoeveel en wat een kwetsbare oudere zorgvrager gegeten heeft	For a nurse / nursing assistant, an important intervention is always to monitor what and how much a frail older care recipient has eaten
2.	Easy	Screening op ondervoeding is meestal niet nodig, omdat ondervoeding goed zichtbaar is op basis van observatie door de verpleegkundige / verzorgende	Screening for malnutrition is usually not necessary, because malnutrition is clearly visible based on the observation of the nurse / nursing assistant
3.	Easy	Het is de taak van de verpleegkundige / verzorgende om de omgeving zo in te richten dat de oudere zorgvrager goed kan eten	It is the task of the nurse / nursing assistant to set up the environment in such a way that the older care recipient can eat well
4.	Easy	Verpleegkundigen / verzorgenden moeten bij opname / intake voorlichting geven aan oudere zorgvragers over het belang van eiwitname via normale voeding	At admission / intake, nurses / nursing assistants must provide information to older care recipients about the importance of protein intake through normal food
5.	Easy	Als verpleegkundige / verzorgende heb je nauwelijks invloed op een veranderend eetpatroon door een vorm van dementie	As a nurse / nursing assistant, you barely have influence on changing eating patterns resulting from a form of dementia
6.	Moderate	Bij de anamnese / intake is het onwenselijk om door te vragen over persoonlijke eetgewoontes en voedselvoorkeur omdat dit de privacy van de oudere zorgvrager in het geding brengt	During the anamnesis / intake, it is undesirable to ask supplementary questions about personal eating habits and food preferences, because it compromises the older care recipient's privacy
7.	Moderate	De beste manier van screenen op ondervoeding blijft het navragen aan de oudere zorgvrager zelf of hij / zij is afgevallen in de afgelopen maand	The best way of screening for malnutrition is to keep checking with the older care recipient himself / herself if he / she has lost weight in the past month
8.	Moderate	Het is goed om een ondervoede oudere met een eiwitrijk dieet te adviseren om minder te bewegen om gewichtsverlies te voorkomen	It is good to advise a malnourished older adult on a protein-enriched diet to exercise less to prevent weight loss
9.	Moderate	Wanneer een oudere zorgvrager met obesitas depressief is, is het belangrijk om eerst de depressie te behandelen alvorens het voedingspatroon te bespreken	When an obese older care recipient is depressed, it is important to treat the depression prior to discussing the eating pattern
10.	Moderate	Het is hoofdzakelijk de taak van de diëtist om interventies voor te schrijven bij ondervoeding	It is primarily the dietitian's job to prescribe interventions for malnutrition
11.	Difficult	Het is de taak van de verpleegkundige om te faciliteren in dieetvoorkeuren (bijvoorbeeld halal, kosjer, veganistisch)	It is the task of the nurse to facilitate dietary preferences (e.g. halal, kosher, vegan)
12.	Difficult	Wanneer is vastgesteld dat een oudere ondervoed is, heeft het prioriteit om te starten met energie- en eiwitrijke drinkvoeding	When it has been determined that an older adult is malnourished, the first priority is to start with energy- and protein-enriched drinks

## Appendix 1. Continued

No.	Difficulty <sup>a</sup>	Statement in Dutch <sup>b</sup>	Statement in English <sup>b</sup>
13.	Difficult	De oudere zorgvrager blijft zelf hoofdverantwoordelijk voor zijn / haar voeding	The older care recipient always carries prime responsibility for his / her nutrition
14.	Difficult	Ouderen kauwen slechter dan jongeren, waardoor zij eerder verzadiging voelen	Older people chew less well than younger people, causing them to feel saturation earlier
15.	Difficult	Het is belangrijk om oudere zorgvragers voor het eten medicijnen in te laten nemen met een glas water	It is important to let older care recipients take their medicines with a glass of water before meals
16.	Easy	Fysiek herstel na een behandeling in het ziekenhuis is belangrijker dan voldoende voedingsname	Physical recovery following hospital treatment is more important than sufficient dietary intake
17.	Easy	Een oudere zorgvrager eet minder wanneer de verpleegkundige / verzorgende hierbij aanwezig is, omdat de oudere zorgvrager hierdoor gestoord wordt bij zijn / haar eetritueel	An older care recipient eats less when a nurse / nursing assistant is present at the scene, because this disturbs the older care recipient in his / her eating ritual
18.	Easy	Bij oudere zorgvragers van bijvoorbeeld Turkse of Marokkaanse afkomst is voorlichting geven over medicatie belangrijker dan over voeding omdat zij van nature aanleg hebben voor diabetes mellitus type II	In older care recipients of, for example, Turkish or Moroccan descent, providing information about medication is more important than about nutrition, because they are by nature susceptible to type 2 diabetes mellitus
19.	Easy	Alleen als er sprake is van gewichtsverlies kan er sprake zijn van ondervoeding	Only when there is weight loss can we speak of malnutrition
20.	Easy	Het is de taak van de verpleegkundige / verzorgende om een alleenstaande oudere zorgvrager te stimuleren om samen te eten met bijvoorbeeld familie, vrienden of bij een vereniging	It is the task of the nurse / nursing assistant to stimulate a single older care recipient to eat together, for example, with family, friends or at an association
21.	Easy	In het ziekenhuis is het eten altijd gebalanceerd en gezond waardoor risico op ondervoeding kleiner is dan in de thuissituatie	In the hospital, the food is always balanced and healthy, which makes the risk for malnutrition smaller than in the home situation
22.	Moderate	Als een oudere zorgvrager ondervoed is, is het belangrijk om zoete tussendoortjes naar wens aan te bevelen zodat ze in ieder geval iets binnenkrijgen	When an older care recipient is malnourished, it is important to recommend sweet snacks, as desired, so that they at least consume something
23.	Moderate	Het meten van de bloedwaarde albumine is de meest betrouwbare methode om ondervoeding vast te stellen	Measuring the albumin blood level is the most reliable method to identify malnutrition

## Appendix 1. Continued

No.	Difficulty <sup>a</sup>	Statement in Dutch <sup>b</sup>	Statement in English <sup>b</sup>
24.	Moderate	Het is bevorderlijk voor de algemene gezondheid van een oudere met een BMI > 25 kg/m <sup>2</sup> dat hij / zij door ziekte binnen korte tijd 5 kg afvalt	It is conducive to the general health of an older adult with a BMI > 25 kg/m <sup>2</sup> that he / she loses 5 kg of weight in a short period of time due to disease
25.	Moderate	De grootste oorzaak van ondervoeding is slechte mondgezondheid	The main cause of malnutrition is poor oral health
26.	Moderate	Bij oudere zorgvragers is het ook in de palliatieve fase belangrijk om bestaande voedingsrestricties te handhaven zodat de situatie niet verergert	Also in the palliative phase it is important for older care recipients to maintain current dietary restrictions to ensure that this situation will not be worsened
27.	Moderate	Het is belangrijk om altijd het protocol te volgen bij het nuchter houden van oudere zorgvragers voor een operatie	It is important always to follow the protocol to keep older care recipients fasting before surgery
28.	Moderate	Het is wenselijk dat de oudere zorgvrager drie keer per dag een volledige maaltijd opeet om onvoldoende voedingsinname te voorkomen	It is desirable for the older care recipient to eat a full meal three times a day to prevent insufficient dietary intake
29.	Difficult	Omdat de waarneming van geur en smaak vermindert bij ouderen kunnen zij minder genieten van eten	Because the sense of smell and taste diminishes in older adults, they can enjoy food less
30.	Difficult	Ouderen moeten meer drinken dan jongeren, onder andere omdat hiermee risico op obstipatie verkleind wordt	Older people should drink more than younger people, among other things, because it reduces the risk of constipation

<sup>a</sup> Difficulty of statements was set at: easy (proportion well-answered statements  $\geq 0.83$ ), moderate (proportion well-answered statements between 0.5 and 0.83) and difficult (proportion well-answered statements  $\leq 0.5$ ).

<sup>b</sup> The original statements are written in the Dutch language. The statements were translated into English according to the back-translation procedure.<sup>48,49</sup>

**Appendix 2.** Questions from the standardised self-reported questionnaire for evaluation of the intervention from the online platform Redgrasp

Questions	Total (n = 94), n (%)	Hospital (n = 57), n (%)	Home care (n = 37), n (%)
1. How likely are you to recommend this knowledge game <sup>†</sup> to a colleague?			
Very unlikely	3 (3.2)	3 (5.3)	0 (0)
○	11 (11.7)	5 (8.8)	6 (16.2)
○	15 (16.0)	12 (21.1)	3 (8.1)
○	35 (37.2)	21 (36.8)	14 (37.8)
Very likely	30 (31.9)	16 (28.1)	14 (37.8)
2. How satisfied are you with this knowledge game <sup>†</sup> ?			
Not satisfied	1 (1.1)	1 (1.8)	0 (0)
○	8 (8.5)	5 (8.8)	3 (8.1)
○	23 (24.5)	15 (26.3)	8 (21.6)
○	45 (47.9)	25 (43.9)	20 (54.1)
Very satisfied	17 (18.1)	11 (19.3)	6 (16.2)
3. I like this knowledge game <sup>†</sup> more than most e-learning			
Totally disagree	3 (3.2)	1 (1.8)	2 (5.4)
○	3 (3.2)	2 (3.6)	1 (2.7)
○	18 (19.4)	8 (14.3)	10 (27.0)
○	33 (35.5)	23 (41.1)	10 (27.0)
Totally agree	36 (38.7)	22 (39.3)	14 (37.8)
4. How much time did you spend on the knowledge game <sup>†</sup> per day (in minutes)?			
Mean (s.d.)	3.1 (2.5)	2.2 (1.6)	4.5 (3.0)
5. I learned something new through the knowledge game <sup>†</sup>			
Totally disagree	2 (2.1)	2 (3.5)	0 (0)
○	9 (9.6)	7 (12.3)	2 (5.4)
○	18 (19.1)	8 (14.0)	10 (27.0)
○	52 (55.3)	34 (59.6)	18 (48.6)
Totally agree	13 (13.8)	6 (10.5)	7 (18.9)
6. I refreshed my knowledge through the knowledge game <sup>†</sup>			
Totally disagree	3 (3.2)	3 (5.3)	0 (0)
○	8 (8.5)	6 (10.5)	2 (5.4)
○	17 (18.1)	10 (17.5)	7 (18.9)
○	43 (45.7)	25 (43.9)	18 (48.6)
Totally agree	23 (24.5)	13 (22.8)	10 (27.0)

## Appendix 2. Continued

Questions	Total (n = 94), n (%)	Hospital (n = 57), n (%)	Home care (n = 37), n (%)
7. Literature that I did not know existed was discussed			
Never	7 (7.4)	4 (7.0)	3 (8.1)
○	21 (22.3)	12 (21.1)	9 (24.3)
○	41 (43.6)	25 (43.9)	16 (43.2)
○	24 (25.5)	16 (28.1)	8 (21.6)
Always	1 (1.1)	0 (0)	1 (2.7)
8. Literature that I had not yet read was discussed			
Never	2 (2.2)	2 (3.5)	0 (0)
○	16 (17.2)	6 (10.5)	10 (27.8)
○	34 (36.6)	22 (38.6)	12 (33.3)
○	34 (36.6)	22 (38.6)	12 (33.3)
Always	7 (7.5)	5 (8.8)	2 (5.6)
9. Did you read the explanation of the answer?			
Never	0 (0)	0 (0)	0 (0)
○	16 (17.0)	13 (22.8)	3 (8.1)
○	17 (18.1)	10 (17.5)	7 (18.9)
○	29 (30.9)	18 (31.6)	11 (29.7)
Always	32 (34.0)	16 (28.1)	16 (43.2)
10. I sometimes discussed an item with a colleague			
Never	14 (15.1)	8 (14.3)	6 (16.2)
○	14 (15.1)	8 (14.3)	6 (16.2)
○	23 (24.7)	14 (25.0)	9 (24.3)
○	39 (41.9)	24 (42.9)	15 (40.5)
Always	3 (3.2)	2 (3.6)	1 (2.7)
11. Items were sometimes discussed among ourselves			
Never	16 (17.4)	10 (17.5)	6 (17.1)
○	19 (20.7)	13 (22.8)	6 (17.1)
○	20 (21.7)	10 (17.5)	10 (28.6)
○	34 (37.0)	22 (38.6)	12 (34.3)
Always	3 (3.3)	2 (3.5)	1 (2.9)
12. There was a discussion between colleagues about the weekly email with the score update			
Never	27 (28.7)	17 (29.8)	10 (27.0)
○	13 (13.8)	8 (14.0)	5 (13.5)
○	29 (30.9)	15 (26.3)	14 (37.8)
○	21 (22.3)	15 (26.3)	6 (16.2)
Always	4 (4.3)	2 (3.5)	2 (5.4)

## Appendix 2. Continued

Questions	Total (n = 94), n (%)	Hospital (n = 57), n (%)	Home care (n = 37), n (%)
13. I think the knowledge game <sup>†</sup> can contribute to improve the quality of care			
Totally disagree	2 (2.2)	2 (3.6)	0 (0)
○	6 (6.5)	5 (8.9)	1 (2.7)
○	19 (20.4)	9 (16.1)	10 (27.0)
○	46 (49.5)	26 (46.4)	20 (54.1)
Totally agree	20 (21.5)	14 (25.0)	6 (16.2)
14. I found it a pity that the knowledge game <sup>†</sup> was over			
Totally disagree	8 (8.5)	7 (12.3)	1 (2.7)
○	9 (9.6)	7 (12.3)	2 (5.4)
○	23 (24.5)	9 (15.8)	14 (37.8)
○	27 (28.7)	20 (35.1)	7 (18.9)
Totally agree	27 (28.7)	14 (24.6)	13 (35.1)
15. I would continue this knowledge game <sup>†</sup> if the items were asked daily			
Totally disagree	7 (7.6)	6 (10.7)	1 (2.8)
○	9 (9.8)	8 (14.3)	1 (2.8)
○	17 (18.5)	11 (19.6)	6 (16.7)
○	35 (38.0)	19 (33.9)	16 (44.4)
Totally agree	24 (26.1)	12 (21.4)	12 (33.3)
16. I would continue this knowledge game <sup>†</sup> if the items were asked three times a week			
Totally disagree	4 (4.3)	3 (5.4)	1 (2.7)
○	8 (8.6)	6 (10.7)	2 (5.4)
○	15 (16.1)	9 (16.1)	6 (16.2)
○	34 (36.6)	21 (37.5)	13 (35.1)
Totally agree	32 (34.4)	17 (30.4)	15 (40.5)
17. I would continue this knowledge game <sup>†</sup> if the items were asked twice a week			
Totally disagree	4 (4.3)	2 (3.5)	2 (5.4)
○	8 (8.5)	6 (10.5)	2 (5.4)
○	17 (18.1)	10 (17.5)	7 (18.9)
○	32 (34.0)	20 (35.1)	12 (32.4)
Totally agree	33 (35.1)	19 (33.3)	14 (37.8)
18. I would continue this knowledge game <sup>†</sup> if the items were asked once a week			
Totally disagree	5 (5.3)	3 (5.3)	2 (5.4)
○	6 (6.4)	5 (8.8)	1 (2.7)
○	17 (18.1)	9 (15.8)	8 (21.6)
○	26 (27.7)	14 (24.6)	12 (32.4)
Totally agree	40 (42.6)	26 (45.6)	14 (37.8)

## Appendix 2. Continued

Questions	Total (n = 94), n (%)	Hospital (n = 57), n (%)	Home care (n = 37), n (%)
19. What did you like about the knowledge game? <sup>†‡</sup>			
<b>Reaction</b>			
Fun way to gain knowledge	12 (12.8)	5 (8.8)	7 (18.9)
Informative	6 (6.4)	2 (3.5)	4 (10.8)
Took little time	5 (5.3)	3 (5.3)	2 (5.4)
Short item and immediate explanation	5 (5.3)	1 (1.8)	4 (10.8)
Practice-based items	3 (3.2)	1 (1.8)	2 (5.4)
Variety of items	3 (3.2)	1 (1.8)	2 (5.4)
Earn points	3 (3.2)	1 (1.8)	2 (5.4)
<b>Knowledge</b>			
Gained and/or refreshed knowledge	16 (17.0)	10 (17.5)	6 (16.2)
Good explanation that was given immediately	12 (12.8)	5 (8.8)	7 (18.9)
Awareness regarding the subject and own knowledge of the subject	7 (7.4)	2 (3.5)	5 (13.5)
Thought-provoking items	2 (2.1)	1 (1.8)	1 (2.7)
More awareness to provide care to older malnourished care recipients	2 (2.1)	1 (1.8)	1 (2.7)
20. What do you think could be better? <sup>†‡</sup>			
<b>Reaction</b>			
Items were not always well formulated or unambiguous	21 (22.3)	9 (15.8)	12 (32.4)
Items were too much focused on the hospital setting	5 (5.3)	0 (0)	5 (13.5)
Total time frame of the intervention was too long and too many items	4 (4.3)	4 (7.0)	0 (0)
<b>Knowledge</b>			
Answers were not always absolutely true or false	8 (8.5)	1 (1.8)	7 (18.9)
Items were too simple	3 (3.2)	1 (1.8)	2 (5.4)
Answers did not leave much room for discussion	2 (2.1)	2 (3.5)	0 (0)

† In this study, our educational intervention was also referred to as 'the knowledge game'.

‡ Frequency values regarding these questions reflect the number of participants who reported positive aspects and points of improvement of the intervention. Each participant could report multiple positive aspects and points of improvement.

