Dissertation

Malnutrition in Austrian Hospitals and Nursing Homes

- Structure, Process and Outcome -

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Declaration

I hereby declare that this doctoral thesis is my own original work and that I have fully acknowledged by name all of those individuals and organizations that have contributed to the research of this doctoral thesis. Due acknowledgement has been made in the text to all other material used. Throughout this doctoral thesis and in all related publications I followed the guidelines of "Good Scientific Practice".

Graz, 13.07.2015   Silvia Bauer, eh

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CONTENTS

LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
BAPEN	British Society for Parenteral and Enteral Nutrition
BMI	Body Mass Index
BSc	Bachelor of Nursing Science
CDS	Care Dependency Scale
CI	Confidence Interval
CPGs	Clinical Practice Guidelines
DI	Discrimination Index
EDCNS	European Doctoral Conference in Nursing Science
ESPEN	European Society for Parenteral and Enteral Nutrition
I-CVI	Item-Content Validity Index
ID	Item Difficulty
KoM	Knowledge of Malnutrition
KoM-G	Knowledge of Malnutrition-Geriatric
LPZ	Landelijke Prevalentiemeting Zorgproblemen
MNA	Mini Nutritional Assessment
n or N	Absolute number
NICE	National Institute for Health and Care Excellence
ONS	Oral Nutritional Supplements
OR	Odds Ratio
P	p-value
Q1 - Q3	Interquartilsrange
SANN-G	Staff Attitude to Nutritional Nursing Care-Geriatric
S-CVI/Ave	Scale-Content Validity Index/Average
SD	Standard Deviation
T0	Baseline
T1	One year later

Chapter 1

General introduction

GENERAL INTRODUCTION

This chapter presents the general background information and describes the theoretical framework of this doctoral thesis. The research gaps and the overall aims are subsequently presented. Finally, the aims and research questions of the studies conducted and the outline of the doctoral thesis are illustrated.

General background

People in Europe and worldwide are living longer than ever before. The proportion of people aged 65 and older will increase from 15% in 2010 to 25% in 2050 in the European region (1). In Austria in 1990, the percentage of people over 65 years of age was 14.9%, in 2013 it was 18.2% and it is expected to be 23.6% in 2030 (2). This suggests that problems associated with ageing are also expected to increase in the future (1, 3).

One of these problems is nutritional intake. The multifaceted social and physiological changes that occur during ageing affect a range of areas from socio-economic status and living situation to reduced appetite and longer satiation. These changes can negatively influence nutritional intake (3-5), which can put elderly people at risk of malnutrition (6-8). In addition, several risk factors for malnutrition are well known in the international literature and include being female, having dementia, cancer or gastrointestinal diseases, having multiple diseases, taking several drugs and being care dependent (9-11).

If a person is malnourished, the consequences are multifaceted and encompass higher morbidity and mortality, a prolonged hospital stay and various complications (e.g., infections). This also leads to reduced quality of life, impaired recovery, post-discharge care needs and a possible deterioration of function and increased care dependency. Furthermore, malnutrition promotes nursing home admission and leads to high health care costs (12-16). For instance, the total costs of managing malnutrition in Dutch nursing homes in 2011 were calculated at € 453 million (17) and at UK hospitals and nursing homes in 2003 reached £ 7,3 billion/€ 10,5 billion. Most of these costs were treatment costs (18).

Although malnutrition is a relevant problem that leads to far-reaching consequences, there is still no internationally accepted criterion for defining malnu-

trition (12, 19, 20). For this doctoral thesis, the most commonly used definition of malnutrition within the international literature was used:

'Malnutrition is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein, and other nutrients causes measureable adverse effects on tissue/body function (shape, size, and composition) and function, and clinical outcome' (21).

This definition includes under-, mal- and overnutrition. It is known that in the elderly, the problem of undernutrition is more relevant than the problem of overnutrition. Although overnutrition is associated with far-reaching consequences in mid-life, for elderly persons, overnutrition may be a protective factor with regard to functionality and mortality (22). Therefore Elia's (21) definition of malnutrition in the sense of undernutrition is used.

Theoretical framework

Since malnutrition is a complex phenomenon, a multidisciplinary approach on multiple levels is required (15). Donabedian's model is well-known among health care professionals and takes different levels into consideration. This model builds the basis of this doctoral thesis and consists of structure, process and outcome (Figure 1). In general, the **structure** refers to the attributes of a setting, in which care occurs and includes material resources (e.g., facilities and money), human resources (e.g., number and qualification of staff) and organization structure (e.g., organization of staff) (23). When transferring structure to malnutrition, it includes, among others, the availability of evidence-based guidelines, nutritional screening and treatment policies and the knowledge and attitudes of health care staff. **Process** addresses what is actually done in health care (23) and means, with regard to malnutrition, to perform nutritional screening and assessment and to conduct prevention and treatment. **Outcomes** are the effects of care on the health status of a patient or resident (23) and refer to the nutritional status of a patient or resident. Structure, process and outcome do not stand alone; they are linked to each other and influence each other, meaning that good structures lead to good processes and thus, to good outcomes (23).
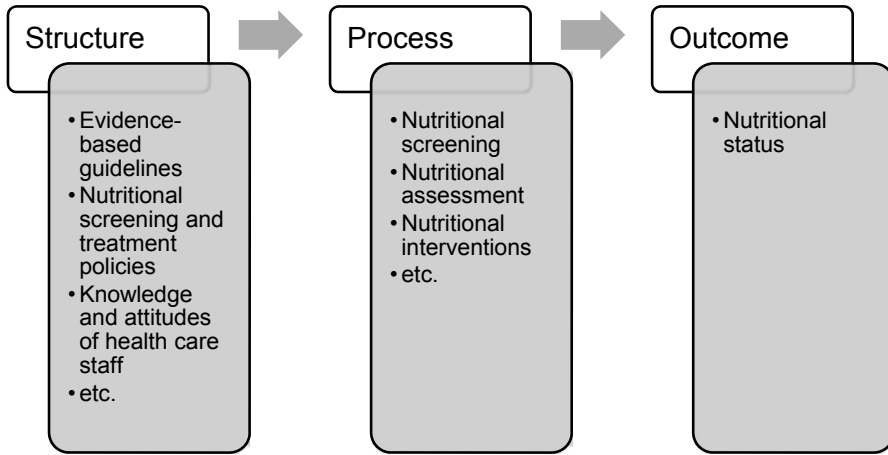
Figure 1: Model of Donabedian (23) regarding malnutrition

Structure, process and outcome regarding malnutrition

Structure

Inadequate knowledge, insufficient interest and negative attitudes on the part of health care professionals are seen as the main structural barriers to adequate nutritional practice (24-26). Of all health care professionals, nurses are in the best position to ensure good nutrition, because they are the only profession in contact with patients and residents 7 days a week, 24 hours a day (27, 28). Negative attitudes and a lack of knowledge were found in several studies among nursing staff in different health care settings (29-31). In addition, feeding patients and residents is not appreciated as a valuable nursing task and is transferred to other staff members or the burden is placed on patients/residents to manage it themselves (27). This may contribute to inadequate nutritional intake especially in patients/residents with special needs, e.g., those with swallowing problems (32). Nevertheless, most of the described international studies were conducted in hospitals. Other than knowledge and attitudes, there is also some information on deficits in other structural indicators, like guideline use or the availability of nutritional screening and treatment policies (33).

Process

As a process indicator, screening is a cost-effective and simple procedure and is the first step in tackling malnutrition (15, 20, 34). After screening, a comprehensive assessment of nutritional status should result in a subsequent care plan including the necessary interventions (35-37). The identification of persons with malnutrition or risk of malnutrition should be done by using nutritional screening tools, which consist of different parameters, like Body Mass Index (BMI), weight loss and appetite and which are confirmed to have good validity and reliability in identifying patients and residents with risk of malnutrition and malnutrition (36). After the identification of patients and residents in need, oral nutrition and its manifold possibilities should always be the first choice of treatment (15, 35, 38). If normal oral nutrition is not enough, adequate nutritional support, in terms of Oral Nutritional Supplements (ONS), enteral or parenteral nutrition should start as early as possible (15). According to international studies, the detection of malnutrition in hospitals and nursing homes remains poor, however, because of deficits in screening and assessment (19, 33, 39). In addition, several studies found that nutritional interventions are not performed routinely in all malnourished patients and residents (7, 33, 40). This leads to the fact that malnutrition is rarely recognized in clinical practice (12, 36, 41), not taken seriously and appropriate interventions were seldom planned (39).

Outcome

The prevalence and incidence of malnutrition are considered outcome indicators and have been investigated in several international studies (6, 42-45). Bell et al. (42) found in their systematic review that malnutrition occurred in up to 71% of nursing home residents (42). Kaiser MJ et al. (43) performed an analysis of pooled data from 24 studies and found that 38.7% of hospital patients and 13.8% of nursing home residents were malnourished. Furthermore, Halfens et al. (45) compared prevalence rates between Austria and the Netherlands and found that in Austrian hospitals, 17% and in Dutch hospitals, 19% of patients were malnourished. In nursing homes, 23% of Austrian residents and 14% of Dutch residents were malnourished (45). International prevalence rates vary widely because the underlying analyses are based on different definitions, instruments, methods and populations (6, 12).

Research gaps

Malnutrition is a highly prevalent phenomenon which has to be identified early and adequately treated (37). Nevertheless, the international literature gives insight into deficits in structure, process and outcome regarding malnutrition in hospitals and nursing homes (26, 33, 43).

Since structure, process and outcome are highly correlated with each other (23), it is first necessary to have comprehensive information on the status quo of these indicators in hospitals and nursing homes. Based on this information concrete areas in need of improvement can be distinguished. However, in the international literature, comprehensive information on structural, process and outcome indicators of nutritional care in hospitals compared with nursing homes is missing.

After obtaining information on structure, process and outcome, it is worth concentrating on nutritional status as an outcome. Information on the changes of nutritional status and associated factors related to a decline in nutritional status in nursing home residents is especially limited, although malnutrition is highly prevalent in nursing homes (42). Such knowledge would support the identification of residents in need of early prevention, which may help to lower the incidence of malnutrition.

Before one can improve process or outcome indicators in the long term, comprehensive information on the most relevant structural indicator - knowledge and attitudes towards malnutrition among nursing staff - is necessary (24-26). Until now only marginal information on knowledge of and attitudes towards malnutrition in the nursing home setting has been available. Studies performed in nursing homes used mixed samples consisting of registered nurses and directors of facilities or investigated only registered nurses. Most did not include nurse aides, despite the fact that they are the main care givers in nursing homes (46, 47). In addition, previously performed studies used small samples and no systematically developed and psychometrically tested tool to measure knowledge (26, 48, 49). Comprehensive information on knowledge and attitudes among registered nurses and nurse aides using systematically developed and psychometrically tested tools may enable the identification of knowledge deficits and areas of negative attitudes. This, in turn, will facilitate the planning of tailored nutritional education which may improve malnutrition care in terms of process and outcome indicators in the long run.

These are the knowledge gaps identified in the international literature which this doctoral thesis will attempt to close with the studies performed in Austrian hospitals and nursing homes.

AIMS OF THIS DOCTORAL THESIS

The overall aims of the doctoral thesis are (1) to describe structural and process indicators of nutritional care in hospitals and nursing homes; (2) to describe changes in nutritional status in nursing home residents; and (3) to assess knowledge and attitudes of nursing staff in nursing homes towards malnutrition.