**Appendix 3.** Overview of the identified key themes and sub-themes from the focus group interviews**Key themes**   **Sub-themes and explanation**

## Theme 1: Reaction

**Positive response:**

- Items were relevant, concrete, logical, diverse, important, educational and participants were encouraged to think about the items
- Presence and reading of the corresponding explanations
- Little (time) investment
- Rewarding
- Game element and competition
- Safe through anonymity
- Accessibility (free of charge, easily accessible, short link between items and corresponding explanations)
- Autonomy when and how to engage in the intervention
- Participation of several nursing care professionals
- Discussions with colleagues about the nutritional care topics
- The intervention was fun
- Total time frame of the intervention was reasonable

**Constructive criticism:**

- Items were not always well formulated and did not always match with corresponding explanations
- Answers were not always absolutely true or false
- Insufficient support for easy access to the provided literature
- The intervention caused too much strain
- Non-rewarding cues
- Failing intervention technology
- Non-participation of all nursing care professionals
- Total time frame of the intervention was too long

## Theme 2: Learning

**Way of learning:**

- Content and formulation of items, careful reading of items, difficulty level of items, relationship between certain items
- Thoughtful answering items based on experience or knowledge
- Two-answer option
- Formulation corresponding explanations
- Reading corresponding explanations and recommended literature (several times), particularly with a new topic or incorrect answered item
- Overview of all items and corresponding explanations
- Support of and kind of learning through the online platform
- Taking time to learn from items and corresponding explanations
- Through self-reflection

**Appendix 3.** Continued

---

**Key themes    Sub-themes and explanation**

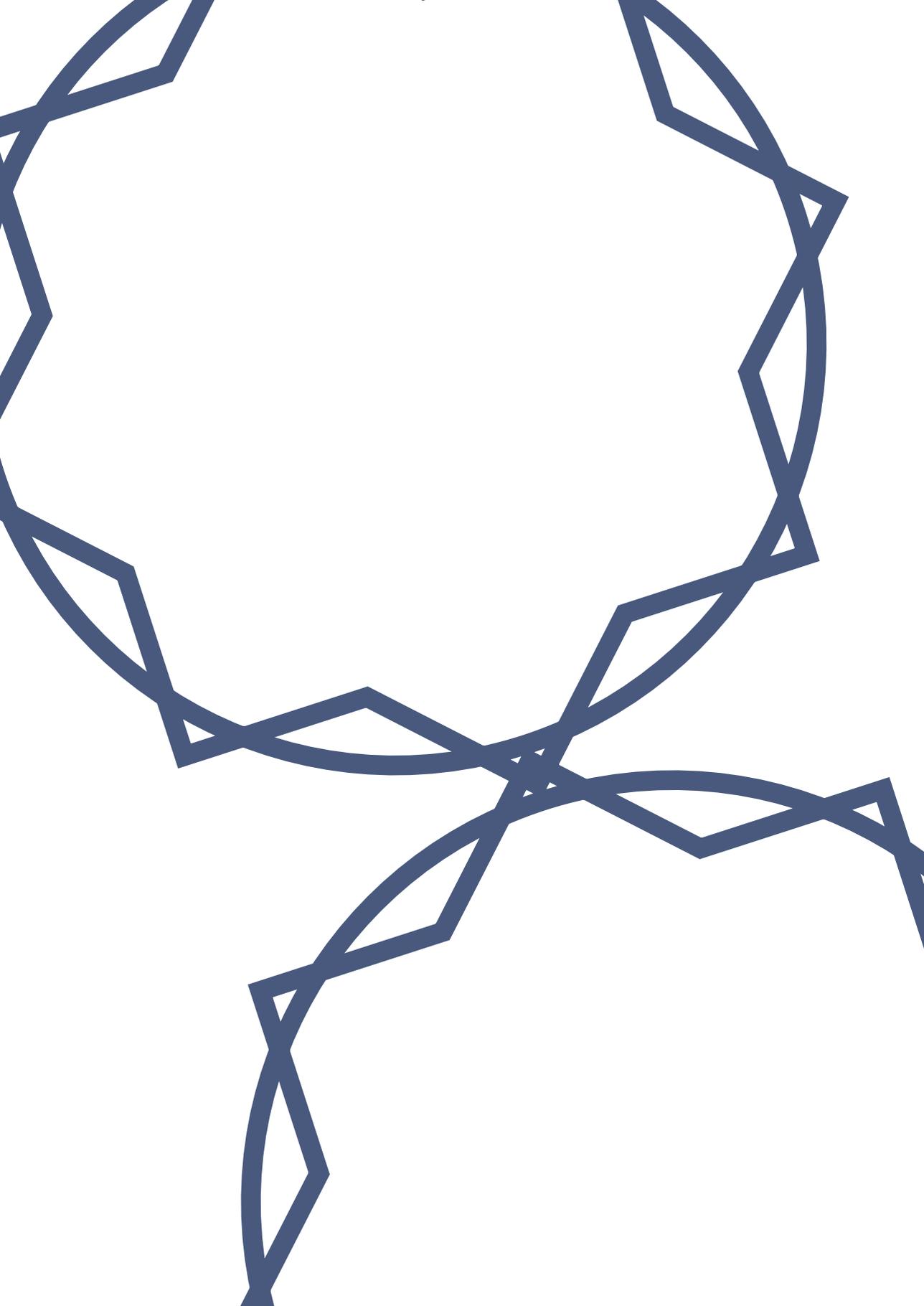
---

- Engagement in the intervention at individual and team level
- Together with the team by filling in items together, discussion and evaluation of items and corresponding explanations

**Acquired knowledge:**

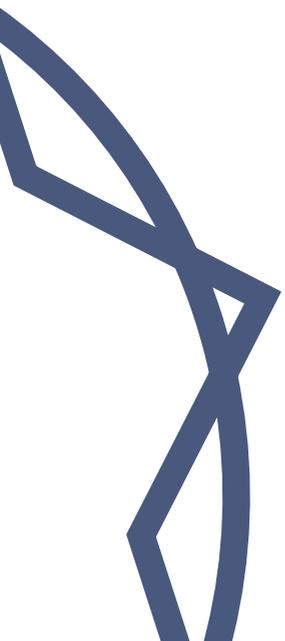
- All themes included in the intervention
  - About specific topics regarding nutritional care provided to older adults
  - In what way improve quality care in nutritional care for older adults
-





# 8

## General Discussion



When guidelines on nutrition and hydration, and hospital and governmental policy<sup>1-4</sup> are followed, better nursing nutritional care can be provided. *Suppose my father G., who was introduced in the case at the start of the General Introduction, had received nutritional care based on these guidelines and policies. Then the situation would have been as follows. On day 2, within 24 hours after G.'s hospital admission, a nurse screened for malnutrition risk and concluded that G. had a high risk of malnutrition. She reported the outcome of the screening in G.'s electronic patient record and the dietitian was informed. The same day, this high risk of malnutrition was discussed with the physician. On day 3, the dietitian came to the ward, conducted a diagnostic assessment with G. and established a nutritional treatment plan, which was reported in G.'s patient record. The goal of this plan was to prevent deterioration of G.'s nutritional status, stimulate his dietary intake and promote recovery of his health and well-being after surgery for successful return home.*

*In the following days (day 3 till 9), the nutritional treatment plan was executed. The dietitian started duodenal tube feeding (till day 6) to increase dietary intake and relieve the wound in the gastric area. This was followed by oral nutritional supplements (continued at home). The diagnosis ileus was promptly excluded and nausea was treated with medication. The nurses' activities were monitoring dietary intake, weighing twice a week and administering tube feeding. Other activities carried out by either the nurse or physician were educating G. about (the risk of) malnutrition and its relation with reduced dietary intake, and stimulating exercise.*

*In preparation for discharge, both the nurse and physician reported G.'s nutritional situation in the care transfer letter to the home care nurse and the discharge letter to the general practitioner, respectively. The dietitian organised dietary aftercare at home with a primary care dietitian. At day 10, G. was discharged from hospital to home. One day after discharge, the home care nurse contacted G. to discuss care at home, including nutritional care. Oral nutritional supplements were delivered at home and within a week, G. had a first consult with a dietitian. Home care ended after a few days because G. was able to take care of himself. Consultations with the dietitian ended after one month when G. had sufficient dietary intake and weight gain.*

While nursing nutritional care based on guidelines and policies<sup>1-4</sup> is better care than nutritional care provided in current practice, it is still suboptimal,<sup>5,6</sup> which impacts its quality and continuity. There appear to be at least two reasons for this. First, there is a lack of evidence for nutritional care interventions to be carried out by nurses.<sup>7</sup> Second, there are several factors, that influence nurses' and nursing assistants' current behaviour, such as lack of knowledge, moderate awareness of the importance and neutral attitudes, resulting in a lack of attention towards nutritional care<sup>5,6,8-10</sup> Therefore, there is a need to generate more evidence<sup>7</sup> and to focus on targeting the factors that influence nurses' and nursing assistants' current behaviour to eventually

promote behaviour change.<sup>11,12</sup> To increase the likelihood of successfully changing their behaviour, an evidence-based educational intervention is appropriate.<sup>11,12</sup> This might lead to enhancing nutritional care and positively impact nutritional status, health and well-being of older adults.

The general objectives of this thesis were:

- 1) To understand the current state of evidence regarding nutrition-related interventions and factors that influence current behaviour in nutritional care for older adults provided by hospital and home care nurses and nursing assistants to prevent and treat malnutrition.
- 2) To develop an educational intervention for hospital and home care nurses and nursing assistants to promote behaviour change by affecting factors that influence current behaviour in nutritional care for older adults and to describe the intervention development and feasibility.

## Main findings

### *Part 1: Current state of evidence in nursing nutritional care:*

- A systematic review of the literature showed no convincing evidence about the effectiveness of four types of interventions to prevent and treat malnutrition: 1) oral nutritional supplements, 2) food/fluid fortification or enrichment, 3) dietary counselling and 4) educational interventions. Although the evidence is sparse, there also seems no harm in using these interventions (Chapter 2).
- Most hospital and home care nurses perceived nutritional care for older adults to prevent and treat malnutrition as important. However, a fair number of them had the opposite perception. It is key to raise the awareness of all hospital and home care nurses about the importance of nutritional care for older adults. This is a precondition to enhance nursing nutritional care across the care continuum between hospital and home and in the transfer between these settings to ensure dietary intake (Chapter 3).
- Older adults and their informal caregivers did not always experience optimal nutritional care before, during and after hospitalisation. They conveyed in what way nutritional care could fit their needs. Older adults and informal caregivers mainly focussed on the in-hospital period, to a certain extent on the period after hospitalisation and rarely on the period before hospitalisation (Chapter 4).
- Based on expert consensus, eight factors that influence hospital and home care nurses' current behaviour regarding nutritional care were considered as relevant,

modifiable and feasible to influence. These factors included knowledge, attitude, prioritisation, motivation to routinely use guidelines and screening tools, awareness about risk factors, involving informal caregivers, motivation to follow education and training, and focus on medical nutrition versus normal nutrition (Chapter 5).

### *Part 2: An educational intervention:*

- To ensure a fit with abovementioned eight factors and based on a comprehensive method, a microlearning intervention was developed. Thirty statements and corresponding explanations regarding nursing nutritional care provided to older adults were generated. These can be delivered in a snack-sized way, this means one statement a day, five times a week in a total time frame of six weeks through an online platform (Chapter 6).
- Feasibility outcomes regarding recruitment and retention for following the microlearning intervention, and acceptability, compliance and delivery of this intervention were generally adequate. This microlearning intervention is feasible but can be refined (Chapter 7).

In part 1 of this thesis, we found supporting evidence that nursing nutritional care provided to older adults in hospital and home care is still suboptimal and gained more insight into factors contributing to it. In part 2 of this thesis, we outlined the development process of a microlearning intervention about nursing nutritional care for hospital and home care nurses and nursing assistants. This intervention is feasible. However, its feasibility can be improved. In this general discussion (chapter 8), we will reflect on the main findings of this thesis, and we will provide implications and recommendations for future research, healthcare practice and education.

## **Reflections on nursing nutritional care for older adults**

### **Current nutritional care is fragmented**

Suboptimal nursing nutritional care in hospital and home care<sup>5,6,8-10</sup> may, among other things, be caused by fragmentation. First, most nutritional care activities, with exception of screening for malnutrition and monitoring of weight or dietary intake, do not seem to be an integral part of the nursing care process.<sup>8,13,14</sup> Second, older adults receive nutritional care, which is fragmented across different healthcare professionals in different healthcare organisations and systems across the care continuum of hospital and home care.<sup>15-19</sup> From our studies, we also concluded that nutritional care provided in hospital and home care was periodically non-integrated

and not continuous (*chapters 4 and 5*). Third, it seems that nursing activities in nutritional care compete with and often lose out to other activities related to medical and technical treatment, and crucial duties related to care recipient safety.<sup>13,14,20-22</sup> Our studies also confirmed that priority was given to these other care and treatment activities (*chapters 3 till 5*). Fourth, various healthcare professionals, and older adults and their informal caregivers are not always engaged in nutritional care and if they are, they do not always collaborate with each other.<sup>18,23,24</sup> Both involvement as well as disengagement of various healthcare professionals, including nurses and nursing assistants, and older adults and informal caregivers in nutritional care was confirmed in our studies (*chapters 3 till 5*). Finally, the roles, competencies and activities of nurses, nursing assistants and other healthcare professionals involved in nutritional care are not always clearly defined, neither in practice nor in guidelines.<sup>25,26,27-30</sup> Consequently, healthcare professionals do not always identify with or are committed to their role or take their full responsibility in nutritional care.<sup>29-31</sup> We found unclarity regarding involvement, role and responsibility of healthcare professionals in several studies (*chapters 4 and 5*).

Fragmented care is a serious matter, because it leads to unfinished nursing care,<sup>32,33</sup> resulting in a decrease of quality and continuity of nutritional care, and eventually affects patient outcomes and satisfaction.<sup>6,13,14,17,24,32,34,35</sup> Political and economic policies of the past decades resulted in cost constraints on health care and nursing. Together with a retiring nursing workforce and an increase in an ageing population resulting in more complex care needs, this led to low resources such as nurse shortages, inadequate skill mix, insufficient time and equipment, and increased workload.<sup>6,13,14,24,33,35-38</sup> Caring activities are affected sooner than medical and technical treatment because the organisation of the healthcare system is still largely based on disease and medical conditions.<sup>14,39-41</sup> Furthermore, nurses and nursing assistants spend a significant amount of time on tasks not belonging to the nursing profession or that can be delegated to other professionals, documentation and administrative tasks.<sup>14,34</sup> Fragmented care ultimately leads to task-based nursing care, low prioritisation, lack of ownership and lack of responsibility, i.e. suboptimal nursing care. However, nutritional care is part of essential nursing care and has long been and still is a core business within the nursing profession.<sup>13,42</sup> Ideally, it contributes to quality of care, and hence to health and well-being of older adults, and prevention of malnutrition in older adults.<sup>25</sup> Therefore, nurses and nursing assistants should go back to the essence of their profession and regain their ownership and responsibility of their role in nutritional care. In this way, they will be able to contribute to the provision of high-quality and continuous nutritional care as an integral part of overall care for older adults.

### **The microlearning intervention is promising**

With the microlearning intervention, we aimed to impact nurses' and nursing assistants' current behaviour and stimulate behaviour change, and consequently stimulate them to (re)gain ownership and responsibility of their role in nutritional care in daily practice. Therefore, we included all aspects of nursing nutritional care. Furthermore, we promoted an easy and direct transfer of knowledge into the daily workplace of nurses and nursing assistants. In this way, we provided a comprehensive overview of this essential aspect of nursing care to serve as an example of how this care should be provided in routine practice. The 30 statements reflected all essential aspects of nursing nutritional care. Here, clinical reasoning and all phases of the nursing process were included. The nursing process is a systematic method of planning that guides all actions in delivering nursing care including five steps: 1) screening and assessment, 2) diagnosis, 3) goals and outcomes, 4) interventions and 5) evaluation.<sup>43</sup> Also, focus was on a variety of nursing activities in diverse populations of older adults in hospital and home care (*chapter 6*), thus reflecting continuity of care. Both the construction of the statements and the microlearning aspect of the intervention contributed to stimulation of transfer of knowledge (*chapters 6 and 7*). Microlearning is a way of work-based learning and seems to fit well with the nursing profession.<sup>44,45</sup> With microlearning, users can receive information quickly and easily, interact with learning content and acquire knowledge when, where and however they want.<sup>44-46</sup> With the microlearning intervention, we intended to change the current suboptimal situation and contribute to optimise nursing nutritional care. In this way, the microlearning intervention is promising for enhancing health and well-being of older adults, and preventing malnutrition in older adults.

### **Methodological considerations**

The studies in this thesis are among the few studies about nursing nutritional care for older adults in hospital and home care. For each of these studies, we used a single design (*chapters 2 till 5*), a multi-methods study design (*chapter 6*) or a mixed-methods study design (*chapter 7*). In these studies, we have systematically and thoroughly collected and analysed data. Several methodological choices were made of which we will discuss some aspects in more detail.

### **Involving various stakeholders**

When taking all studies of this thesis into account, we included various groups of stakeholders involved in nutritional care, where these various groups were represented in heterogeneous study samples (*chapters 2 till 7*). This led to input from many different

perspectives. Subsequently, this generated a comprehensive understanding and a solid evidence base<sup>13,42,47-50</sup> of both current nursing nutritional care as well as the development and feasibility process of our microlearning intervention.

We mostly, but not completely succeeded to include all or complete groups of stakeholders such as nursing assistants, nursing support professionals such as personal care attendants, the informal network of older adults and certain older adult groups with increased vulnerability. Excluding vulnerable groups of older adults has resulted in excluding older adults with low socio-economic status and/or low health literacy, which can have a substantial influence on dietary intake and nutritional care.<sup>25,51</sup> These groups may have had other perspectives by which we potentially missed key information<sup>48,49</sup> regarding current nursing nutritional care and the microlearning intervention. In our studies, we gained a good understanding of current nutritional care, we adequately developed the microlearning intervention and there was a sufficient fit between the intervention, its users and its context. However, information from non-involved stakeholders may have contributed to further refinement of a comprehensive and evidence-based view on current nutritional care, the microlearning intervention and its feasibility.

### **Fit of the microlearning intervention with daily practice**

To increase the likelihood of successfully promoting behaviour change to eventually improve nursing nutritional care, we considered it important to ensure an optimal fit between the microlearning intervention and daily nursing practice.<sup>11,52,53</sup> Therefore, we provided a comprehensive overview of current nutritional care (*chapters 3 till 5*). During intervention development, we took its users, i.e. nurses and nursing assistants, and the context of the hospital and home care setting into account (*chapter 6*). Subsequently, the feasibility study demonstrated that the microlearning intervention is feasible, but needs refinement (*chapter 7*). This means that we can conclude there is an adequate fit between the intervention and daily practice, but we propose follow-up actions for further optimisation and hence successful future implementation. From the feasibility study, we implied reconsideration of formulation and explanation of some statements, stimulating self-reflection, avoiding non-rewarding cues and failing technology, and re-assess the length of the total time frame of the intervention (*chapter 7*). Furthermore, it is a suggestion to anticipate on specific key features of each team such as organisational, social and cultural features, protocols, policies and implementation climate. Additional aspects are involving nurse champions, management and policy makers, and incorporate nutritional care in collaboration with other professionals and as part of total nursing care.<sup>29,47,50,54</sup>

## Future of nutritional care for older adults

In the ideal situation, nutritional care would have been provided continuously, interprofessionally and person centred and as an integral part of overall care and treatment to promote health and well-being, and prevention of malnutrition. *Suppose, my father G. was admitted to a hospital department in a future year, where this ideal nutritional care was provided. By carrying out G.'s care, evidence-based guidelines and derived protocols, clearly describing the roles of all involved healthcare professionals, were followed. On day 2, G.'s hospitalisation was prolonged because he developed a gastric perforation in the evening after the diagnostic procedure. The same evening, he underwent emergency surgery. In the meantime, the nurse signalled early signs and symptoms of nutritional deterioration, subsequently screened for malnutrition risk and concluded that G. had a high risk of malnutrition. On day 3, the nurse initiated, coordinated and ensured continuity of interprofessional collaboration on the ward including G. and his spouse, all members of the nursing team, the dietitian, physician, physiotherapist and room service. The interprofessional team made a nutritional care plan together, integrated in the treatment of and care for G., and tailored to G.'s and his spouse's needs. This plan was carried out immediately and covered the period during hospitalisation, the period at home after hospitalisation and the transition between these periods. Central focus of the nutritional care plan was on the following goal as mentioned by G.: "Maintaining my condition to continue to share activities such as cycling, walking, gardening and housekeeping with my spouse".*

*Directly after surgery, the intensivist started with preventive treatment of nausea (till discharge) and the dietitian started duodenal tube feeding (till day 3). Then, she prescribed an energy- and protein-enriched diet, and oral nutritional supplements (continued at home). Room service provided meals and snacks (till discharge). The physiotherapist promoted and practiced exercises twice a day and stimulated G. to carry out exercises himself for three times a day (physiotherapy till discharge, self-practice exercises continued at home). The nursing team provided tube feeding, gave G. oral nutritional supplements, weighed G. and monitored his dietary intake (till discharge). They carried out supporting interventions to facilitate dietary intake such as eating at the table, optimising meal ambiance and giving G. room to carry out eating rituals. They also discussed with G., his spouse and children to bring desired food and visit during mealtimes to eat together (till discharge). The nurse, dietitian and physician educated G. and his spouse about (the risk for) malnutrition, its consequences and promoted self-management to manage the situation in hospital and at home (till discharge).*

*In advance to discharge, the nurse personally contacted a home care nurse to discuss the transfer and together, they organised interdisciplinary dietary aftercare at home. For discharge, an interprofessional treatment and care transfer letter was written, which included G.'s nutritional*

*situation, and treatment and care plan. At day 6, G. was discharged from hospital to home. The same day, the home care nurse contacted G. and his spouse. They discussed continuation of the interprofessional nutritional treatment and care plan appropriate to G.'s personal situation, and G.'s and his spouse's self-management supporting continued recovery. In addition, the home care nurse continued to educate G. and his spouse about the importance of nutrition for the recovery of G.'s health and well-being. Oral nutritional supplements were delivered at home, which G. used for another week. G. continued to eat energy- and protein-enriched products. Within a few days, G. had a consult with the general practitioner and primary care dietitian. Because G. was able to self-manage his situation and his condition improved, care ended after one week.*

From previous reflections, we concluded that current nutritional care is fragmented due to several reasons including discontinuity of care and disengagement of involved stakeholders. In this part, we will outline our future perspective, which is that nutritional care should be delivered continuously, interprofessionally and person centred where nutritional care is an integral part of overall care and treatment. The main focus in the provision of nutritional care should be on promoting older adults' health and well-being, preventing deterioration of nutritional status by early signalling and risk assessment, and timely identifying and treating potential malnutrition.

Nutritional care for older adults should cover a proportional part of daily healthcare practice activities and should be given sufficient priority. It should be continuous and an integral part throughout the whole care and treatment process, and focus on cooperation through the hospital and home care context.<sup>39,55</sup> Furthermore, nutritional care should be interprofessional and person centred with and around the older adults and their informal network.<sup>15,56,57</sup> Teams should have a common view on an individualised approach with shared goal setting and decision making<sup>13,58,59</sup> and based on older adults' needs.<sup>13,15,39,40,60,61</sup> Teams should have clarity regarding each role, competencies and activities where healthcare professionals, older adults and their informal network demonstrate shared ownership and responsibility.<sup>29,62,63</sup>

Active involvement and collaboration of nursing professionals, including nurses, nursing assistants and personal care attendants, is key. They play an important role in providing nutritional care and they function as the focal point and connect the interprofessional team together.<sup>2,25,26,13,39,63-66</sup> Nursing professionals should regard nutritional care as essential and hence as a core business, where nutritional care is appropriately prioritised and integrated throughout the total care process.<sup>13</sup> They should acknowledge and define their role in nutritional care, understand its importance and impact, exude a sense of self confidence regarding this role and how it can contribute

to enhance nutritional care.<sup>28,29,39,67</sup> Nursing professionals should (re)gain ownership and full responsibility in nutritional care, be committed to and accountable for it. Besides nursing professionals, also other professionals involved in nutritional care, and management and organisations should acknowledge the importance of nursing care activities within nutritional care and revalue and prioritise these.

## Implications and recommendations for future research, healthcare practice and education

### Future research

Important stakeholders, such as nursing professionals, other healthcare professionals involved in nutritional care, older adults, including those who are vulnerable, and the informal network serve as pillars in providing interprofessional, person-centred nutritional care.<sup>15,39,56,58,60</sup> However, there is not much evidence for this type of nutritional care and it is not exactly clear how it should be provided in daily practice. Therefore, it is recommended that research is done to build evidence for activities within interprofessional, person-centred nutritional care. Furthermore, it is recommended that important stakeholders, such as nursing professionals, other healthcare professionals involved in nutritional care, older adults and the informal network, continuously participate in practice-based interprofessional research teams. This involvement can contribute to the quality and relevance of research studies and outcomes, and dissemination and implementation of research outcomes for further shaping an evidence base for continuous person-centred, integral nutritional care in healthcare practice.<sup>41,68-71</sup> These research activities should be supported by involved management and organisations enabling close cooperation between interprofessional teams and researchers.<sup>69,72</sup>

We have shown that our microlearning intervention is promising and although the intervention is feasible, some aspects can be improved, such as stimulating self-reflection and avoiding non-rewarding cues and failing technology (*chapter 7*). Also, we suggested to anticipate on specific key features of nursing teams, such as organisational, social and cultural features, and to involve stakeholders, such as champions, management and policy makers to optimise a fit between our intervention in a particular context. Therefore, we recommend to refine our microlearning intervention to optimise its feasibility. This will eventually contribute to successful implementation of the intervention in nursing practice<sup>47,50</sup> and more importantly to support nursing professionals to sufficiently carry out their role to provide high-quality continuous person-centred, integral nutritional care. After

refinement of the microlearning intervention, its feasibility should be re-tested in a feasibility or pilot study concurrently taking implementation, context and system fit into account, as recommended by the MRC framework.<sup>50</sup> In conclusion, the microlearning intervention is ready for use in daily practice, however, a refined version will have a closer fit to the individual routine practices.

### **Healthcare practice**

As in research, it is also important that in healthcare practice, nurses, nursing assistants, personal care attendants, other healthcare professionals who are involved in nutritional care, and older adults and their informal network are structurally engaged in nutritional care. These key actors should be added to interprofessional teams in hospitals, home care and in transitions to contribute to continuous person-centred, integral nutritional care. With current nurse shortages and inadequate skill mix,<sup>33-36</sup> we recommend investment of healthcare organisations to recruit and retain sufficient nurses, nursing assistants and personal care attendants. Subsequently, it is important that healthcare organisations support nursing professionals to continue to learn and develop themselves, and to organise their daily nursing activities differently, so that nursing professionals can fully practice their nursing profession. Then, all these members of nursing teams should be able to carry out nutritional care activities in older adults. Furthermore, we recommend to select and positively influence core nursing care activities, such as nutritional care, within daily practice and reduce unfinished nursing care.<sup>37</sup> In addition, we recommend reconsideration of reallocating nutritional care activities between involved healthcare professionals. Other recommendations are to implement opportunities for greater involvement of the informal network, such as joining mealtimes in hospital, get groceries, or cook or organise joint mealtimes in the neighbourhood, for example in community centres.

As one of the causes of fragmentation of nutritional care, we mentioned that the roles of nurses, nursing assistants and other healthcare professionals involved in nutritional care are not always clearly defined in practice and guidelines.<sup>25,27,29</sup> Also, we stated that nursing professionals should (re)gain ownership and full responsibility for nutritional care. To improve and support continuous person-centred, integral nutritional care in hospital, home care and transitions between both settings, roles and activities of each professional involved, and older adults and their informal network, should be further clarified, agreed and integrated in daily practice. Competence profiles of healthcare professionals, guidelines and standards, which are translated to local procedures, protocols and pathways may be used as tools and provide guidance on nutritional care in and between specific hospital and home care organisations in routine practice.<sup>11,29,39,73</sup> The outline and conduct of the roles and

activities of interprofessional team members should be promoted and prioritised by healthcare regulations, organisations, support systems, managers and leadership of professionals to ensure spread and sustainability.<sup>29,55,74</sup>

To address in more details the specific roles and activities of nurses, nursing assistants and personal care attendants, we suggest that their activities in nutritional care should be structured by incorporating the nursing care process.<sup>75</sup> Here, we consider all phases of the nursing process equally important and that the nursing process should be integrated in its complete potential. The kind of activities carried out by each nursing professional is dependent on function and educational level. Also, these activities should be provided continuously throughout the full care process and across the care continuum between hospital and home and in its transition. This may potentially lead to holistic, safe and quality-based nursing nutritional care<sup>13,75</sup> as part of continuous person-centred, integral nutritional care for older adults. We recommend that risk identification and early signalling of (future) nutritional problems should be part of screening to focus more on health, well-being and prevention of malnutrition.<sup>76</sup> Also, we recommend that in the intervention phase, several interventions should be carried out by nursing professionals. In our systematic review, we found no convincing evidence for oral nutritional supplements, food or fluid fortification or enrichment, giving dietary counselling and education to older adults, but nurses can safely carry out these interventions (*chapter 2*). Additional interventions should be readily accessible interventions, such as creating a stimulating environment, pleasant mealtimes and exercise, and additional medical nutrition, such as tube feeding and parenteral feeding. Also, information and education, face-to-face or digitally, should be given to older adults and their informal caregivers.<sup>25,26,75</sup>

### **Education**

We stated that nursing professionals should go back to the essence of their profession and (re)gain their ownership and responsibility of their role in nutritional care. To achieve this, (future) nursing professionals should be more aware of the importance of nutritional care for older adults. It is essential that they should gain greater confidence and competencies on taking ownership and responsibility regarding their role but also understand other healthcare professionals' role in nutritional care.<sup>39,77</sup> Other key topics should focus on developing, managing and operationalising competencies regarding the impact of nutritional status on health and well-being, essential nutritional care and which activities are included, and the integration of nursing nutritional care in the whole nursing care process throughout the care continuum. Nursing students and nursing professionals should learn about

which care should be provided to older adults and how these activities should be carried out, taking older adults' needs and preferences into account. In addition, they should learn what their contribution is in nutritional care, how they can influence the quality and continuity of nutritional care and how they can collaborate and communicate interprofessionally.

We recommend that lecturers and trainers, with support from policy makers and management teams, should incorporate education and training about abovementioned topics throughout the whole curriculum of undergraduate nursing and in nursing practice. This education and training should be provided in theory, internships, nursing practice and as shared learning activities with other healthcare students and professionals, older adults and their informal network. This education and training should be given by experienced and competent lecturers and trainers.

## **Conclusion**

Nurses and nursing assistants have a key role in providing nutritional care to older adults in hospital and home care. Current nutritional care in daily practice is however still suboptimal, which is due to several factors that influence nurses' and nursing assistants' current behaviour. The microlearning intervention has great potential to support hospital and home care nurses and nursing assistants in (re)gaining ownership and responsibility of their role in nutritional care. This intervention supports them to be equipped and well positioned to provide high-quality nursing nutritional care and contribute to continuous person-centred, integral nutritional care for older adults.

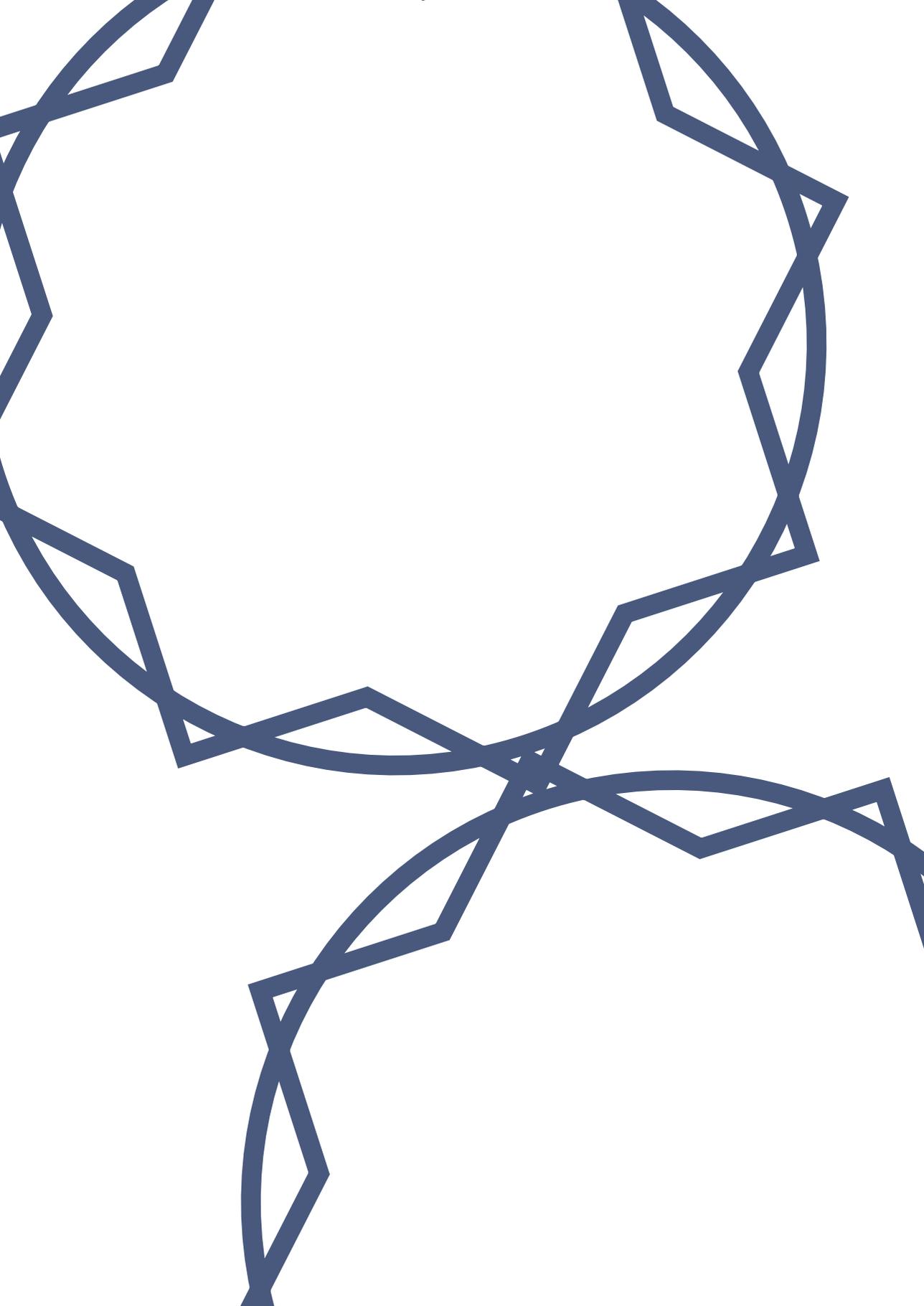
## References

1. The Dutch Association of Dietitians. *Artsenwijzer Dietetiek*. [Advice for physicians about dietetics]. The Dutch Association of Dietitians; 2018.
2. Cederholm T, Barazzoni R, Austin P, Ballmer P, Biolo G, Bischoff SC, et al. ESPEN guidelines on definitions and terminology of clinical nutrition. *Clin Nutr*. 2017;36(1):49-64.
3. The Dutch Malnutrition Steering Group. *Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen*. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2017.
4. Health and Youth Care Inspectorate. *Basisset medisch specialistische zorg 2020* [Basic set specialist medical care 2020]. Health and Youth Care Inspectorate; 2017.
5. Bonetti L, Bagnasco A, Aleo G, Sasso L. 'The transit of the food trolley' – malnutrition in older people and nurses' perception of the problem. *Scand J Caring Sci*. 2013;27(2):440-448.
6. Dahl Eide H, Halvorsen K, Almendingen K. Barriers to nutritional care for undernourished hospitalised older people. *J Clin Nurs*. 2015;24(5-6):696-706.
7. Zwakhalen S, Hamers J, Metzethin S, Ettema R, Heinen M, de Man – van Ginkel, J., et al. Basic nursing care: The most provided, the least evidence based – A discussion paper. *J Clin Nurs*. 2018;27(11-12):2496-2505.
8. Bell J, Bauer J, Capra S, Pulle CR. Barriers to nutritional intake in patients with acute hip fracture: time to treat malnutrition as a disease and food as a medicine? *Can J Physiol Pharmacol*. 2013;91(6):489-495.
9. Boaz M, Rychani L, Barami K, Houry Z, Yosef R, Siag A, et al. Nurses and nutrition: a survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *J Contin Educ Nurs*. 2013;44(8):357-364.
10. Bachrach – Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff working with older people towards nutritional nursing care. *J Clin Nurs*. 2007;16(11):2007-2014.
11. Michie S, Atkins L, West R. *The behaviour change wheel. A guide to designing interventions*. Sutton: Silverback Publishing; 2014.
12. Michie S, van Stralen MM, West R. The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42.
13. Kitson AL, Conroy T, Kuluski K, Locock L, Lyons R. *Reclaiming and redefining the Fundamentals of Care: Nursing's response to meeting patients' basic human needs*. Adelaide: University of Adelaide; 2013.
14. Schubert M, Ausserhofer D, Desmedt M, Schwendiman R, Lesaffre E, Li B, et al. Levels and correlates of implicit rationing of nursing care in Swiss acute care hospitals – A cross sectional study. *Int J Nurs Stud*. 2013;50(2):230-239.
15. Barry MJ, Edgman – Levitan S. Shared decision making – The pinnacle of patient-centered care. *N Engl J Med*. 2012;366(9):780-781.
16. Longpré C, Dubois CA. Fostering development of nursing practices to support integrated care when implementing integrated care pathways: what levers to use? *BMC Health Serv Res*. 2017;17(1):790.
17. Porter Starr KN, McDonald SR, Bales CW. Nutritional vulnerability in older adults: A continuum of concerns. *Curr Nutr Rep*. 2015;4(2):176-184.
18. Verwijs MH, Puijk – Hekman S, van der Heijden E, Vasse E, de Groot LCPGM, de van der Schueren MAE. Interdisciplinary communication and collaboration as key to improved nutritional care of malnourished older adults across health-care settings – A qualitative study. *Health Expect*. 2020;23(5):1096-1107.
19. World Health Organization. *Innovative care for chronic conditions: building blocks for action: global report*. Geneva: World Health Organization; 2002.