The detailed aims and research questions of the studies conducted, which were carried out within the framework of three research projects, are illustrated below:

Study 1: The aim is to describe the structural and process indicators of nutritional care in hospitals and nursing homes and to compare these two settings.

- What are the structural and process indicators of nutritional care in hospitals and nursing homes?
- What are the differences in the structural and process indicators of nutritional care between hospitals and nursing homes?

Study 2: The aim is to describe how nutritional status changes in nursing home residents over a period of one year and what factors are associated with a decline in nutritional status in nursing home residents over a period of one year.

- What is the change in nutritional status in nursing home residents over a period of one year?
- What factors are associated with a decline in nutritional status in nursing home residents over a period of one year?

Study 3, part I: The aim is to develop and psychometrically evaluate a questionnaire to assess knowledge of malnutrition care among nursing staff in nursing homes.

- What are the psychometric properties (content validity, item validity, construct validity, internal consistency) of a questionnaire to assess knowledge of malnutrition care among nursing staff in nursing homes?

Study 3, part II: The aim is to assess the knowledge and attitudes of registered nurses[*] and nurse aides towards malnutrition care in nursing homes, as well as to look at differences in knowledge and attitudes with regard to general characteristics like gender, age and years of working experience.

- What are the knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes?
- What are the differences in knowledge and attitudes with regard to general characteristics like gender, age and years of working experience of registered nurses and nurse aides towards malnutrition care in nursing homes?

Structure of the doctoral thesis

The doctoral thesis consists of seven chapters. Chapter two provides a short overview of the methodological aspects of the studies conducted. Chapters three to six present the studies according to the four research aims. These chapters have been published, accepted or submitted as scientific publications in peer-reviewed journals. Chapter seven includes a general discussion reflecting on the results of the studies described.

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[*] The equivalent of a registered nurse in Austria is to have a diploma

REFERENCES

1. World Health Organization Regional Office for Europe. The European Health Report 2012. 2012, http://www.euro.who.int/de/data-and-evidence/european-health-report-2012 (accessed 08 May 2015).

2. Statistik Austria. Bevölkerung. 2015, http://www.statistik.at/web_de/statistiken/bevoelkerung/index.html (accessed 08 May 2015).

3. Bauer JM, Wirth R, Volkert D, Werner H, Sieber CC. Malnutrition, Sakropenie und Kachexie im Alter - von der Pathophysiologie zur Therapie. Dtsch Med Wochenschr 2008; 133: 305-310.

4. Milne AC, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. Cochrane Database of Systematic Review 2009; 2: doi: 10.1002/14651858.CD003288.pub3.

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

6. Stratton RJ, Green CJ, Elia M. Disease-related malnutrition: an evidence-based approach to treatment. 1st ed. Cambridge: CABI Publishing; 2003.

7. Valentini L, Schindler K, Schlaffer R, Bucher H, Mouhieddine M, Steininger K, Tripamer J, Handschuh M, Schuh C, Volkert D, Lochs H, Sieber CC, Hiesmayr M. The first NutritionDay in nursing homes: participation may improve malnutrition awareness. Clin Nutr 2009; 28: 109-116.

8. Volkert D, Saeglitz C, Gueldenzoph H, Sieber CC, Stehle P. Undiagnosed malnutrition and nutrition-related problems in geriatric patients. J Nutr Health Aging 2010; 14: 387-392.

9. Meijers JMM, Schols JMGA, van Bokhorst-de van der Schueren MAE, Dassen T, Janssen MAP, Halfens RJG. Malnutrition prevalence in The Netherlands: results of the Annual Dutch National Prevalence Measurement of Care Problems. Br J Nutr 2009a; 101: 417-423.

10. Pirlich M. Schütz T, Norman K, Gastell S, Lübke HJ, Bischoff SC, Bolder U, Frieling T, Güldenzoph H, Hahn K, Jauch KW, Schindler K, Stein J, Volkert D, Weimann A, Werner H, Wolf C, Zürcher G, Bauer P, Lochs H. The German hospital malnutrition study. Clin Nutr 2006; 25: 563-572.

11. van Nie-Visser NC, Meijers J, Schols J, Lohrmann C, Bartholomeyczik S, Spreeuwenberg M, Halfens R. Which characteristics of nursing home residents influence differences in malnutrition prevalence? An international comparison of The Netherlands, Germany and Austria. Br J Nutr 2014; 28: 1129-1136.

12. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5-15.

13. van Bokhorst-de van der Schueren MA, Klinkenberg M, Thijs A. Profile of the malnourished patient. Eur J Clin Nutr 2005; 59: 1129-1135.

14. Arvanitakis M, Beck A, Coppens P, De Man F, Elia M, Hebuterne X, Henry S, Kohl O, Lesourd B, Lochs H, Pepersack T, Pichard C, Planas M, Schindler K, Schols J, Sobotka L, van Gossum A. Nutrition in care homes and home care: how to implement adequate strategies (report of the Brussels Forum (22-23 November 2007)). Clin Nutr 2008; 27: 481-488.

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

16. Törmä J, Winblad U, Cederholm T, Saletti A. Does undernutrition still prevail among nursing home residents? Clin Nutr 2013; 32: 562-568.

17. Freijer K, Tan SS, Koopmanschap MA, Meijers JMM, Halfens RJG, Nuijten MJC. The econo-mic costs of disease related malnutrition. Clin Nutr 2013; 32: 136-141.

18. Russel CA. The impact of malnutrition on healthcare costs and economic considerations for the use of oral nutritional supplements. Clin Nutr Suppl 2007; 2: 25-32.

19. Volkert D, Bauer JM, Frühwald T, Gehrke I, Lechleitner M. Lenzen-Großimlinghaus R, Wirth R, Sieber C und das DGEM Steering Committee. Klinische Ernährung in der Geriatrie. Aktuel Ernahrungsmed 2013; 38: e1-e48.