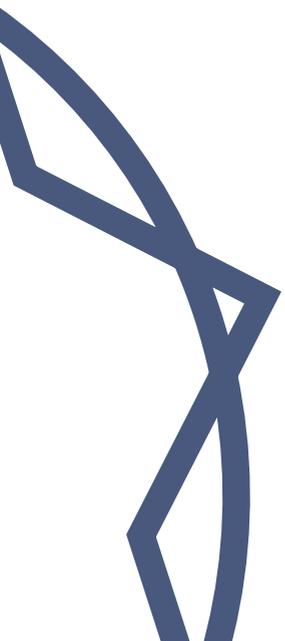
20. Hyde A, Treacy MMP, Scott AP, Mac Neela P, Butler M, Drennan J, et al. Social regulation, medicalisation and the nurse's role: Insights from an analysis of nursing documentation. *Int J Nurs Stud.* 2006;43(6):735-744.
21. McCarthy MP, Jones JS. The medicalization of nursing: The loss of a discipline's unique identity. *Int J Hum Caring.* 2019;23(1):101-108.
22. O'Connell MB, Jensen PS, Andersen SL, Fernbrant C, Nørholm V, Petersen HV. Stuck in tradition – A qualitative study on barriers for implementation of evidence-based nutritional care perceived by nursing staff. *J Clin Nurs.* 2018;27(3-4):705-714.
23. Hestevik CH, Molin M, Debesay J, Bergland A, Bye A. Hospital nurses and home care providers' experiences of participation in nutritional care among older persons and their family caregivers: a qualitative study. *J Hum Nutr Diet.* 2020;33(2):198-206.
24. Lassen KO, Grinderslev E, Nyholm R. Effect of changed organisation of nutritional care of Danish medical inpatients. *BMC Health Serv Res.* 2008;8:168.
25. Volkert D, Beck AM, Cederholm T, Cruz – Jentoft A, Hooper L, Kiesswetter E, et al. ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clin Nutr.* 2022;41(4):958-989.
26. The Dutch Malnutrition Steering Group. Richtlijn ondervoeding. Herkenning, diagnosestelling en behandeling van ondervoeding bij volwassenen. [Guideline malnutrition. Recognition, diagnosis and treatment of malnutrition in adults]. The Dutch Malnutrition Steering Group; 2019.
27. Jefferies D, Johnson M, Ravens J. Nurturing and nourishing: The nurses' role in nutritional care. *J Clin Nurs.* 2011;20(3-4):317-330.
28. Keller HH, Vesnaver E, Davidson B, Allard J, Laporte M, Bernier P, et al. Providing quality nutrition care in acute care hospitals: perspectives of nutrition care personnel. *J Hum Nutr Diet.* 2014;27(2):192-202.
29. Laur C, McCullough J, Davidson B, Keller H. Becoming food aware in hospital: A narrative review to advance the culture of nutrition care in hospitals. *Healthcare (Basel).* 2015;3(2):393-407.
30. 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(1):41-46.
31. Bonawitz K, Wetmore M, Heisler M, Dalton VK, Damschroder LJ, Forman J, et al. Champions in context: which attributes matter for change efforts in healthcare? *Implement Sci.* 2020;15(1):62.
32. Griffiths P, Recio – Saucedo A, Dall'Ora C, Briggs J, Maruotti A, Meredith P, et al. The association between nurse staffing and omissions in nursing care: A systematic review. *J Adv Nurs.* 2018;74(7):1474-1487.
33. Jones TL, Hamilton P, Murry N. Unfinished nursing care, missed care, and implicitly rationed care: State of the science review. *Int J Nurs Stud.* 2015;52(6):1121-1137.
34. Chiappinotto S, Papastavrou E, Efsthathiou G, Andreou P, Stemmer R, Ströhm C, et al. Antecedents of unfinished nursing care: a systematic review of the literature. *BMC Nurs.* 2022;21(1):137.
35. Hegney DG, Rees CS, Osseiran – Moisson R, Breen L, Eley R, Windsor C, et al. Perceptions of nursing workloads and contributing factors, and their impact on implicit care rationing: A Queensland, Australia study. *J Nurs Manag.* 2019;27(2):371-380.
36. Ausserhofer D, Zander B, Busse R, Schubert M, De Geest S, Rafferty AM, et al. Prevalence, patterns and predictors of nursing care left undone in European hospitals: results from the multicountry cross-sectional RN4CAST study. *BMJ Qual Saf.* 2014;23(2):126-135.
37. Schubert M, Ausserhofer D, Bragadóttir H, Rochefort CM, Bruyneel L, Stemmer R, et al. Interventions to prevent or reduce rationing or missed nursing care: A scoping review. *J Adv Nurs.* 2021;77(2):550-564.
38. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. *J Clin Nurs.* 2009;18(3):431-439.

39. Geirsdóttir OG, Bell JJ, editors. *Interdisciplinary nutritional management and care for older adults: An evidence-based practical guide for nurses*. Cham: Springer International Publishing; 2021.
40. World Health Organization. *Integrated care for older people (ICOPE): Guidance for person-centred assessment and pathways in primary care*. Geneva: World Health Organization; 2019.
41. World Health Organization. *Decade of healthy ageing 2020 – 2030*. Geneva: World Health Organization; 2020.
42. Kitson A, Conroy T, Wengstrom Y, Profetto – McGrath J, Robertson – Malt S. Defining the fundamentals of care. *Int J Nurs Pract*. 2010;16(4):423-434.
43. George JB, editor. *Nursing theories: The base for professional nursing practice*. 6th edition. London: Pearson; 2010.
44. Gross B, Rusin L, Kiesewetter J, Zottman JM, Fischer MR, Prückner S, et al. Microlearning for patient safety: Crew resource management training in 15-minutes. *PLoS One*. 2019;14(3):e0213178.
45. Zhang J, West RE. Designing microlearning instruction for professional development through a competency based approach. *TechTrends*. 2020;64(2):310-318.
46. Leong K, Sung A, Au D, Blanchard C. A review of the trend of microlearning. *JWAM*. 2021;13(1):88-102.
47. Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M, et al. Developing and evaluating complex interventions: the new medical research council guidance. *BMJ*. 2008;337:979-983.
48. van Meijel B, Gamel C, van Swieten – Duijfs B, Grypdonck MHE. The development of evidence-based nursing interventions: methodological considerations. *J Adv Nurs*. 2004;48(1):84-92.
49. Polit DF, Beck CT. *Nursing research: Generating and assessing evidence for nursing practice*. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2017.
50. Skivington K, Matthews L, Simpson SA, Craig P, Baird J, Blazeby JM, et al. A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance. *BMJ*. 2021;374:n2061.
51. Kuczmarski MF, Adams EL, Cotugna N, Pohlig RT, Beydoun MA, Zonderman AB, et al. Health literacy and education predict nutrient quality of diet of socioeconomically diverse, urban adults. *J Epidemiol Prev Med*. 2016;2(1):13000115.
52. Aiken LH, Sloane DM, Bruyneel L, Van den Heede K, Sermeus W for the RN4CAST Consortium. Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe. *Int J Nurs Stud*. 2013;50(2):143-153.
53. Bleijenberg N, de Man – van Ginkel JM, Trappenburg JCA, Ettema RGA, Sino CG, Heim N, et al. Increasing value and reducing waste by optimizing the development of complex interventions: Enriching the development phase of the Medical Research Council (MRC) Framework. *Int J Nurs Stud*. 2018;79:86-93.
54. Nevalainen M, Lunkka N, Suhonen M. Work-based learning in health care organisations experienced by nursing staff: A systematic review of qualitative studies. *Nurse Educ Pract*. 2018;29:21-29.
55. 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. *JPEN J Parenter Enteral Nutr*. 2013;37(4):482-497.
56. Grey M, Connolly CA. "Coming together, keeping together, working together": Interdisciplinary to transdisciplinary research and nursing. *Nurs Outlook*. 2008;56(3):102-107.
57. Rosenfield PL. The potential of transdisciplinary research for sustaining and extending linkages between the health and social sciences. *Soc Sci Med*. 1992;35(11):1343-1357.
58. Kolovos P, Kaitelidou D, Lemonidou C, Sachlas A, Zyga S, Sourtzi P. Patient participation in hospital care: Nursing staffs' point of view. *Int J Nurs Pract*. 2015;21(3):258-268.
59. Swan WI, Vivanti A, Hakel – Smith NA, Hotson B, Orrevall Y, Trostler N, et al. Nutrition care process and model update: Toward realizing people-centered care and outcomes management. *J Acad Nutr Diet*. 2017;17(12):2003-2014.

60. Hestevik CH, Molin M, Debesay J, Bergland A, Bye A. Older patients' and their family caregivers' perceptions of food, meals and nutritional care in the transition between hospital and home care: a qualitative study. *BMC Nutr.* 2020;18;6:11.
61. Marshall S, Bauer J, Capra S, Isenring E. Are informal carers and community care workers effective in managing malnutrition in the older adult community? A systematic review of current evidence. *J Nutr Health Aging.* 2013;17(8):645-651.
62. Ellis G, Sevdalis N. Understanding and improving multidisciplinary team working in geriatric medicine. *Age Ageing.* 2019;48(4):498-505.
63. Schot E, Tummers L, Noordegraaf M. Working on working together. A systematic review on how healthcare professionals contribute to interprofessional collaboration. *J Interprof Care.* 2020;34(3):332-342.
64. World Health Organization. Enhancing nursing and midwifery capacity to contribute to the prevention, treatment and management of noncommunicable diseases in practice: policy and advocacy, research and education. Geneva: World Health Organization; 2012.
65. Mitchell P, Wynia M, Golden R, McNellis B, Okun S, Webb CE, et al. Core principles & values of effective team-based health care. Washington, DC: Institute of Medicine; 2012.
66. Rosen MA, DiazGranados D, Dietz AS, Benishek LE, Thompson D, Pronovost PJ, et al. Teamwork in healthcare: Key discoveries enabling safer, high-quality care. *Am Psychol.* 2018;73(4):433-450.
67. Dellafiore F, Caruso R, Arrigoni C, Magon A, Baroni I, Alotto G, et al. The development of a self-efficacy scale for nurses to assess the nutritional care of older adults: A multi-phase study. *Clin Nutr.* 2021;40(3):1260-1267.
68. Crocker JC, Ricci – Cabello I, Parker A, Hirst JA, Chant A, Petit – Zeman S, et al. Impact of patient and public involvement on enrolment and retention in clinical trials: systematic review and meta-analysis. *BMJ.* 2018;363:k4738.
69. Dimova S, Prideaux R, Ball S, Harshfield A, Carpenter A, Marjanovic S. Enabling NHS staff to contribute to research: Reflecting on current practice and informing future opportunities. *Rand Health Q.* 2020;8(4):RR-2679.
70. Forsythe L, Heckert A, Margolis MK, Schrandt S, Frank L. Methods and impact of engagement in research, from theory to practice and back again: early findings from the Patient-Centered Outcomes Research Institute. *Qual Life Res.* 2018;27(1):17-31.
71. Heckert A, Forsythe LP, Carman KL, Frank L, Hemphill R, Elstad EA, et al. Researchers, patients, and other stakeholders' perspectives on challenges to and strategies for engagement. *Res Involv Engagem.* 2020;6:60.
72. Miller C, Cook J, Gibson JME, Watkins CL, Jones SP. Clinical academic research internships for nurses, midwives and allied health professionals: a qualitative evaluation. *Nurse Res.* 2020;28(3):16-23.
73. Keller H, Laur C, Atkins M, Bernier P, Butterworth D, Davidson B, et al. Update on the Integrated Nutrition Pathway for Acute Care (INPAC): post implementation tailoring and toolkit to support practice improvements. *Nutr J.* 2018;17(1):2.
74. Conroy T. Factors influencing the delivery of the fundamentals of care: Perceptions of nurses, nursing leaders and healthcare consumers. *J Clin Nurs.* 2018;27(11-12):2373-2386.
75. Carpenito – Moyer LJ. *Zakboek verpleegkundige diagnosen. [Handbook of nursing diagnosis].* 4th ed. Groningen/Houten: Noordhoff Uitgevers; 2012.
76. Leij – Halfwerk S, Verwijs MH, van Houdt S, Borkent JW, Guaitoli PR, Pelgrim T, et al. Prevalence of protein-energy malnutrition risk in European older adults in community, residential and hospital settings, according to 22 malnutrition screening tools validated for use in adults  $\geq 65$  years: A systematic review and meta-analysis. *Maturitas.* 2019;126:80-89.
77. Hutchings M, Scammell J, Quinney A. Praxis and reflexivity for interprofessional education: towards an inclusive theoretical framework for learning. *J Interprof Care.* 2013;27(5):358-366.



# Summary



---

Malnutrition is a serious and widespread health problem in community-dwelling older adults who receive care in hospital and at home. Hospital and home care nurses and nursing assistants have a key role in the delivery of high-quality multidisciplinary nutritional care. Nursing nutritional care in current practice, however, is still suboptimal, which impacts its quality and continuity. There appear to be at least two reasons for this. First, there is a lack of evidence for nutritional care interventions to be carried out by nurses. Second, there are several factors, that influence nurses' and nursing assistants' current behaviour, such as lack of knowledge, moderate awareness of the importance and neutral attitudes. This results in a lack of attention towards nutritional care. Therefore, there is a need to generate more evidence and to focus on targeting the factors that influence nurses' and nursing assistants' current behaviour to eventually promote behaviour change. To increase the likelihood of successfully changing their behaviour, an evidence-based educational intervention is appropriate. This might lead to enhancing nutritional care and positively impact nutritional status, health and well-being of community-dwelling older adults.

The general objectives of this thesis are:

- 1) To understand the current state of evidence regarding nutrition-related interventions and factors that influence current behaviour in nutritional care for older adults provided by hospital and home care nurses and nursing assistants to prevent and treat malnutrition.
- 2) To develop an educational intervention for hospital and home care nurses and nursing assistants to promote behaviour change by affecting factors that influence current behaviour in nutritional care for older adults and to describe the intervention development and feasibility.

This thesis consists of two parts. In **part 1**, the current state of evidence in nursing nutritional care is explored. In **part 2**, the development and feasibility of an educational intervention is outlined.

### **Part 1: Current state of evidence in nursing nutritional care**

The first part of the thesis sets out to explore current nursing nutritional care for older adults to prevent and treat malnutrition.

In **chapter 2**, a systematic review of the literature was conducted to identify interventions to prevent and treat malnutrition in older adults, which can be integrated in nursing care. Also, the effects of these interventions on outcomes related to malnutrition were reported. We included 21 randomised clinical trials. Identified

interventions were 1) oral nutritional supplements, 2) food/fluid fortification or enrichment, 3) dietary counselling and 4) educational interventions. In evaluating the effects of these interventions on 11 outcomes related to malnutrition, significant and non-significant effects were found. Minor effects were found in the outcomes 'protein intake' and 'body mass index'. The certainty of evidence was graded as very low to moderate. Although the evidence is sparse, there also seems no harm in using these four interventions in healthcare practice. Nurses can safely provide oral nutritional supplements and food/fluid fortification or enrichment, and give dietary counselling and education to older adults, as they are well placed to provide nutritional care. In future research, there is a need for high-quality studies to build evidence for interventions in nursing nutritional care.

In **chapter 3**, we gained insight into the experiences and perceptions of hospital and home care nurses regarding nutritional care for older adults to prevent and treat malnutrition. In a multicentre cross-sectional descriptive study, a total of 1,135 validated questionnaires addressing malnutrition were sent to hospital and home care nurses. Nurses were selected from 34 general nursing wards in three hospitals and 27 nursing teams in ten home care organisations. The questionnaires were filled in by 556 nurses (response rate: 49%). Of all the nurses, 37% estimated the prevalence of malnutrition among their care recipients to be between 10% and 25%. Almost 22% of the nurses neither agreed nor disagreed or disagreed with the statement that prevention of malnutrition is possible. More than 28% of the nurses reported that malnutrition is a small or no problem. The nurses considered several interventions for treating malnutrition important. Over 81% of the nurses indicated they wanted to follow further training. In conclusion, most hospital and home care nurses perceived that nutritional care for older adults to prevent and treat malnutrition was important. However, a fair number of them had the opposite perception. It is pivotal to raise the awareness of all hospital and home care nurses about the importance of nutritional care for older adults. This is a precondition for successfully providing nursing nutritional care across the care continuum between hospital and home and in the transfer between these settings to ensure dietary intake. Furthermore, nurses should follow training to contribute to consolidation of nutritional care.

In **chapter 4**, we explored older adults' and their informal caregivers' experiences and needs regarding nutritional care provided in the periods before, during and after hospitalisation. A qualitative design was used. One-time, in-depth, semi-structured interviews were conducted with 15 older adults who had been recently discharged from hospital, and seven informal caregivers. Five themes emerged from the interviews: 1) dietary intake, 2) food service during hospitalisation, 3) nutrition-



---

related activities, 4) whose job it is to give nutritional care, and 5) competing care priorities. Further, several opinions about nutritional issues were identified. Older adults and their informal caregivers did not always experience optimal nutritional care before, during and after hospitalisation. They conveyed in what way nutritional care could fit their needs. Older adults and informal caregivers mainly focussed on the in-hospital period, to a certain extent on the period after hospitalisation and rarely on the period before hospitalisation. When developing guidelines and to enhance the quality of nutritional care through the care continuum, older adults' and informal caregivers' perspective on nutritional care should be incorporated. Also, the periods before, during and after hospitalisation should be taken into account equally.

In **chapter 5**, a Delphi study was conducted where expert consensus on which factors that influence current behaviour of hospital and home care nurses are most relevant, modifiable and feasible to influence was obtained. First, nine pre-selected factors, which were related to suboptimal nursing nutritional care for community-dwelling older adults before, during and after hospitalisation, were identified from six preparatory studies. Second, in two rounds through online questionnaires, 26 experts rated these nine pre-selected factors. The expert panel reached consensus on eight out of nine factors and rated these as relevant, modifiable and feasible to influence. These factors were: 1) lack of sufficient knowledge, 2) mainly neutral attitude, 3) low prioritisation, 4) ambiguous motivation to routinely use guidelines and screening tools, 5) moderate awareness about risk factors, 6) lack of sense of involving informal caregivers, 7) ambiguous motivation to follow education and training and 8) strong focus on medical nutrition. Strategies in both nursing practice, education and research should focus on targeting the eight factors to achieve behaviour change in hospital and home care nurses. This may create an opportunity for nurses to enhance nutritional care for community-dwelling older adults before, during and after hospitalisation.

## **Part 2: An educational intervention**

The second part of this thesis addresses the development and feasibility of an evidence-based educational intervention for hospital and home care nurses and nursing assistants. The intervention aims to promote nurses' and nursing assistants' behaviour change by affecting factors that influence their current behaviour in nutritional care for older adults.

In **chapter 6**, the development process of an educational intervention for hospital and home care nurses and nursing assistants to promote behaviour change in nutritional care for older adults was described. To ensure a fit with abovementioned eight

factors (from **chapter 5**) and based on a multi-methods approach using literature and expert input, a microlearning intervention was developed. This intervention was based on five principles: 1) interaction between intervention and users, 2) targeting users on both individual and team level, 3) supporting direct and easy transfer to the workplace, and continuous learning, 4) facilitating learning within an appropriate period, 5) having a fit with the context. The intervention consisted of 30 statements about nursing nutritional care for older adults, which nurses and nursing assistants were asked to confirm or reject, followed by corresponding explanations. These can be delivered in a snack-sized way, this means one statement a day, five times a week in a total time frame of six weeks through an online platform. The intervention development is an important first step to eventually make an essential contribution to improve nursing nutritional care to enhance health, well-being and adequate dietary intake of older adults.

In **chapter 7**, the feasibility of our microlearning intervention (from **Chapter 6**) was assessed to achieve the best fit between the intervention and nursing practice in the hospital and home care setting. In a multicentre study, a mixed-methods design was used. Feasibility was determined by assessing 1) recruitment and retention of the participants and 2) the acceptability, compliance and delivery of the intervention. Data about the use of the intervention, and data from a standardised questionnaire and two focus group interviews were used to measure the feasibility outcomes. Fourteen teams (five hospital teams and nine home care teams) with a total of 306 participants (response rate: 89.7%) completed the intervention. The median (Q1, Q3) score for completed statements per participant was 23 (12, 28) (total of 30 statements). The mean proportion of correct answers was 72.2%. Participants were both positive and constructive about the intervention. Constraints were statement formulation and explanation, stimulating self-reflection, non-rewarding cues, failing technology and the length of the total time frame. Participants confirmed that they mostly learned from the intervention. Overall, the intervention was acceptable to the participants and compliance and delivery was generally adequate. Based on participants' constructive feedback, this microlearning intervention is considered feasible but needs refinement to improve its feasibility.

In **chapter 8**, the general discussion, we reflected on the main outcomes and some methodological considerations, and provided implications and recommendations for future research, healthcare practice and education.

In conclusion, in this thesis, we found evidence that current nursing nutritional care for older adults in daily practice is still suboptimal. This is due to several factors that

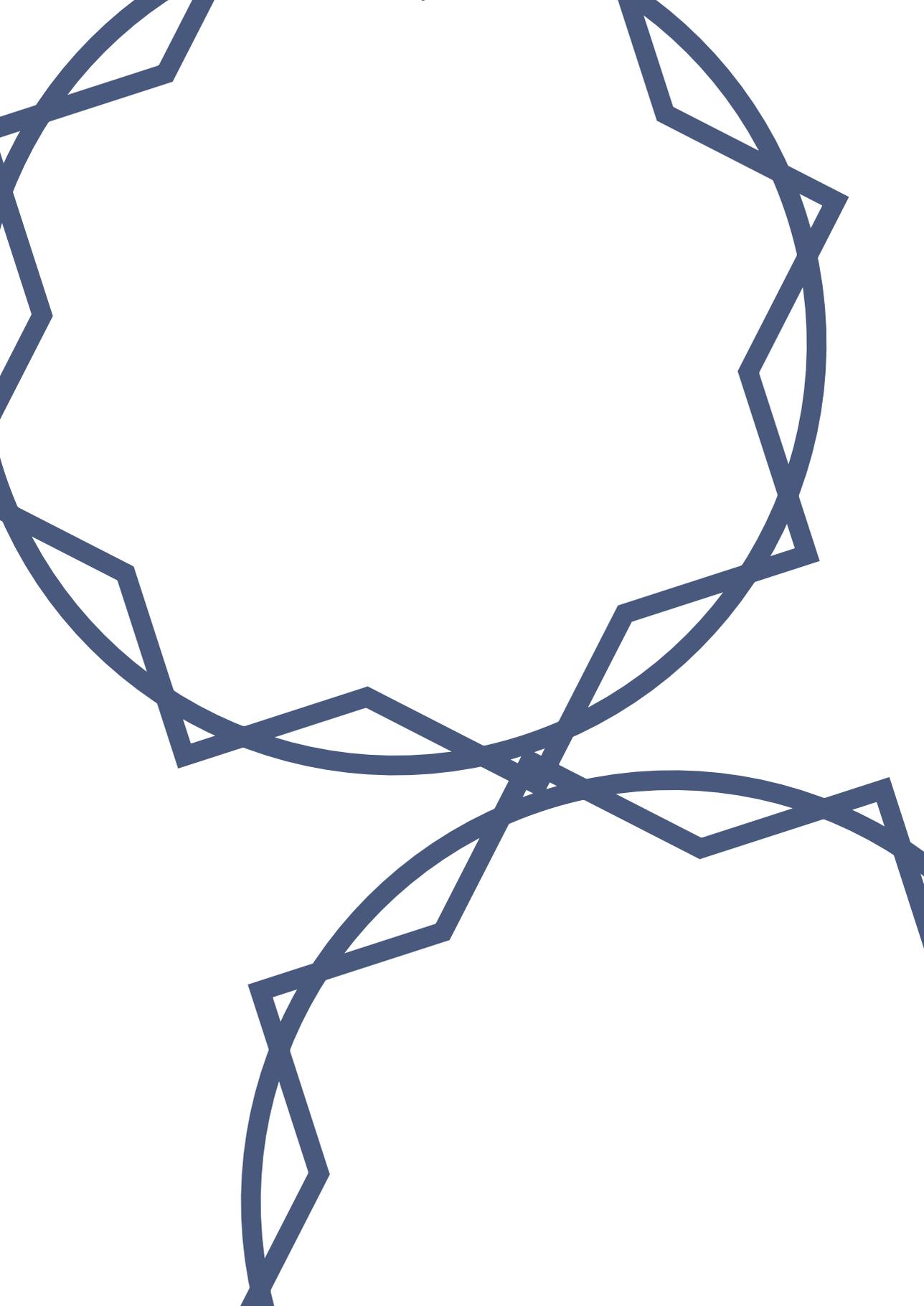


---

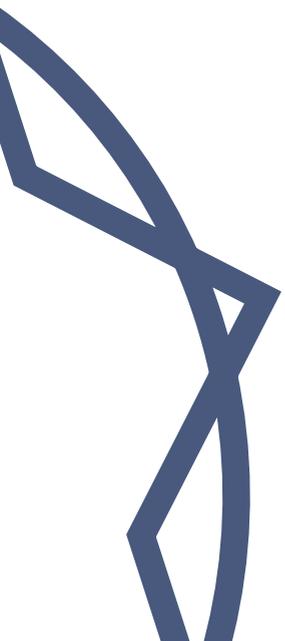
influence nurses' and nursing assistants' current behaviour. Suboptimal nutritional care may be caused by fragmentation. Fragmented care can ultimately lead to unfinished nursing care and hence to lack of ownership and lack of responsibility. In this thesis, we showed that our microlearning intervention is promising. It has the potential to change the current suboptimal situation and support hospital and home care nurses and nursing assistants to change their behaviour and in (re)gaining ownership and responsibility of their role in nutritional care.

To improve nutritional care, we suggest that this should be delivered continuously, interprofessionally and person centred where nutritional care is an integral part of overall care. Active involvement of nursing professionals, including nurses, nursing assistants and personal care attendants, is key. Therefore, we recommend to structurally engage important key actors in nutritional care, to clarify their roles and activities and specifically, to structure roles and activities of nursing professionals in healthcare practice. We also recommend providing education and training about nursing professionals' competencies in nutritional care, for example in taking ownership and responsibility, and on how nursing activities within nutritional care are carried out. All this allows nursing professionals to contribute to the provision of high-quality, interprofessional, person-centred and continuous nutritional care as an integral part of overall care. This will eventually enhance health and well-being of older adults and prevent malnutrition in older adults.





# Samenvatting



---

Ondervoeding is een ernstig en wijdverbreid gezondheidsprobleem bij thuiswonende ouderen die in het ziekenhuis en thuis zorg krijgen. Verpleegkundigen en verzorgenden die werkzaam zijn in het ziekenhuis en de wijkzorg hebben een sleutelrol bij het geven van kwalitatief goede multidisciplinaire voedingszorg. Verpleegkundige voedingszorg is in de huidige zorgpraktijk echter niet optimaal en dit beïnvloedt de kwaliteit en continuïteit ervan. Hiervoor lijken ten minste twee redenen te zijn. Ten eerste is er een gebrek aan bewijs voor interventies die door verpleegkundigen uitgevoerd kunnen worden bij het geven van voedingszorg. Ten tweede zijn er verschillende factoren die het huidige gedrag van verpleegkundigen en verzorgenden beïnvloeden, zoals het ontbreken van kennis, geringe bewustwording van het belang en neutrale attitudes. Dit resulteert in weinig aandacht voor voedingszorg. Hierdoor is het nodig om meer bewijs te genereren. Ook is het nodig te focussen op het aanpakken van de factoren die het huidige gedrag van verpleegkundigen en verzorgenden beïnvloeden, om uiteindelijk gedragsverandering te bevorderen. Om de kans op succesvolle gedragsverandering te vergroten, is een wetenschappelijk onderbouwde educatieve interventie geschikt. Dit kan leiden tot betere voedingszorg en kan een positieve invloed hebben op de voedingsstatus, de gezondheid en het welzijn van ouderen.

De doelstellingen van dit proefschrift zijn:

- 1) Beter begrip krijgen van de huidige stand van bewijs met betrekking tot voedingsgerelateerde interventies en factoren die het huidige gedrag beïnvloeden in de voedingszorg aan ouderen welke wordt gegeven door verpleegkundigen en verzorgenden in het ziekenhuis en de wijkzorg, met als doel om ondervoeding te voorkomen en te behandelen.
- 2) Het ontwikkelen van een educatieve interventie voor verpleegkundigen en verzorgenden in het ziekenhuis en de wijkzorg om gedragsverandering te bevorderen door factoren aan te pakken die het huidige gedrag in voedingszorg aan ouderen beïnvloeden en om de ontwikkeling en haalbaarheid van deze interventie te beschrijven.

Dit proefschrift bestaat uit twee delen. In **deel 1** wordt de huidige stand van zaken en wetenschappelijk bewijs met betrekking tot verpleegkundige voedingszorg onderzocht. In **deel 2** wordt de ontwikkeling en haalbaarheid van een educatieve interventie beschreven.

## **Deel 1: Huidige stand van zaken en wetenschappelijk bewijs met betrekking tot verpleegkundige voedingszorg**

Het eerste deel van het proefschrift richt zich op het verkennen van de huidige verpleegkundige voedingszorg aan ouderen om ondervoeding te voorkomen en te behandelen.

In **hoofdstuk 2** is een systematische review van de literatuur uitgevoerd om interventies te identificeren die ondervoeding bij ouderen voorkomen en behandelen en welke kunnen worden geïntegreerd in de verpleegkundige zorg. Ook werden de effecten van deze interventies op uitkomsten gerelateerd aan ondervoeding gerapporteerd. De systematische review omvatte 21 gerandomiseerde klinische studies. Geïdentificeerde interventies waren 1) orale voedingssupplementen, 2) voedsel-/vochttoevoeging of -verrijking, 3) dieetbegeleiding en 4) educatieve interventies. Bij het evalueren van de effecten van deze interventies op elf uitkomsten gerelateerd aan ondervoeding werden significante en niet-significante effecten gevonden. Bij de uitkomsten 'eiwitinname' en 'body mass index' werden geringe effecten gevonden. De zekerheid van bewijs werd beoordeeld als zeer laag tot matig. Hoewel het bewijs schaars is, lijkt het niet schadelijk om deze vier interventies in de zorgpraktijk te gebruiken. Verpleegkundigen kunnen veilig orale voedingssupplementen en voedsel-/vochttoevoeging of -verrijking verstrekken, en dieetbegeleiding en educatie geven aan ouderen, aangezien zij op de juiste positie zitten om voedingszorg te geven. In toekomstig onderzoek is het nodig om kwalitatief goede studies uit te voeren om bewijs te genereren voor interventies in verpleegkundige voedingszorg.

In **hoofdstuk 3** hebben we inzicht gekregen in de ervaringen en percepties van verpleegkundigen in het ziekenhuis en de wijkzorg met betrekking tot voedingszorg aan ouderen om ondervoeding te voorkomen en te behandelen. In een multicenter, cross-sectioneel beschrijvend onderzoek werden in totaal 1135 gevalideerde vragenlijsten over ondervoeding gestuurd naar verpleegkundigen in het ziekenhuis en de wijkzorg. Verpleegkundigen werden geselecteerd van 34 algemene verpleegafdelingen in drie ziekenhuizen en 27 verpleegkundige teams in tien wijkzorgorganisaties. De vragenlijsten werden ingevuld door 556 verpleegkundigen (respons: 49%). Van alle verpleegkundigen schatte 37% de prevalentie van ondervoeding bij hun zorgvragers tussen de 10% en 25%. Bijna 22% van de verpleegkundigen was het noch eens noch oneens, of oneens, met de stelling dat preventie van ondervoeding mogelijk is. Ruim 28% van de verpleegkundigen gaf aan dat ondervoeding een klein of geen probleem is. De verpleegkundigen vonden verschillende interventies voor de behandeling van ondervoeding belangrijk. Ruim



---

81% gaf aan bijscholing te willen volgen. Concluderend, de meeste verpleegkundigen die werkzaam zijn in het ziekenhuis en de wijkzorg vonden voedingszorg aan ouderen om ondervoeding te voorkomen en behandelen belangrijk. Een behoorlijk aantal van hen had echter de tegenovergestelde perceptie. Het is van cruciaal belang om alle verpleegkundigen werkzaam in het ziekenhuis en de wijkzorg bewust te maken van het belang van voedingszorg aan ouderen. Dit is een voorwaarde voor het succesvol geven van verpleegkundige voedingszorg in het hele zorgcontinuüm tussen ziekenhuis en thuis en in de transitie tussen deze settingen om voedingsinname te waarborgen. Verder zouden verpleegkundigen scholing moeten volgen om bij te dragen aan de verbetering van voedingszorg.

In **hoofdstuk 4** hebben we de ervaringen en behoeften van ouderen en hun mantelzorgers met betrekking tot voedingszorg in de periodes voor, tijdens en na ziekenhuisopname onderzocht. Er werd een kwalitatief design gebruikt. Er werden eenmalige, verdiepende, semigestructureerde interviews gehouden met 15 ouderen, die recent uit het ziekenhuis waren ontslagen en zeven mantelzorgers. Uit de interviews kwamen vijf thema's naar voren: 1) voedingsinname, 2) foodservice tijdens ziekenhuisopname, 3) voedingsgerelateerde activiteiten, 4) wiens taak het is om voedingszorg te geven, en 5) concurrerende prioriteiten in de zorg. Verder werden verschillende meningen over voedingskwesties geïdentificeerd. Ouderen en hun mantelzorgers ervaarden niet altijd optimale voedingszorg voor, tijdens en na ziekenhuisopname. Ze benoemden tevens op welke manier voedingszorg op hun behoeften kon aansluiten. Ouderen en mantelzorgers richtten zich vooral op de ziekenhuisopname, tot op zekere hoogte op de periode na ziekenhuisopname en zelden op de periode vóór ziekenhuisopname. Bij het ontwikkelen van richtlijnen en om de kwaliteit van voedingszorg in het zorgcontinuüm te verbeteren, zou het perspectief van ouderen en mantelzorgers op voedingszorg moeten worden meegenomen. Ook zouden de periodes voor, tijdens en na ziekenhuisopname in gelijke mate in acht genomen moeten worden.

In **hoofdstuk 5** is een Delphi-studie uitgevoerd waarbij consensus onder experts werd verkregen over welke factoren die het huidige gedrag van verpleegkundigen in het ziekenhuis en de wijkzorg beïnvloeden, het meest relevant, beïnvloedbaar en haalbaar zijn. Eerst werden negen voorgeselecteerde factoren geïdentificeerd uit zes voorbereidende studies. Deze factoren waren gerelateerd aan suboptimale verpleegkundige voedingszorg aan thuiswonende ouderen in de periodes voor, tijdens en na ziekenhuisopname. Vervolgens beoordeelden 26 experts in twee rondes door middel van online vragenlijsten deze negen voorgeselecteerde factoren. Het expertpanel bereikte consensus over acht van de negen factoren en beoordeelde

deze als relevant, beïnvloedbaar en haalbaar. Deze factoren waren: 1) gebrek aan voldoende kennis, 2) overwegend neutrale houding, 3) lage prioritering, 4) ambigue motivatie om routinematig richtlijnen en screeningsinstrumenten te gebruiken, 5) matige bewustwording over risicofactoren, 6) onvoldoende besef om mantelzorgers te betrekken, 7) ambigue motivatie om educatie en training te volgen en 8) sterke focus op medische voeding. Strategieën in zowel de verpleegkundige praktijk, het onderwijs als het onderzoek zouden zich moeten richten op deze acht factoren om gedragsverandering bij verpleegkundigen in het ziekenhuis en de wijkzorg te bewerkstelligen. Dit kan voor verpleegkundigen een mogelijkheid scheppen om voedingszorg aan thuiswonende ouderen voor, tijdens en na ziekenhuisopname te verbeteren.

## **Deel 2: Een educatieve interventie**

Het tweede deel van dit proefschrift behandelt de ontwikkeling en haalbaarheid van een wetenschappelijk onderbouwde educatieve interventie voor verpleegkundigen en verzorgenden in het ziekenhuis en de wijkzorg. De interventie heeft tot doel om gedragsverandering bij verpleegkundigen en verzorgenden te bevorderen door factoren aan te pakken die hun huidige gedrag in voedingszorg aan ouderen beïnvloeden.