20. Cederholm T, Bosaeus I, Barazzoni R, Bauer J, Van Gossum A, Klek S, Muscaritoli M, Nyu-lasi I, Ockenga J, Schneider SM, de van der Schueren MAE, Singer P. Diagnostic criteria for malnutrition - an ESPEN Consensus Statement. Clin Nutr 2015; 34: 335-340.

21. Elia M. Principles of Clinical Nutrition: contrasting the practice of nutrition in health and di-sease. In Clinical Nutrition, 1st ed. (Gibney MJ, Elia M, Ljungqvist O, Dowsett J eds). Oxford: Blackwell Sciences Ltd; 2005: 1-14.

22. Kaiser R, Winning K, Uter W, Volkert D, Lesser S, Stehle P, Kaiser MJ, Sieber CC, Bauer JM. Functionality and mortality in obese nursing home residents: an example of 'risk factor paradox'. J Am Med Dir Assoc 2010; 11: 428-435.

23. Donabedian A. The quality of care: How can it be assessed? JAMA 1988; 260: 1743-1748.

24. Holst M, Staun M, Kondrup J, Bach-Dahl C, Rasmussen HH. Good nutritional practice in hospitals during an 8-year period: The impact of accreditation. e-SPEN 2014; 9: e155-e160.

25. Bjerrum M, Tewes M, Pedersen P. Nurses' self-reported knowledge about and attitude to nut-rition - before and after a training programme. Scand J Caring Sci 2012; 26: 81-89.

26. 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 2013; 9: 54-64.

27. Kowanko I. The role of the nurse in food service: a literature review and recommendations. Int J Nurs Pract 2008; 3: 73-78.

28. Bonetti L, Bagnasco A, Giuseppe A, Sasso L. Validation of the Staff Attitudes to Nutritional Nursing Care Geriatric scale in Italian. Int Nurs Rev 2013; 60: 389-396.

29. Bachrach-Lindström M, Jensen S, Lundin R, Christensson L. Attitudes of nursing staff wor-king with older people towards nutritional nursing care. J Clin Nurs 2007; 16: 2007-2014.

30. Eide HD, Halvorsen K, Almendingen K. Barriers to nutritional care for the undernourished hospitalized elderly: perspectives of nurses. J Clin Nurs 2014; 24: 696-706.

31. 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: 208-215.

32. Forster A, Samaras N, Gold G, Samaras D. Oropharyngeal dysphagia in older adults: A re-view. Eur Geriatr Med 2011; 2: 356-362.

33. Meijers JMM, Halfens RJG, van Bokhorst-de van der Schueren MAE, Dassen T, Schols JMGA. Malnutrition in Dutch health care: prevalence, prevention, treatment and quality indi-cators. Nutrition 2009b; 25: 512-519.

34. van Bokhorst-de van der Schueren MAE, Guaitoli PR, Jansma EP, de Vet HCW. A Systematic Review of Malnutrition Screening Tools for the Nursing Home Setting. J Am Med Dir Assoc 2014; 15: 171-184.

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

36. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr 2003; 22: 415-421.

37. Council of Europe Committee of Ministers. Resolution ReAP on food and nutritional care in hospitals. Straßburg: Council of Europe; 2003.

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

39. Hiesmayr M, Schindler K, Pernicka E, Schuh C, Schoeniger-Hekele A, Bauer P, Laviano A, Lovell AD, Mouhieddine M, Schuetz T, Schneider SM, Singer P, Pichard C, Howard P, Jonkers C, Grecu I, Ljungqvist O, the NutritionDay Audit Team. Decreased food intake is a risk factor for mortality in hospitalised patients: the NutritionDay survey 2006. Clin Nutr 2009; 28: 484-491.

40. Bavelaar JW, Otter CD, van Bodegraven AA, Thijs S, van Bokhorst-de van der Schueren MA. Diagnosis and treatment of (disease-related) in-hospital malnutrition: the performance of medical and nursing staff. Clin Nutr 2008; 27: 431-438.

41. Adams NE, Bowie AJ, Simmance N, Murray M, Crowe TC. Recognition by medical and nursing professionals of malnutrition and risk of malnutrition in elderly hospitalized patients. Nutrition & Dietetics 2008; 65: 144-150.

42. Bell CL, Tamura BK, Masaki KH, Amella EJ. Prevalence and measures of nutritional compromise among nursing home patients: weight loss, low Body Mass Index, malnutrition, and feeding dependency, a systematic review of the literature. J Am Med Dir Assoc 2013; 14: 94-100.

43. Kaiser MJ, Bauer JM, Rämisch C, Uter W, Guigoz Y, Cederholm T, Thomas DR, Anthony PS, Charlton KE, Maggio M, Tsai AC, Vellas B, Sieber CC, Mini Nutritional Assessment International Group. Frequency of malnutrition in older adults: A multinational perspective using the Mini Nutrition Assessment', J Am Geriatr Soc 2010; 58: 1734-1738.

44. BAPEN. Nutrition Screening Survey in the UK and Republic of Ireland in 2011. 2012, http://www.bapen.org.uk/pdfs/nsw/nsw-2011-report.pdf (accessed 08 May 2015).

45. Halfens RJG, Meesterberends E, van Nie-Visser NC, Lohrmann C, Schönherr S, Meijers JMM, Hahn S, Vangelooven C, Schols JMGA. International prevalence measurement of care problems: results. J Adv Nurs 2013; 69: e5-e17.

46. Barry T, Brannon D, Mor V. Nurse aide empowerment strategies and staff stability: effects on nursing home resident outcomes. Gerontologist 2005; 45: 309-317.

47. Crogan NL, Evans BC. Nutrition education for nursing assistants: an important strategy to improve long-term care. J Contin Educ Nurs 2001c; 32: 216-218.

48. Stanek K, Powell C, Betts N. Nutritional knowledge of nurses in long-term health care facilities. J Nutr Elder 1991; 10: 35-48.