In **hoofdstuk 6** staat het ontwikkelingsproces beschreven van een educatieve interventie voor verpleegkundigen en verzorgenden in het ziekenhuis en de wijkzorg om gedragsverandering in voedingszorg aan ouderen te bevorderen. Met de bovengenoemde acht factoren (uit **hoofdstuk 5**) en op basis van een multi-methode benadering door middel van literatuur en input van experts werd een microlearning interventie ontwikkeld. Deze interventie was gebaseerd op vijf principes: 1) interactie tussen interventie en gebruikers, 2) gericht op gebruikers op zowel individueel niveau als teamniveau, 3) ondersteuning van directe en gemakkelijke overdracht naar de werkplek en continu leren, 4) het faciliteren van leren binnen een geschikt tijdsbestek, 5) passend bij de context. De interventie bestond uit 30 stellingen over verpleegkundige voedingszorg aan ouderen. Aan verpleegkundigen en verzorgenden werd gevraagd deze te bevestigen of af te wijzen en daarna werden bijbehorende toelichtingen gegeven. De stellingen kunnen snack-sized worden aangeleverd, wat betekent dat er één stelling per dag, vijf keer per week in een totaal tijdsbestek van zes weken via een online platform wordt aangeboden. De interventie ontwikkeling is een belangrijke eerste stap om uiteindelijk een essentiële bijdrage te leveren aan het optimaliseren van verpleegkundige voedingszorg. Hiermee kan de gezondheid, het welzijn en adequate voedingsinname van ouderen worden verbeterd.



---

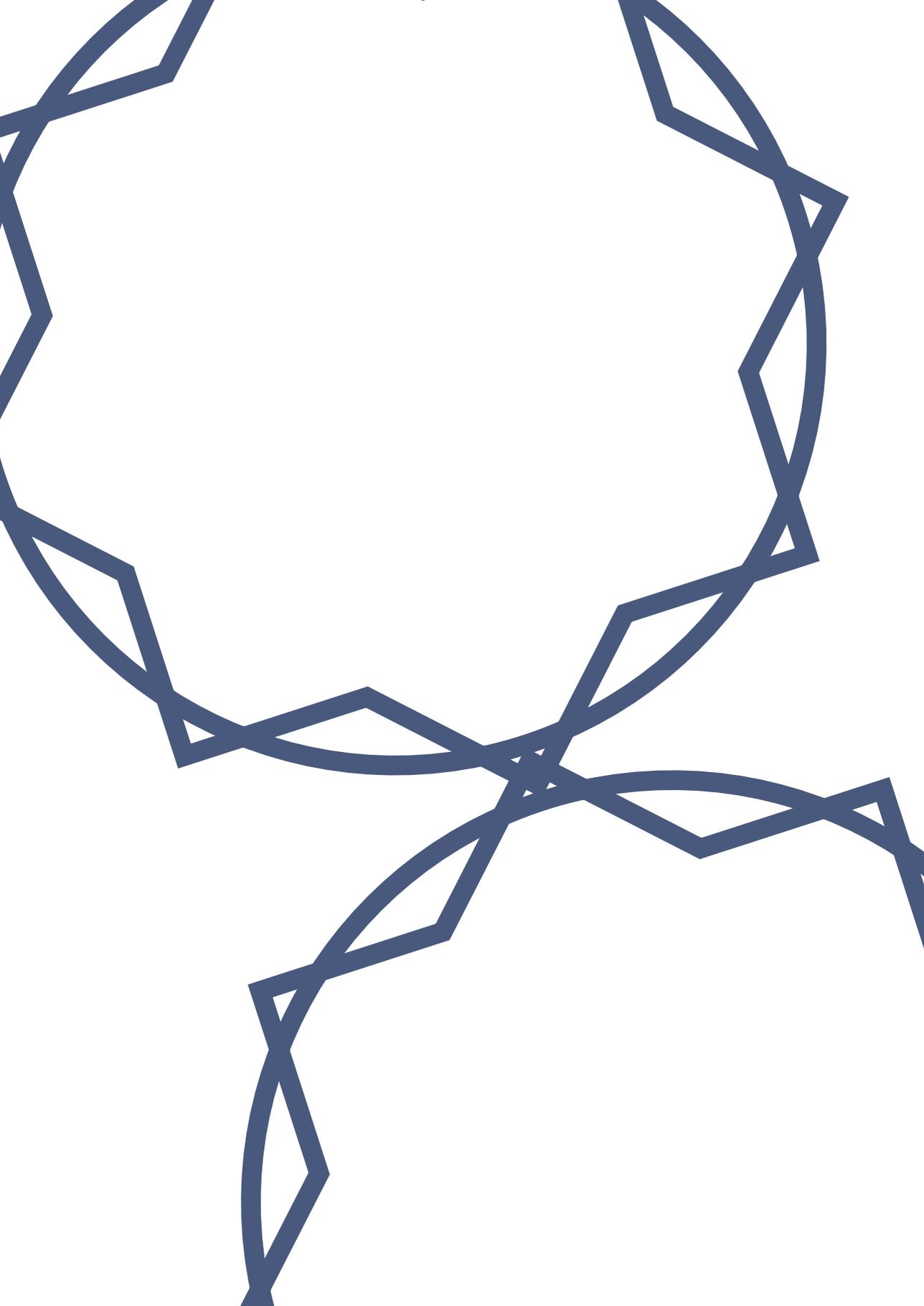
In **hoofdstuk 7** is de haalbaarheid van onze microlearning interventie (uit **hoofdstuk 6**) geëvalueerd om zo de beste aansluiting tussen de interventie en de verpleegkundige praktijk in het ziekenhuis en de wijkzorg te realiseren. In een multicenter onderzoek werd een mixed-methods design gebruikt. Haalbaarheid werd vastgesteld door het onderzoeken van 1) het werven en behouden van de deelnemers en 2) de aanvaardbaarheid, naleving en het leveren van de interventie. Data over het gebruik van de interventie en data van een gestandaardiseerde vragenlijst en twee focusgroepinterviews werden gebruikt om de uitkomsten met betrekking tot haalbaarheid te meten. Veertien teams (vijf ziekenhuisteam en negen wijkzorgteams) met in totaal 306 deelnemers (respons: 89,7%) rondden de interventie af. De mediaan (Q1, Q3) voor ingevulde stellingen per deelnemer was 23 (12, 28) (totaal 30 stellingen). Het gemiddelde percentage van correcte antwoorden was 72,2%. De deelnemers waren zowel positief als constructief over de interventie. Knelpunten waren de formulering en toelichting van bepaalde stellingen, het stimuleren van zelfreflectie, niet lonende signalen, falende technologie en de lengte van het totale tijdsbestek. Deelnemers bevestigden dat ze vooral van de interventie hadden geleerd. Over het algemeen was de interventie acceptabel voor de deelnemers en was de naleving en het leveren van de interventie toereikend. Deze microlearning interventie is haalbaar, maar verdere aanscherpingen zijn nodig om de haalbaarheid ervan te verbeteren.

In **hoofdstuk 8**, de algemene discussie, hebben we gereflecteerd op de belangrijkste uitkomsten en een aantal methodologische overwegingen. Ook hebben we implicaties en aanbevelingen voor toekomstig onderzoek, de zorgpraktijk en het onderwijs gegeven.

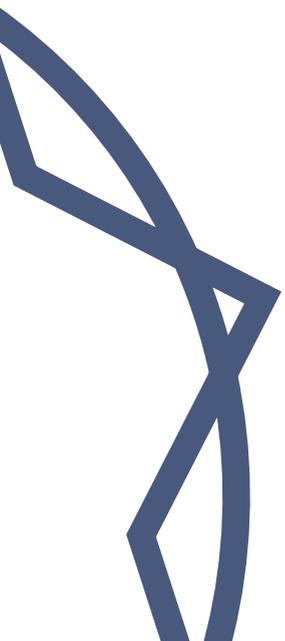
Concluderend, in dit proefschrift hebben we bewijs gevonden dat de huidige verpleegkundige voedingszorg aan ouderen in de dagelijkse praktijk suboptimaal is. Dit komt door verschillende factoren die het huidige gedrag van verpleegkundigen en verzorgenden beïnvloeden. Suboptimale voedingszorg kan worden veroorzaakt door fragmentatie. Gefragmenteerde zorg kan uiteindelijk leiden tot onafgemaakte verpleegkundige zorg en daarmee tot gebrek aan eigenaarschap en verantwoordelijkheid. In dit proefschrift hebben we laten zien dat onze microlearning interventie veelbelovend is. Het heeft de potentie om de huidige suboptimale situatie te verbeteren en om verpleegkundigen en verzorgenden in het ziekenhuis en de wijkzorg te ondersteunen. Hiermee kunnen ze hun gedrag veranderen en eigenaarschap en verantwoordelijkheid in voedingszorg (her)pakken.

Om voedingszorg te verbeteren, stellen we voor deze continu, interprofessioneel en persoonsgericht te geven, waarbij voedingszorg een integraal onderdeel is van de totale zorg. Actieve betrokkenheid van verpleegkundige professionals, waaronder verpleegkundigen, verzorgenden en helpende verzorgenden, is essentieel. Daarom bevelen we aan om belangrijke sleutelactoren in voedingszorg structureel te betrekken en hun rollen en activiteiten te verduidelijken. We adviseren om specifiek de rollen en activiteiten van verpleegkundige professionals in de zorgpraktijk te structureren. Ook bevelen wij aan om educatie en training te geven over de competenties van verpleegkundige professionals in voedingszorg. Dit kan gaan over het nemen van eigenaarschap en verantwoordelijkheid en over hoe verpleegkundige activiteiten binnen voedingszorg worden uitgevoerd. Dit alles stelt verpleegkundigen in staat bij te dragen aan het geven van kwalitatief goede, interprofessionele, persoonsgerichte en continue voedingszorg als integraal onderdeel van de totale zorg. Uiteindelijk kan hiermee de gezondheid en het welzijn van ouderen worden verbeterd en ondervoeding bij ouderen worden voorkomen.





# Dankwoord



---

Het is klaar! De afgelopen jaren heb ik met veel plezier aan mijn onderzoek mogen werken. Dit is omdat ik me kon verdiepen in het prachtige onderwerp van verpleegkundige voedingszorg bij ouderen en me verder kon bekwamen in onderzoeksmethodologie. Maar bovenal omdat ik met zoveel mensen heb samengewerkt waarbij eenieder met enthousiasme een bijdrage wilde leveren aan het promotietraject. Ook ben ik iedereen zeer erkentelijk voor de oprechte interesse in hoe het onderzoek verliep en hoe het met me ging. Aan iedereen: dank hiervoor! Een aantal mensen wil ik in het bijzonder bedanken.

Voor mijn promotieteam bestaande uit prof. dr. Marieke Schuurmans, prof. dr. Lisette Schoonhoven en dr. Roelof Ettema wil ik mijn warme waardering uitspreken. Ik wil jullie bedanken voor alle ruimte, vertrouwen en ondersteuning om dit promotietraject uit te voeren. Marieke, al die jaren in het traject heb ik continu van je mogen leren. Je inspireert, bent scherp en snel om essentiële punten uit vaak complexe zaken te halen en hebt lef om keuzes te maken, ook als deze niet altijd voor de hand liggen. Je bent open om zelfreflecties en je kennis en kunde van veel zaken in het wetenschappelijke onderzoek, ons verpleegkundige vak en daarbuiten te delen. Lisette, met jouw komst naar Utrecht ben jij tevens mijn promotor geworden. Het was een treffer dat jij als één van de initiatiefnemers van Basic Care Revisited mijn promotieteam kwam versterken. Dit heb ik ervaren als een enorme verrijking. Ik waardeer jouw passie voor essentiële verpleegkundige zorg, je vermogen om snel en creatief tot onderbouwde oplossingen te komen, je structuur, taalgevoeligheid en observatievermogen. Daarnaast hield je iedere keer helder voor ogen wat nodig was ten behoeve van het onderzoek en van mij. Roelof, ik vond het heel leuk dat we na een aantal projecten op de thoraxchirurgie voor langere tijd gingen samenwerken in dit traject. Wat hebben we veel zaken uitgezocht, mede omdat er nog zo weinig over dit onderwerp bekend was en ook omdat we lange tijd dachten dat we een voedingsinterventie gingen ontwikkelen. Bedankt voor je deskundigheid over zoveel verpleegkundige, onderwijskundige en epidemiologische aangelegenheden, je energieke en enthousiaste benadering van zaken en je vermogen om zonder oordeel maar motiverend te coachen.

De leden van de beoordelingscommissie, prof. dr. Niek de Wit, prof. dr. Sandra Zwakhalen, prof. dr. Mariëlle Emmelot – Vonk, prof. dr. Marieke van der Schaaf en prof. dr. Marian de van der Schueren, wil ik graag bedanken voor het plaatsnemen in de beoordelingscommissie. Het is een eer voor mij dat jullie mijn proefschrift wilden beoordelen.

Naast mijn promotieteam hebben een aantal andere mensen meegeschreven aan de zes artikelen. Eén van hen wil ik in het bijzonder danken. Dr. Jack Bell, I was so glad when we found the publications of your important research regarding nursing nutritional care, which you had conducted in Australia. We got into contact and kept in touch at a distance during the last years. Thank you for your substantive contribution, your view as a dietitian on nutritional matters, your ability to put things into perspective and your positive view on matters. I look forward to further collaboration. Cheers.

Paul Westers en Cas Kruitwagen, dank voor jullie consulten over statistische vraagstukken en het meedenken hierover in een aantal onderzoeken. Inge Pool, Menno Vergeer en Frans van Camp, jullie denkracht en ervaring met onderwijsvraagstukken heeft ons CONNECT-project verdere verdieping gegeven. Irma Hoekstra, je was de eerste verpleegkundige die participeerde in de focusgroepen en observaties bij het CONNECT-project om met enthousiasme en openheid je onderzoeksvaardigheden verder te ontwikkelen. Muirne Paap, je expertise in IRT-analyses en je bereidheid om mee te denken in de uitdagingen die we tegenkwamen bij onze educatieve interventie waren leerzaam en hebben belangrijke inzichten gegeven.

Graag wil ik alle collega's van Basic Care Revisited, uit Utrecht, Nijmegen en Maastricht, bedanken voor de leerzame en inspirerende samenwerking: prof. dr. Jan Hamers, prof. dr. Sandra Zwakhalen, prof. dr. Hester Vermeulen, prof. dr. Marieke Schuurmans, prof. dr. Lisette Schoonhoven, dr. Maud Heinen, dr. Getty Huisman – de Waal, dr. Silke Metzethin, dr. Janneke de Man – van Ginkel, dr. Roelof Ettema, Elise van Belle, Harm van Noort, Gerda van den Berg, Annick van Manen en Carolien Verstraten. Mooi hoe we essentiële verpleegkundige zorg op de kaart konden zetten in onze onderzoeken en tijdens symposia op diverse congressen. Getty, Gerda en Harm, we hebben jarenlang samengewerkt binnen het vraagstuk van de verpleegkundige voedingszorg. Met jullie kritische blik en deskundigheid ben ik van mening dat we dit onderwerp in Nederland op een hoger plan hebben gebracht.

Mijn bijzondere dank gaat uit naar de zorgvragers en hun mantelzorgers die tijdens een intensieve periode in hun leven hun ervaringen omtrent voedingszorg met ons deelden. Alle experts en professionals die in hun dagelijkse werk met voeding en voedingszorg te maken hebben, wil ik bedanken dat ze, ondanks hun drukke agenda's en werkzaamheden, belangeloos een relevante bijdrage hebben geleverd aan één of meerdere onderzoeken of projecten. Evelien Nap en Gretha Thiele, bedankt dat ik stage bij jullie mocht lopen in de wijk. Anja van Vloten, Karin Nass, Petra Eland – de Kok, Mirjam Beek – Zwijnenburg, Annemarie Olthof – Ernens, Anouk Brinkman



---

– van Soest, Roely Witvoet, Marianne Oosterwegel – Baas, Daniëlla Aelbers, Sarah Frans – Rensen, Mariëlle Emmelot – Vonk, Inez van Bronsveld, Tania Mudrikova, Bianca Cuijpers – Patist, Nienke Wolterbeek, Rammelt de Koning, Judith Egberts, Susanne Rus, Sandra Bruel, Nelleke Samwel, Floor Buesink, Ingrid Halstein, Simone Struikmans, Jeroen Bras, Ginny Hoogendoorn, Monique Mul, Els van der Schoot, Thijs Jansen, Romy Stubbe, Maité Linnemans, Krista van Veenendaal, Karin Kuijer – van Dycke, Bertil van der Gun, Alexandra van Dorst, Julia Reh en Desiree Wolf (collega F3!): veel dank dat ik in jullie organisaties, op jullie afdelingen en bij jullie wijkteams data mocht verzamelen.

Onderzoek doe je niet alleen en het was een voorrecht om te werken met alle 77 studenten die hebben geparticipeerd in één van de onderzoeken als onderdeel van een studieonderdeel tijdens hun opleiding. Het was ontzettend leuk om jullie op het raakvlak van onderzoek en onderwijs te begeleiden en een bijdrage te mogen leveren aan jullie ontwikkeling als professional. Een aantal van jullie wil ik expliciet benoemen. Henk – Jan van 't Hof, mooi om je focus en enthousiasme mee te mogen maken. Matt Mellema Theunissen, heel veel dank voor je substantiële inzet bij één van de onderzoeken en je geduld van afgelopen jaren. Jorna van Eijk, we komen elkaar steeds tegen: bij je studie bij de bachelor Verpleegkunde (BVK), onze Delphi-studie en nu als collega's. Ik weet zeker dat jouw promotietraject een succes gaat worden. Gigi Dekker, multitalent met oneindige interesse en energie voor alles wat je aanpakt. Je wordt een topverpleegkundige en ik hoop dat je verder gaat met onderzoek.

En bij focus op een onderwerp, rol je van het één in het ander. Paul Riha, Janine Franken, Marlijn van den Berg en Heleen Scholten, interdisciplinair samenwerken doen wij al om het voedingsonderwijs bij de BVK van Hogeschool Utrecht (HU) op een hoger niveau te tillen. Het is goed samenwerken met jullie op dit onderwerp. Liesbeth Haverkort, wat leer ik veel van je en je steekt me aan met je eindeloze energie en doorzettingsvermogen. Ik zie uit naar verdere samenwerking. Canan Ziyilan – sister-in-arms –, wat een match zijn we! Ik krijg veel energie van je en vind het fantastisch hoe we elkaar binnen en buiten het werk vinden. Hoe geweldig dat we verder blijven samenwerken. Naast Canan, ook Jellie Zuidema, Iris van den Boomgaard, Jeroen Dikken, Gwendell Foendoe Aubèl, Marian de van der Schueren en Ellen van der Heijden, met de Expertgroep Onderwijs van het Kenniscentrum Ondervoeding hebben we een uitstekende start gemaakt om voeding (en leefstijl) op landelijk niveau binnen het verpleegkunde-onderwijs op de kaart te zetten. Ik kijk uit naar het vervolg. Willemieke Kroeze, Truus Groenendijk – van Woudenbergh, Gerlinde Jordaan, Anneke Berendts, Menrike Menkveld, Noortje Campman, Sara Bax, Evelyn Monninkhof, Heleen Scholten, Claudia Geenen en Nienke Bleijenberg,

collega's van werkpakket 6 van de Regio Deal Foodvalley. Wat een prachtige opdracht hebben wij om binnen onze regio en in samenwerking met verschillende organisaties voeding in zorgopleidingen te verstevigen. Heleen, ik leer veel van je, zowel over voeding als onderwijs, en het is telkens gezellig. Meta de Graaff en Monique Verschuieren van Netwerk Utrecht Zorg Ouderen (NUZO), mooi dat we met zoveel enthousiasme, in samenwerking met studenten en ouderen, de maaltijdvoorziening van thuiswonende ouderen in Utrecht in kaart hebben gebracht. Canan Ziylan, Judith van Zwienen, Marlies Wagener, Jeroen Dikken, Gwendell Foendoe Aubèl, Melissa Zevenhoven, Eva Creutzberg, Ien van Doormalen en Liesbeth Haverkort, wat een fantastische groep zijn wij. Ik waardeer de energie in onze groep en de drive om binnen ons VITALIS-project bij te dragen aan beter onderwijs en aandacht voor voeding en leefstijl bij senioren.

Ik wil mijn collega's van de onderzoeksgroep Verplegingswetenschap van het UMC Utrecht en alle andere geïnteresseerden bij de Researchbesprekingen bedanken voor hun deskundigheid en belangstelling wat me heeft geholpen in het maken van stappen binnen de onderzoeken. Mijn kamergenoten van kamer 6.125 in het Juliuscentrum: dank voor jullie gastvrijheid en gezelligheid, onder andere met de koffies bij Micaffe, de 1-minuut sportoefeningen en filmpjes. In het bijzonder dank ik Heleen Westland voor het delen van tips en tricks in het promotietraject en de gezelligheid, waaronder de etentjes bij de Kust met Yvonne en Carolien.

Al mijn collega's en oud-collega's van het lectoraat Chronisch Zieken, nu Proactieve Zorg voor Thuiswonende Ouderen van de HU. Wat fijn om binnen zo'n dynamische en enthousiaste groep mensen te mogen werken. Iedereen op zijn of haar eigen onderwerp, maar allemaal met veel passie voor het verpleegkundige vak. Nienke Bleijenberg, door het stokje over te nemen van Marieke, heb je afgelopen jaren met bevlogenheid en ambitie met succes het lectoraat verder uit kunnen bouwen. Dank voor je vertrouwen in het voortzetten van mijn promotietraject onder jou en de ruimte die je hebt gegeven om me verder te ontwikkelen binnen andere projecten, met name het Foodvalley project. Ik zie uit naar verdere samenwerking en gezamenlijke vervolgstappen in het onderzoek. Jita Hoogerduijn, veel dank dat je me over de streep hebt gehaald om de uitdaging van een promotietraject aan te gaan en ook voor de ondersteuning en etentjes van de afgelopen jaren. Sigrid Müller – Schotte, wat weet jij ontzettend veel, vooral op het gebied van onderwijs en onderzoek, en jij bent steeds bereid om deze kennis met anderen, waaronder mij, te delen. We hebben veel besproken tijdens de lunches en koffiemomenten. Mijn andere oud-collega's Pieterbas Lalleman, Mariska van Dijk, Anja Rieckert, Hugo Schalkwijk en Dieke Martini. Hoe kort of lang jullie er ook zijn geweest, altijd vol toewijding, inspiratie



---

en optimisme. Jeroen Dikken, wat een mooi (CONNECT-)project hebben wij opgezet. We gingen als een trein en hebben in korte tijd fantastische onderzoeken uitgevoerd. Je energie en denkkracht hebben mijn promotietraject een boost gegeven. Thóra Hafsteindóttir, het is al lang een voorrecht om met jou te mogen werken, omdat je met recht een vakvrouw bent. Janneke de Man – van Ginkel, met bewondering kijk ik naar jouw immer tomeloze geduld en doorzettingsvermogen in het onderwijs en onderzoek en hoe je keer op keer kwaliteit levert. Yvonne Korpershoek, samen gestart en opgetrokken in onze trajecten. Hoe fijn was dat! Je was continu geïnteresseerd hoe de onderzoeken verliepen en hoe het met me ging, op de HU, de promovenduskamer van het Juliuscentrum en tijdens de gezellige etentjes bij De Kust. Nienke Dijkstra, we hebben elkaar echt gevonden in het onderzoek, onderwijs en op andere vlakken. Je objectieve, kritische en onbevagen blik hebben me vaak verder geholpen. Altijd had je een luisterend oor. Ik heb genoten van onze uitjes en vooral de vieringen met taart als we weer een succes wilden delen. Graag op naar de volgende chocoladetaart. Ik ben overtuigd dat jij nog mooie bijdrages gaat leveren aan het verbeteren van gezondheidszorg. Je hebt een belangrijke rol gespeeld in de laatste stap van mijn carrière, het promotietraject, en ik ben trots en dankbaar dat jij mijn paranimf bent. De frisse wind, gezelligheid en expertise van en prettige samenwerking met collega's Linda Smit, Yvonne Jordens, Dagmar van Nimwegen, Inge Wolbers, Rixt Zuidema, Selma Kok, Marit Schwenke, Niek Galekamp en Jeroen Bakker. Jessica Veldhuizen, dank voor je input in een aantal van mijn onderzoeken, wat mij vooral inzicht heeft gegeven in de wijkzorg. Wietske Blom – Ham, leuk dat we elkaar weer zijn tegengekomen, tien jaar na ons afstuderen bij Verplegingswetenschap. Wat een aanwinst ben jij voor ons lectoraat. Ymkje Damsma, stille kracht en immer stabiele factor. Veel dank voor de ondersteuning die je hebt gegeven, vooral bij ingewikkelde bureaucratische zaken die toch weer moesten gebeuren.

Collega's van het onderwijs BVK bij de HU, maar ook Christelijke Hogeschool Ede en sinds twee jaar Klinische Gezondheidswetenschappen van de Universiteit Utrecht. Carolien Sino, dank voor je vertrouwen en voor het juist instellen van alle radartjes, zichtbaar maar vooral onzichtbaar, zodat ik tijd en ruimte kreeg om het promotietraject tot een succes te maken. Margreet Oostenbrink en Eva Povel, dank dat ik onder jullie het promotietraject kon afronden. Eva, ik zie uit naar verdere samenwerking. Marleen Schultz, door je empathie en daadkracht bleef de spagaat tussen onderwijs en onderzoek haalbaar. Josien Engel, je input in één van de onderzoeken was waardevol. Remco Verbrugge en Lidia van Veenendaal, wat een werk hebben we verricht tijdens respectievelijk de systematische review en het CONNECT-project. Remco, ik heb weer tijd voor een bijpraat bij de Bijenkorf. Lidia, hilarisch hoe we zes weken lang kriskras door Utrecht en omgeving taarten langsbrachten

bij de winnaars van de week. Marjolein van Wijk, je hebt de focusgroepen bij het CONNECT-project uitstekend begeleid. Jeanette den Uil – Westerlaken, Rolf Wiersma, Ria den Hertog, Jeroen Bakker, Vera Habes, Marleen Denissen, Marianne Sinoo, Gerlien Roke en Jacqueline Dijkstra, dank voor de samenwerking tijdens de kwaliteitsprojecten. Thóra Hafsteindóttir, Everlien de Graaf, Hetty Ockhuysen, Agnes van den Hoogen, Karin Valkenet, Marco van Brussel, Kevin Jenniskens, Elise van Belle en Saskia Weldam, het is een plezier om bij de vakken Wetenschap en Verpleegkundige Praktijk, en Systematisch Literatuuronderzoek met zo'n groep mensen met zoveel expertise te mogen werken.

Ik wil mijn vrienden en dierbaren bedanken voor de afgelopen jaren, vooral door het luisteren, geven van ontspanning en door me uit de bubbel van het promotietraject te trekken. Judith, hoe leuk dat we na 17 jaar nog steeds samenwerken, eerst op de thoraxchirurgie en nu bij de BVK. Je bent scherpzinnig en eerlijk. Wat wordt onze volgende reis, samen met Evelien? Alice, heerlijk die afspraken bij onze stamkroeg Guusjes en om over iets anders te praten dan werk. Ik waardeer je betrokkenheid en empathie. Rianne, dank voor alle gesprekken met ruimte voor gezelligheid, reflectie en openheid. We hebben afgelopen maanden samen een bijzonder traject mogen doorlopen en ik kijk daar met veel plezier op terug. Ik zie uit naar de Italiaan waar we het al zo lang over hebben. Carolien, fijn dat we jaren konden optrekken in onze onderzoekstrajecten over essentiële zorg binnen het Basic Care Revisited project. En daarnaast natuurlijk de gezellige koffiemomenten bij de Food Club in ons wijkje en alle etentjes. Dank hiervoor, ook voor je warmte, scherpte en relativiseringsvermogen. Helen, als collega's gestart op kamer 3.104 en na elf jaar zien we elkaar nog steeds met een diversiteit aan gezamenlijke interesses zoals katten, planten, reizen, emancipatie en natuurlijk de verpleegkunde, het onderwijs en onderzoek. Ik leer veel van je lef, directheid en vermogen om op gevoel focus te houden op zaken die ertoe doen. Anouk, ook begonnen als kamergenoot op 3.104 (doe het licht uit!) en inmiddels elf jaar later als vriendinnen. Onze wandelingen door Utrecht die we zijn begonnen tijdens corona zijn me ontzettend dierbaar. Je bent royaal in je tijd en onophoudelijk wervelend, vrolijk en vol verrassingen. Hiermee maak je keer op keer ons samenzijn tot een feestje. Hanneke en Nathalie, al 27 jaar samen vanaf dat we elkaar kennen uit de flat in Groningen. En ook al zien we elkaar een tijdje niet, het is steevast goed en gezellig. Ik kijk uit naar nieuwe uitjes bij de wijnbar, op Terschelling en bij concerten. En Nat, ik zie ernaar uit om weer live naar Noorderslag te gaan. Annemarie en Iris, onze studie Algemene Taalwetenschap lijkt als de dag van gisteren. We vinden nog steeds de momenten om bij te praten en het is telkens gezellig. Jiska, wat hebben we veel beleefd met elkaar. De lange Pinksterweekenden met jou zijn altijd bruisend. Eric, hoe aangenaam dat we onze interesse in cultuur en muziek met elkaar kunnen



---

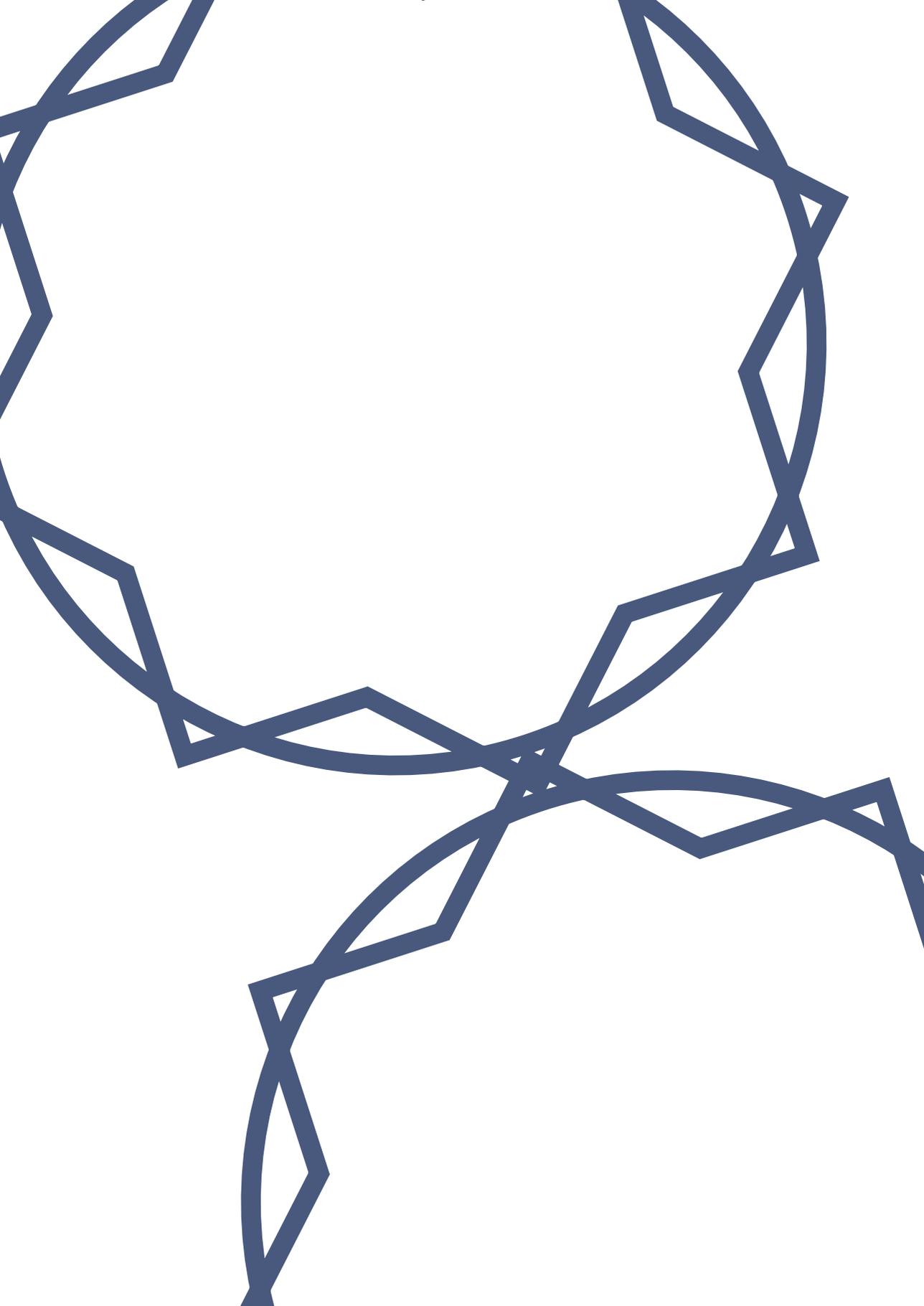
delen. Het is altijd weer nieuwe plekken ontdekken met jou. Ilona en Bertinel, met elkaar in beweging vanaf het moment dat we samenwerkten bij R&D Cardiologie. Laat de nieuwe wandelingen en schaatstochten maar komen! Evelien, onze levens lopen al lang naast elkaar, vanaf de thoraxchirurgie, zowel in werk als privé. Ik kan altijd bij je terecht met lief en leed. Ook dank dat ik een aantal onderzoeken op jouw afdeling mocht uitvoeren. Ik waardeer je veerkracht, positiviteit en denkkraft. Je bent erbij geweest bij de start van mijn carrière en ik ben vereerd dat je als paranimf naast me wilt staan om een belangrijke periode in mijn werkende leven af te sluiten.

Mijn broer Arthur, fijn om onderzoekszaken en onze visies hierop te kunnen delen. En voor jou en Leonie: er is weer meer tijd om af te spreken voor familieaangelegenheden. Hidde en Fenna, ik ben trots op jullie. Mateo, mooi om te zien hoe jij je pad uitstippelt en dicht bij jezelf blijft. Na Casa di David, Tenuta en Qanela ben ik heel nieuwsgierig waar we een volgende keer terecht komen. Luzmila y Teofilo, qué suegros más encantadores tengo. De cerca y de lejos siempre me reciben con los brazos abiertos. Que lindo fue poder volver a vernos después de un largo y emocionante tiempo. Estoy deseando que llegue la próxima vez en Melgar. Prima Elizabeth, estoy orgullosa de lo que has logrado, sobre todo en la primera línea en la pandemia. Espero que nos volvamos a ver pronto, en Madrid o Utrecht.

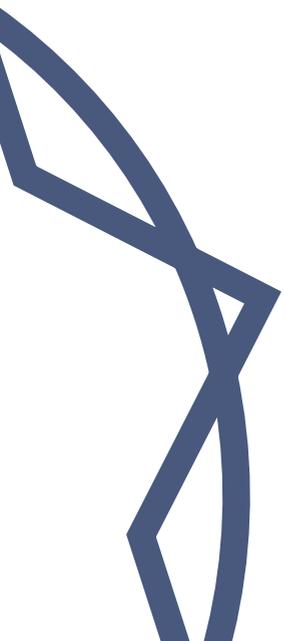
Lieve papa en mama, bijzonder veel dank wat jullie allemaal voor mij hebben gedaan dat ik zo ver ben gekomen. Jullie staan telkens voor me klaar en jullie steun is onvoorwaardelijk. Dit betekent ontzettend veel voor mij. We hebben afgelopen jaren veel meegemaakt, maar gelukkig gaat alles weer goed. Ik hoop dat we nog veel jaren met elkaar kunnen genieten van de mooie dingen.

Lieve Alberto, dank voor je geduld, je luisterend oor, je relativerend vermogen en me te wijzen op zaken die ertoe doen. Ik bewonder je intuïtieve benadering van zaken, je visie op de wereld en je lichtheid. Ik ben blij met en dankbaar voor de mooie momenten die we hebben meegemaakt en kijk uit naar de volgende Wititi.





# List of publications, presentations and courses obtained



---

## SCIENTIFIC PUBLICATIONS

**ten Cate D**, Dikken J, Ettema RGA, Schoonhoven L, Schuurmans MJ. Development of a microlearning intervention regarding nursing nutritional care for older adults: A multi-methods study. *Nurse Educ Today*. 2023;120:105623.

**ten Cate D**, Schuurmans MJ, van Eijk J, Bell JJ, Schoonhoven L, Ettema RGA. Factors influencing nurses' behavior in nutritional care for community-dwelling older adults before, during, and after hospitalization: A Delphi study. *J Contin Educ Nurs*. 2022;53(12):545-556.

**ten Cate D**, Dikken J, Ettema RGA, van Veenendaal L, Schuurmans MJ, Schoonhoven L. Feasibility of a microlearning intervention about nutritional care for older adults provided by hospital and home care nurses and nursing assistants: A mixed-methods study. *J Nurs Educ Pract*. 2022;12(12):37-48.

Rieckert A, Schuit E, Bleijenberg N, **ten Cate D**, de Lange W, de Man – van Ginkel J, Matijssen E, Smit L, Stalpers D, Schoonhoven L, Veldhuizen J, Trappenburg J. How can we build and maintain the resilience of our healthcare professionals during COVID-19? Recommendations based on a mixed-method study. *BMJ Open*. 2021;11:e043718.