49. Crogan NL, Shultz JA, Massey LK. Nutrition knowledge of nurses in long-term care facilities. J Contin Educ Nurs 2001a; 32: 171-176.

Chapter 2

Methods

METHODS

The following chapter provides an overview of the methodological aspects of the studies (design, sample, setting, data collection and analysis). A detailed description of the methods can be found in chapters three to six.

Table 1: Overview of the methodological aspects of the studies

	Study 1	**Study 2**
Topic	Structural and process indicators of nutritional care in hospitals and nursing homes	Changes in nutritional status and factors associated with a decline in nutritional status in nursing home residents over a period of one year
Design	Multicenter, cross-sectional study	Secondary data analysis; panel study
Setting & sample	18 Austrian hospitals with 2326 patients and 18 Austrian nursing homes with 1487 residents	3 Austrian nursing homes with 157 residents who participated twice in the measurements
Data collection	Assessment of each patient/ resident on one day in April 2010 by a team of two nurses using a standardized questionnaire	Assessment of each resident on one day over two consecutive years (from 2010 - 2013) by a team of two nurses using a standardized questionnaire
Data analysis	Descriptive and inductive statistics	Descriptive, inductive statistics and logistic regression analysis

	Study 3, part I	Study 3, part II
	Development and psychometric evaluation of a questionnaire to assess knowledge of malnutrition care among nursing staff in nursing homes	Assessment of knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes
	Psychometric methodological study	Multicenter, cross-sectional study
	66 Austrian nursing homes with 1152 registered nurses and nurse aides	
	Development of the dimensions and items of the questionnaire: Delphi study with eight international malnutrition experts. Psychometric evaluation (item validity, construct validity, internal consistency) of the questionnaire: Registered nurses and nurse aides filled in a questionnaire consisting of the newly developed Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire and the Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) scale within a period of four weeks between November 2012 and February 2013	Registered nurses and nurse aides filled in a questionnaire consisting of the KoM-G questionnaire and the SANN-G scale within a period of four weeks between November 2012 and February 2013
	Descriptive and inductive statistics	

Chapter 3

Structural and process indicators of nutritional care: A comparison between Austrian hospitals and nursing homes

Silvia Schönherr, Ruud JG Halfens, Judith MM Meijers, Jos MGA Schols, Christa Lohrmann

ABSTRACT

Objective: The aim of this study was to describe and compare structural and process indicators of nutritional care in Austrian hospitals and nursing homes.

Methods: A multicenter, cross-sectional study was performed using a standardized and tested questionnaire. Data were collected on patient and institutional levels of hospitals and nursing homes.

Results: Data from 18 Austrian hospitals (n=2326 patients) and 18 Austrian nursing homes (n=1487 residents) were collected. The prevalence of malnutrition was 23.2% in hospitals and 26.2% in nursing homes. All hospitals and 83.3% of the nursing homes employed dietitians. Guidelines for the prevention and treatment of malnutrition were used infrequently. Nutritional screening at admission was performed in 62.6% of the hospitalized patients and 93.4% of the nursing home residents. Nutritional screening tools were used in 28.9% of the nursing home residents and 14.5% of the hospitalized patients. Oral nutritional support was preferred to enteral and parenteral nutrition in the two settings. Dietitians were consulted in 27.5% of the malnourished hospitalized patients and 74.7% of the malnourished nursing home residents.

Conclusion: The study demonstrated that nursing homes fulfilled more structural indicators and performed nutritional screening at admission more often than hospitals. Nevertheless, the prevalence of malnutrition was high in the two settings and a substantial number of malnourished patients/residents received no nutritional intervention at all. These results show the necessity for improvements in the nutritional care in Austria, for instance, through the routine use of nutritional screening tools followed by tailored nutritional interventions in patients/residents in need.

Keywords: nutritional care, malnutrition, structure, process, hospitals, nursing homes

INTRODUCTION

Malnutrition has a significant impact on patients' and residents' health out-comes in terms of increased mortality and a higher risk of complications, on quality of life, and on health care costs (1-5). Numerous studies have investi-gated the prevalence of malnutrition in health care settings (6-9). One multi-center study from the Netherlands reported a malnutrition prevalence rate of 14.8% in hospitals and 18.5% in nursing homes (9). Stratton et al. (7) found that disease-related malnutrition occurred in up to 60% of hospitalized pa-tients and in up to 85% of nursing home residents. Prevalence rates vary widely because the underlying analyses are based on different definitions, instruments, methods, and populations (2, 7).

There are several factors that may influence the prevalence of malnutrition. Donabedian (10) showed that the structure of a setting has a considerable influence on actual nursing practice (process), which in turn has an effect on the outcome of a patient/resident. The use of guidelines for the prevention and treatment of malnutrition, the availability of dietitians, and information bro-chures for patients, residents, and relatives can be ranked among the structur-al indicators of nutritional care. The application of these structural indicators is recommended to improve the process of nutritional care, comprising a routine nutritional screening or assessment and adequate interventions (11, 12). A standardized screening procedure is necessary to identify patients/residents at malnutrition risk (12). Psychometrically tested screening tools such as the Nutritional Risk Screening and the Malnutrition Universal Screening Tool are available for this purpose (13). After identifying patients/residents at risk using a nutritional screening, the performance of a detailed nutritional assessment, through the examination of metabolic, nutritional, or functional variables, is recommended, which should result in an appropriate care plan (11, 12). A care plan includes nutritional interventions, such as providing oral nutritional sup-plements, protein- and energy-enriched snacks, or enteral nutrition, which can help to fulfill the nutritional requirements and to improve the nutritional status of nutritionally compromised patients/residents (14, 15).

Some studies have found relations between structural and process indicators of nutritional care. The involvement of dietitians in nutritional therapy has been shown to improve the rates of nutritional screening and nutritional intake (16, 17). Others have shown that a practice based on evidence, through the use

of guidelines, can improve care and influence outcomes (18). Caccialanza et al. (19) found that the implementation of the European Society for Clinical Nutrition and Metabolism guidelines in an Italian hospital led to an increase in the number of patients treated with enteral and home artificial nutrition. Other studies have investigated the effect of protocols or guidelines for enteral nutrition in intensive care units. These results indicated that the use of protocols or guidelines lead to an enhancement of enteral nutrition, a shorter time to enteral nutrition, and improvements in patients' nutritional intake (20, 21). Rasmussen et al. (22) found that the implementation of a screening guideline increased not only the documentation of relevant nutritional parameters such as body mass index (BMI) and weight loss but also nutritional screening and the availability of nutritional plans for at-risk patients. To conclude, there is, albeit limited, evidence that structural indicators may improve process indicators.

There are only a few studies that have compared the structural and process indicators of nutritional care between hospitals and nursing homes. Meijers et al. (9) found that Dutch nursing homes used more structural indicators, such as guidelines for the prevention and treatment of malnutrition, than hospitals. Some studies have found that oral nutritional supplements are preferred to enteral and parenteral nutrition in hospitals and in nursing homes (8, 9, 23), but not every malnourished patient/resident received some kind of intervention (9, 24). Tannen et al. (24) investigated malnutrition in German institutions and found that only 20.8% of the hospitalized patients and 50.1% of the nursing home residents at risk of malnutrition received nutritional interventions. Other studies have examined the rates of screening or the kind of nutritional interventions in hospitals or in nursing homes and used different methods and criteria (6, 8, 16). Therefore, it is difficult to compare these studies.

As mentioned earlier, the prevalence rates between hospitals and nursing homes have been investigated several times and differ to a considerable degree (6-9). However, less is known about the structural and process indicators of nutritional care in hospitals compared with nursing homes, although a comparison of structural and process indicators, which influence prevalence rates, between those two settings might increase knowledge and help to explain the differences in prevalence rates.

Therefore the aim of this study was to describe the structural and process indicators of nutritional care in Austrian hospitals and nursing homes and to compare these two settings.

MATERIALS AND METHODS

Design

For this study, the design, instruments, and procedure of the Dutch National Prevalence Measurement of Care Problems (Landelijke Prevalentiemeting Zorgproblemen) were used (9). It was a multicenter, cross-sectional measurement, also conducted in Austria in 2010, in which data about pressure ulcers, incontinence, malnutrition, intertrigo, falls, and restraints were collected. The present report focuses on the malnutrition data.

Setting and sample

All Austrian hospitals (n=227) and nursing homes (n=467) with more than 50 beds were invited to participate. Patients/residents were included in the study only after informed consent was given. To allow a comparable and consistent analysis, only patients/residents who were at least 18 y old and whose weight, height, and weight loss had been recorded were included in the present analysis. Ethical approval from the ethics committee of the Medical University of Graz was obtained.

Data collection

Each participating institution had an internal coordinator who was responsible for the measurement within the institution. These coordinators were trained by the researchers and were provided with training material to ensure the correct completion of the questionnaire. They determined which wards of their institution would take part in the measurement and organized the training program of the nurses who collected the data. To ensure an objective judgment, a team of two nurses (one from the ward and one from a different ward) assessed the patients/residents. Data were collected on 1 d (April 13, 2010) with a printed questionnaire and afterward entered into an online program.

Instrument

The original Dutch version of the questionnaire was based on the literature (11) and nursing and nutritional experts' knowledge. This version was translated professionally and sent to the Austrian experts for feedback. The resulting changes in wording were discussed again with the Dutch researchers who spoke also German. In November 2008, a pilot measurement was performed in 11 Austrian hospitals to test its comprehensibility and applicability. Feedback on the questionnaire was given by the participating hospitals. Furthermore, previously translated and scientifically evaluated tools such as the Care Dependency Scale were incorporated in the questionnaire (25).

The questionnaire generates data on patient and institutional levels. On the patient level, demographic characteristics (gender, age), main diagnoses according to the *International Classification of Disease, Tenth Revision*, and care dependency were assessed. Care dependency was measured using the Care Dependency Scale, which consists of 15 items and a 5-point Likert scale. Sum scores range from 15 to 75, with a low score indicating a high care dependency (25). Weight was measured while patients/residents wore light clothes and no shoes. If weight could not be assessed with bed or chair weight scales, patients or residents or their families were asked about the weight. If height could not be measured owing to the patients' or residents' immobility, it was calculated based on the knee height and the length of the forearm or demi-span. In addition, the occurrence of unintentional weight loss and the amount of nutritional intake were recorded. The amount of nutritional intake was determined from the nurses' point of view without any predetermined quantifications.

The prevalence of malnutrition was operationalized according to the definition of Meijers et al. (9). Patients/residents were diagnosed as malnourished when meeting one or more of the following criteria: a BMI ≤18.5 kg/m^2 in subjects 18 to 64 y old or a BMI ≤20 kg/m^2 in those older than 64 y, unintentional weight loss (>6 kg in the previous 6 mo or >3 kg in the previous month), and/or no nutritional intake for 3 d or a decreased intake for more than a week combined with a BMI from 18.5 to 20 kg/m^2 in subjects 18 to 64 y old or 20 to 23.9 kg/m^2 in those older than 64 y.

Patients/residents were defined as at risk of becoming malnourished when meeting one or more of the following criteria: a BMI from 21 to 23.9 kg/m^2

and/or not having eaten or having hardly eaten anything for 3 d or not having eaten normally for longer than 1 wk. This definition was based on the literature and the opinion of malnutrition experts and was tested to have good face and criterion validity (9).

Two questions were asked about the screening of the nutritional status. One asked whether a general nutritional screening of the patients/residents had been performed at admission. The second question collected data on the indicators of the nutritional status (e.g., weight, nutritional screening tools) being used in the general nutritional screening. In addition, the kinds of interventions in malnourished patients/residents, such as oral nutritional supplements or between-meal snacks, were registered by a multiple-answer question.

On the institutional level, data about the kind of institution and the structural indicators used were collected, e.g., on the availability of guidelines for preventing and treating malnutrition or the employment of dietitians. These indicators were formulated based on a resolution of the Council of Europe (11).

Statistical analysis

Statistical analyses were performed with SPSS 17 (SPSS, Inc., Chicago, IL, USA). Descriptive analyses of all variables were made to determine the distribution and outliers. Differences between groups were identified using chi-square tests and the Mann-Whitney U test, because of the non-parametric distribution of the data. Fisher's exact test was used if the preconditions for the chi-square test were not fulfilled. P values were based on two-sided tests, and values lower than 0.05 were considered statistically significant. Patients/residents with no interventions owing to a palliative policy were excluded from the calculation of the number of nutritional interventions.

RESULTS

Demographic characteristics

Overall, 18 hospitals with 2987 patients and 18 nursing homes with 1906 residents took part, and 78.1% of the hospitalized patients and 78.0% of the nursing home residents met the inclusion criteria. The median age of hospitalized patients was 68 y (range 19-101) and that of the nursing home residents was 86 y (range 38-109; Table 1). Nursing home residents were significantly

older, more often female, had a lower BMI, and had a significantly higher care dependency than hospitalized patients. There were also significant differences in the diseases of the patients and residents. In hospitals, most patients had cardiovascular diseases (38.7%) and musculoskeletal disorders (31.1%), whereas in nursing homes, the residents were mainly affected by cardiovascular diseases (59.6%) and dementia (59.2%).

Table 1: Demographic characteristics of hospitalized patients and nursing home reisdents

Characteristics	Hospitals (n=2326)	Nursing homes (n=1487)	P
Age (y)	68 ± 23	86 ± 9	<0.001
Women	53.9	83.9	<0.001
BMI (kg/m²)	26.1 ± 6.6	24.2 ± 6.2	<0.001
High care dependency (CDS 15-44 points)	9.4	59.0	<0.001
Cardiovascular disease	38.7	59.6	<0.001
Musculoskeletal disorder	31.1	42.2	<0.001
Dementia	3.6	59.2	<0.001

BMI, body mass index; CDS, Care Dependency Scale
Values are presented as median ± interquartile range or percentages

A malnutrition risk was found in 20.8% of the hospitalized patients and 30.9% of the nursing home residents. The prevalence of malnutrition was 23.2% in hospitals and 26.2% in nursing homes. There was a significant difference in the malnutrition risk (P<0.001) and malnutrition prevalence (P=0.035) between hospitalized patients and nursing home residents.

Structural indicators of nutritional care

Data on the structural indicators of nutritional care from four hospitals had to be excluded because of their contradictory answers. These institutions stated having someone who audited the guideline for the prevention and treatment of malnutrition, although they stated not having such a guideline. Thus, data on the structural indicators were available from 14 hospitals and 18 nursing homes. As presented in Table 2, dietitians were employed in all hospitals and in 83.3% of the nursing homes. The criteria for defining malnutrition were available in 64.3% of the hospitals and 88.9% of the nursing homes. A guideline for the prevention and treatment of malnutrition existed in 57.1% of the

hospitals and 44.4% of the nursing homes. Information brochures for patients, residents, and relatives were available in 21.4% of the hospitals and 22.2% of the nursing homes. The differences in the available structural indicators between hospitals and nursing homes were not statistically significant.

Table 2: Availability of structural indicators of nutritional care on the institutional level in hospitals and nursing homes

Structural indicators	Hospitals (n=14)	Nursing homes (n=18)	P
Guideline for prevention and treatment	8 (57.1)	8 (44.4)	0.476
Auditing of guideline	6 (42.9)	6 (33.3)	0.928
Advisory committee for malnutrition	8 (57.1)	13 (72.2)	0.373
Updating of guideline	6 (42.9)	7 (38.9)	0.821
Criteria for determining malnutrition	9 (64.3)	16 (88.9)	0.195
Employment of dietitians	14 (100)	15 (83.3)	0.238
Refresher course for caregivers	13 (92.9)	13 (72.2)	0.196
Information brochure	3 (21.4)	4 (22.2)	1.0
Standard policy for handover	11 (78.6)	14 (77.8)	1.0

Values are presented as numbers (percentage)

Process indicators of nutritional care

Nursing homes conducted a general nutritional screening at admission in 93.4% of the residents, whereas hospitals screened 62.6% of the patients (P<0.001). Table 3 presents the subgroup of patients/residents in which a general nutritional screening had been conducted at admission. Results show that this general nutritional screening focused mostly on weight measurements and clinical view. Nutritional screening tools (e.g., Malnutrition Universal Screening Tool) were applied to 14.5% of the hospitalized patients and to 28.9% of the nursing homes residents, showing a significant difference between those two settings. Weight changes over time were measured in 18.2% of the hospitalized patients and in 76.9% of the nursing home residents.

Table 3: Indicators of nutritional status in hospitalized patients and nursing home residents within a general nutritional screening (percentage)

Indicators	Hospitals (n=1457)	Nursing homes (n=1389)	P
Assessment of weight	88.5	99.2	<0.001
Use of nutritional screening tool	14.5	28.9	<0.001
Assessment of weight over time	18.2	76.9	<0.001
Use of clinical view	78.9	69.7	<0.001
Use of biochemical parameters	15.0	10.7	0.001
Other	7.4	8.4	0.353
Unknown	0.3	0.1	0.115

No information on the applied nutritional interventions was available from 275 (50.9%) malnourished hospitalized patients and 66 (16.9%) malnourished nursing home residents. In those patients/residents with available information, the most common nutritional interventions were the provision of 1 to 1.5 L/d of fluid and oral nutritional support (Table 4). Malnourished nursing home residents were treated significantly more often with energy- and protein-enriched diets and snacks and texture-modified diets than malnourished hospitalized patients. Enteral and parenteral nutrition methods were applied more often in hospitals than in nursing homes. Dietitians were consulted for 27.5% of the malnourished hospitalized patients and 74.7% of the malnourished nursing home residents, showing a significant difference between these two settings.

Table 4: Nutritional interventions and rate of consultation of dietitians in malnourished hospitalized patients and nursing home residents (percentage)

Nutritional interventions	Hospitals (n=265)	Nursing homes (n=324)	P
Dietitian consulted	27.5	74.7	<0.001
Energy- and protein-enriched diet	23.0	33.0	0.007
Energy-enriched snack	19.2	38.0	<0.001
Oral nutritional support	37.7	38.6	0.834
Enteral nutrition	10.9	4.3	0.002
Parenteral nutrition	20.0	2.2	<0.001
Texture-modified diet	14.3	27.8	<0.001
Fluid 1-1.5 L/d	44.2	54.9	0.009
No interventions owing to palliative policy	2.6	0.9	0.109

There was also a significant difference in the number of nutritional interventions (P<0.001) in malnourished hospitalized patients compared with nursing home residents. In hospitals and nursing homes, 3.6% and 13.4% of malnourished subjects, respectively, received no nutritional intervention at all (Figure 1). The number of patients receiving more than four different nutritional interventions was larger in the nursing homes than in the hospitals.
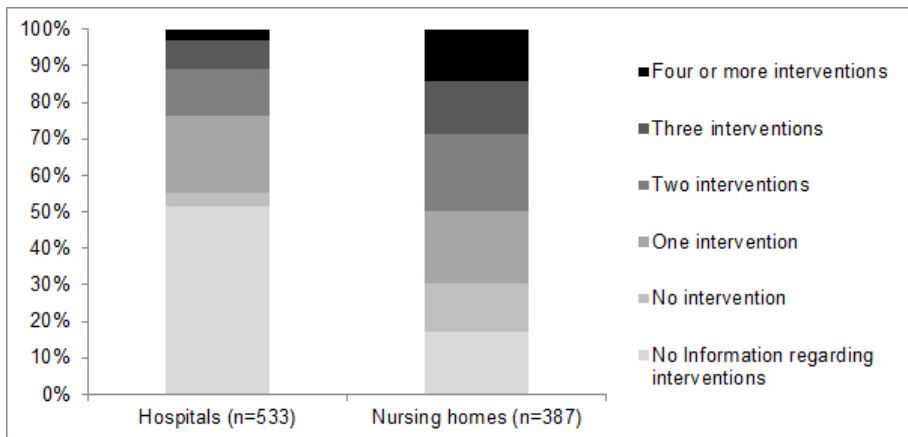
Figure 1: Number of nutritional interventions (without consultation of dietitians) in malnourished hospitalized patients and nursing home residents

DISCUSSION

This study, which is part of a large prevalence measurement, is one of the first to provide a comprehensive insight into the structural and process indicators of nutritional care in Austrian hospitals and nursing homes. The main result was that nursing homes provided more structural indicators and performed more nutritional screening than hospitals did. Nevertheless, the prevalence of malnutrition was high in the two settings and not every malnourished patient/ resident received nutritional interventions, which shows the need for improvements in nutritional care in Austria.

Structure of nutritional care

The differences between hospitals and nursing homes in the structural indicators were, because of the small sample, not significant. Trends indicated that a larger number of applied structural indicators of nutritional care are found

in nursing homes than in hospitals. This trend is corroborated by a previous study conducted in the Netherlands (9), but it has to be taken into consideration that not every structural indicator is of equal importance and the respective influence of each indicator on the outcome parameter (e.g., prevalence of malnutrition) is not known. Therefore, it is not permissible to automatically conclude that nursing homes had better structures of nutritional care; it is only possible to say that nursing homes applied more structural indicators than hospitals did.

One of the most commonly applied indicators was the employment of dietitians and the availability of predefined criteria for identifying malnutrition. In a recently performed German study, predefined criteria for identifying malnutrition also comprised one of the most often available indicators in nursing homes (8). One structural indicator of particular interest concerned the use of guidelines for nutritional care, which, in principle, is recommended for all settings (1, 11). Several studies have reported trends for improvements in nutritional therapy in intensive care units because of the use of protocols or guidelines (20, 21). However, in this context, it has to be noted that the impact of guidelines on nursing practice and on outcome parameters, for instance, the prevalence of malnutrition, is complex and that there is only limited evidence on their effect (18, 26). Guidelines for the prevention or treatment of malnutrition were used in about 60% of the hospitals and about 50% of the nursing homes. In comparison, a study by Valentini et al. (6) focusing on German and Austrian nursing homes ascertained that 80% of the participating nursing homes used guidelines, which is considerably higher than the results of the present study. The difference between these results may be in the different terminologies concerning guidelines, protocols, and standards in Austria and Germany (27). The low use of guidelines in the Austrian hospitals and nursing homes, found as a result of this study, can be explained in part by the possible low awareness of national and international guidelines, but this has to be investigated in another study.

Information brochures for patients, residents, and relatives emerged to be the least available indicator, which are nevertheless recommended in the National Expert Standard (13).

Process of nutritional care

These structural indicators can influence the process of nutritional care (10). According to standards for the screening and treatment of malnutrition, the screening of all patients/residents at admission is strongly recommended (11, 12). In this study, a general nutritional screening at admission was applied in most nursing home residents (93.4%) but in only two-thirds of the hospitalized patients (62.6%). This general screening mostly involved patients' or residents' weight measurement, but a more critical indicator for nutritional status is weight change over time, which is often included in nutritional screening or assessment tools (12, 13). Information about weight change was measured in only 18.2