**ten Cate D**, Mellema M, Ettema RGA, Schuurmans MJ, Schoonhoven L. Older adults' and their informal caregivers' nutritional care experiences and needs before, during and after hospitalization: A qualitative study. *J Nutr Gerontol Geriatr*. 2021;40(2-3):80-107.

**ten Cate D**, Schoonhoven L, Huisman – de Waal G, Schuurmans MJ, Ettema RGA. Hospital and home care nurses' experiences and perceptions regarding nutritional care for older adults to prevent and treat malnutrition: A cross-sectional study. *J Clin Nurs*. 2021;30(13-14):2079-2092.

**ten Cate D**, Ettema RGA, Huisman – de Waal G, Bell JJ, Verbrugge R, Schoonhoven L, Schuurmans MJ. On behalf of the Basic Care Revisited Group (BCR). Interventions to prevent and treat malnutrition in older adults to be carried out by nurses: A systematic review. *J Clin Nurs*. 2020;29(11-12):1883-1902.

**ten Cate D**, Gamel CJ, Sol BGM. Awareness, risk perception and behavioural intention in patients with a myocardial infarction. *Clin Nurs Stud.* 2015;3(2):8-16.

Ziegler W, Kerkhoff G, **ten Cate D**, Artinger F, Zierdt A. Spatial processing of spoken words in aphasia and in neglect. *Cortex.* 2001;37(5):754-756.

## **SCIENTIFIC PRESENTATIONS**

### *International*

'The attitude of lecturers who are teaching at the Bachelor's program in Nursing towards malnutrition education: A qualitative study'. Poster presentation NETNEP. Sitges, Spain. October 2022.

'Older people's and their informal caregivers' experiences and needs regarding nutritional care provided before, during and after hospitalisation'. Presentation European Nursing Conference. Online. October 2022.

'Educating hospital and home care nurses and nursing assistants about nutritional care for older people'. Presentation European Nursing Conference. Online. October 2022.

"Of course, nutrition education is important, but...". The ambivalence of Bachelor of Nursing lecturers'. Poster presentation COHEHRE Conference. Rotterdam, the Netherlands. May 2022.

'The attitude of Bachelor of Nursing lecturers towards malnutrition education: A qualitative study'. Presentation Care4 Conference. Online. February 2022.

'Changing nurses' behaviour towards nutritional care in older adults: Evaluation of a snack-sized learning intervention'. Presentation Care4 Conference. Online. February 2022.

'Older adults' and informal caregivers' perspectives on nutritional care before, during and after hospitalisation'. Abstract 2nd International Conference of the German Society of Nursing Science's Scientific Programme Committee. Berlin, Germany. May 2020.

'From misfit to fit: The influence of current nursing practice on complex nursing intervention development'. Abstract 2nd International Conference of the German Society of Nursing Science's Scientific Programme Committee. Berlin, Germany. May 2020.



---

'Validation of a snack-sized learning intervention to change nurses' behaviour towards nutritional care in older adults'. Abstract NETNEP. Sitges, Spain. April 2020.

'Nurses' opinions and beliefs about malnutrition in older adults: A cross-sectional study'. Poster presentation GSA Annual Meeting. Austin, USA. November 2019 (abstract available in: *Innov Aging*. 2019;3(Suppl1):S491-S492).

'Changing nurses' and nursing assistants' behavior toward nutritional care in older adults with a snack-sized learning intervention: A pilot study'. Presentation GSA Annual Meeting. Austin, USA. November 2019 (abstract available in: *Innov Aging*. 2019;3(Suppl1):S47).

'Behaviour of nurses to prevent malnutrition among older adults: A Delphi study'. Presentation Care4 Conference. Leuven, Belgium. February 2019.

'An intervention to prevent malnutrition before and after hospitalisation in non-institutionalised elderly patients'. Poster presentation CBC Conference. London, Great Britain. February 2018.

'Conducting a systematic review: Methods and importance'. Presentation European Nursing Conference. Rotterdam, the Netherlands. October 2016.

'Conducting a systematic review: Methods and importance'. Presentation STTI European Nursing Conference. Utrecht, the Netherlands. June 2016.

### *National*

'Samen een brug slaan: goede voedingszorg niet alleen voorbehouden aan de diëtist?'. Workshop Ouderen en Voeding Conference. Ede, the Netherlands. March 2020 (postponed).

'Meningen van verpleegkundigen over ondervoeding bij oudere zorgvragers: een cross-sectioneel onderzoek'. Poster presentation Geriatriedagen. Den Bosch, the Netherlands. February 2020.

'Snack-sized' leren voor verpleegkundigen en verzorgenden om betere voedingszorg aan oudere zorgvragers te geven: een pilotstudie'. Presentation Geriatriedagen. Den Bosch, the Netherlands. February 2020.

'Passende onderzoeksmethodologie voor complexe vraagstukken'. Workshop ZonMw program Tussen Weten en Doen II. Utrecht, the Netherlands. November 2019.

'De essentiële rol van verpleegkundigen en verzorgenden bij de aanpak van ondervoeding bij thuiswonende ouderen'. Workshop Nursing Conference. Ede, the Netherlands. October 2019.

'Samen een brug slaan bij ondervoede ouderen: interdisciplinaire samenwerking binnen en tussen de muren'. Workshop Ouderen en Voeding Conference. Ede, the Netherlands. March 2019.

'Participatie docenten en onderzoekers bij uitvoering literatuuronderzoek leidt tot samenwerking, deskundigheidsbevordering en efficiëntie'. Poster presentation Jaarcongres Vereniging Hogescholen. Ede, the Netherlands. April 2018.

'Verpleegkundige voedingsinterventie bij thuiswonende ouderen rondom ziekenhuisopname: ontwikkeling en uitdagingen'. Presentation Nationaal Gerontologiecongres. Ede, the Netherlands. November 2017.

'Basic Care Revisited – Nursing Nutrition Interventions (NNI) to decrease and prevent undernutrition at home and in hospital'. Poster presentation Future Proof Nursing – Challenges and Opportunities – ZonMw program Tussen Weten en Doen II. Utrecht, the Netherlands. June 2017.

'Ondervoeding: een serieus probleem? Cross-sectioneel onderzoek naar de opvattingen van ziekenhuisverpleegkundigen over ondervoeding'. Presentation Geriatriedagen. Den Bosch, the Netherlands. February 2017.

'Voeding, een taak voor verpleegkundigen?'. Presentation Alliantie Voeding in de Zorg. Ede, the Netherlands. June 2016.

## **PUBLICATIONS FOR HEALTHCARE PRACTICE OR EDUCATION**

Zuidema J, Ziylan C, **ten Cate D**. Leerdoelenoverzicht voor ondervoedingsonderwijs. OenG. 2021;45(6):15.

van den Boomgaard I, Ziylan C, Zuidema – Cazemier J, Huisman – de Waal G, Foendoe Aubèl G, de van der Schueren M, **ten Cate D**, Dikken J. De attitude van verpleegkundedocenten ten aanzien van ondervoedingsonderwijs. OenG. 2020;44(6):26-29.

---

Schoonhoven L, Trappenburg J, Bleijenberg N, **ten Cate D**, de Lange W, de Man – van Ginkel J, Matijssen E, Rieckert A, Schuit E, Smit L, Stalpers D, Veldhuizen J. Co-fit. Behoud van korte en lange termijn fysieke/mentale gezondheid en inzetbaarheid van zorgprofessionals blootgesteld aan Covid-19 crisis werkomstandigheden. Utrecht: UMC Utrecht en Hogeschool Utrecht; 2020.

Zuidema – Cazemier J, **ten Cate D**, van den Boomgaard I, Dikken J, Foendoe Aubèl G, Huisman – de Waal G, de van der Schueren M, Ziylan C. Leerdoelen voor ondervoedingsonderwijs Bachelor Verpleegkunde volgens CanMEDS-rollen. Stuurgroep Ondervoeding; 2019.

De Ontmoeting. Expertraad ontwikkelt onderwijsmodules over ondervoeding. Interview met **Debbie ten Cate** en Canan Ziylan. OenG. 2019;43(3):8-9.

van den Boomgaard I, Ziylan C, Zuidema – Cazemier J, Huisman – de Waal G, Foendoe Aubèl G, de van der Schueren M, **ten Cate D**, Dikken J. Hoe ondervoedingswijs ben jij. Factsheet Stuurgroep Ondervoeding (*Winnaar posterprijs VoedingNL congres 2019*).

Groenendijk – van Woudenberg T, **ten Cate D**, van der Veen Y, Ettema R. Krijgt voeding in het onderwijs meer vaste grond onder de voeten? OenG. 2019;43(6):22-25. (*Genomineerd voor de Henk Ritzen-prijs 2019*).

**ten Cate D**, Verbrugge R, Ettema R, Schuurmans M. Samen de brug slaan tussen onderzoek en onderwijs. Docenten en onderzoekers werken samen bij uitvoering literatuuronderzoek. OenG. 2018;42(6):21-23.

Burgman E, **ten Cate D**, Hoekstra T. In drie stappen naar een patiëntenpad. Nieuw voorlichtingsmateriaal geeft de patiënt regie. Cordiaal. 2013;33(4):120-123.

**ten Cate D**, Verweij E, Hindori V, Yilmaz A. Mitralisklepooperatie via VATS. Cordiaal. 2010;31(5):166-168.

Hendriksen J, **ten Cate D**, van Meeuwen E. Screenen met SLIM. Een screeningsinstrument voor ondervoeding bij patiënten na openhartchirurgie. Cordiaal. 2008;29(1):8-10.

## **PRESENTATIONS FOR HEALTHCARE PRACTICE OR EDUCATION**

'Het perspectief van oudere zorgvragers en hun mantelzorgers op voedingszorg rondom ziekenhuisopname: een kwalitatieve studie'. Presentation Department Lung Diseases, UMC Utrecht. Utrecht, the Netherlands. March 2020.

'Voeding en verpleegkunde: onbekend, onbemind of niet van ons?'. Presentation and round table Brede Netwerk Bijeenkomst, NUZO. Utrecht, the Netherlands. June 2018.

'Voeding en verpleegkunde: onbekend, onbemind of niet van ons?'. Presentation Symposium Research Group Chronic Diseases, Hogeschool Utrecht. Utrecht, the Netherlands. May 2018.

'Ondervoeding: een serieus probleem? Cross-sectioneel onderzoek naar de opvattingen van ziekenhuisverpleegkundigen over ondervoeding'. Presentation Platvorm Ondervoeding, St. Antonius Ziekenhuis. Nieuwegein, the Netherlands. October 2017.

'Tjitze talks: Ondervoeding'. Presentation Farewell symposium Tjitze talks, St. Antonius Ziekenhuis. Nieuwegein, the Netherlands. June 2017.

'Preventie van ondervoeding bij oudere zorgvragers rondom ziekenhuisopname: EATING studie Utrecht'. Presentation Platvorm Ondervoeding, St. Antonius Ziekenhuis. Nieuwegein, the Netherlands. February 2017.

'Ondervoeding: een serieus probleem? Cross-sectioneel onderzoek naar de opvattingen van ziekenhuisverpleegkundigen over ondervoeding'. Presentations Division of Internal Medicine and Infectious Diseases, UMC Utrecht. Utrecht, the Netherlands. February 2017.

'Voeding en Ondervoeding: een taak voor wijkverpleegkundigen?' Kick off Homecare nurses, Hogeschool Utrecht. Utrecht, the Netherlands. January 2017.

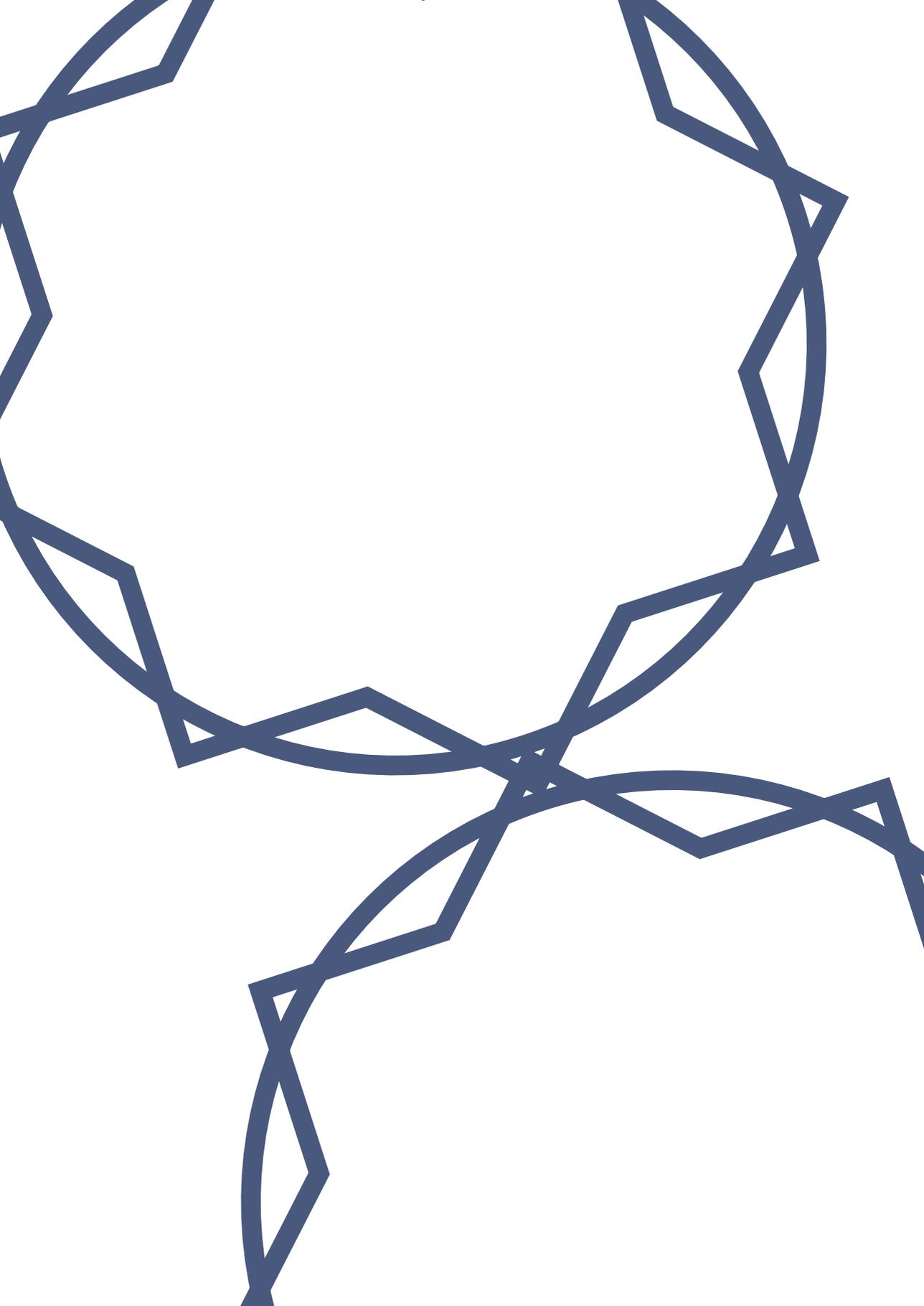
## **COURSES OBTAINED**

Academic writing in English – Advanced (course). Babel. Utrecht, the Netherlands. 2019.

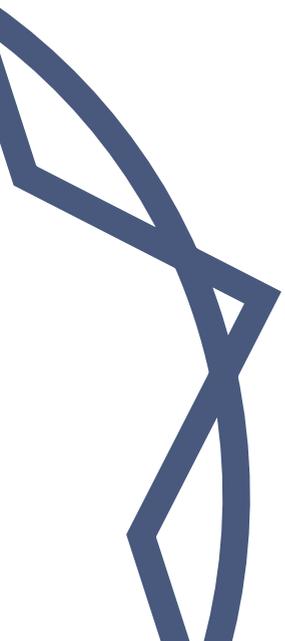
Modern methods in data analysis (course 6 ECTS). Master Epidemiology, Utrecht University. Utrecht, the Netherlands. 2017.

Classical methods in data analysis. (course 4,5 ECTS). Master Epidemiology, Utrecht University. Utrecht, the Netherlands. 2016.





# Curriculum Vitae



---

Debbie ten Cate was born on 18 May 1977 in Beetgumermolen, the Netherlands. After graduating from secondary school at the Slauerhoff College in Leeuwarden in 1995, she moved to Groningen and studied General Linguistics (major: Neurolinguistics) at the Rijksuniversiteit Groningen. In 1999 and 2000, she first lived and studied in Potsdam and then in Munich, Germany. Debbie obtained her master's degree in 2000. During her master thesis, she preceded with the Bachelor of Nursing at the Noordelijke Hogeschool Leeuwarden, where she followed the dual programme and worked in the St. Lucas Hospital in Winschoten. She obtained her Bachelor's degree in Nursing by the end of 2003 and moved to Utrecht. From early 2004 till 2010, she worked as a registered nurse, care coordinator and research nurse respectively at the cardiology and cardio-thoracic department of the St. Antonius Hospital in Nieuwegein. At this department, she initiated a project to structurally screen all patients on malnutrition at hospital admission (before malnutrition became a so-called performance indicator). In 2007, Debbie started with the pre-master in Nursing Science at Utrecht University. She completed her Master of Science in Nursing Science in 2010. In the same year, she took a job as a lecturer at the bachelor program of Nursing at the University of Applied Sciences Utrecht. She continued to work as a registered nurse at the cardio-thoracic department of the St. Antonius Hospital in Nieuwegein.



At the end of 2014, Debbie started her PhD project at the Research Group Chronic Diseases (since 2018: Research Group Proactive Care for Older People living at Home) of the University of Applied Sciences Utrecht and the Julius Center for Health Sciences and Primary Care. This PhD project was part of the Basic Care Revisited project, a collaboration between the universities and universities of applied sciences of Maastricht, Nijmegen and Utrecht. During her PhD project, Debbie continued to work as a lecturer at the bachelor program of Nursing. She also teaches at the master's program of Clinical Health Sciences of Utrecht University.

Debbie conducted board activities for the Dutch Society of Cardiovascular Nursing (NVHVV) from 2011 till 2017. From 2018, Debbie joined the Expert Council Education of the Dutch Malnutrition Steering Group. She is a member of the Consortium Nutrition in Health Educations (Foodvalley project) (since 2019) and the Consortium VITALIS (Transdisciplinary education about preventive lifestyle in seniority) (since 2020). Also, Debbie is a member of the board committee Geriatrics and Gerontology of the Dutch professional organisation for nurses V&VN.

Debbie's future ambition is to contribute to health and well-being of, and quality of care for older adults with focus on prevention, lifestyle and interprofessional collaboration within research, healthcare practice and education.

Check Debbie ten Cate her profile at the University of Applied Sciences Utrecht:



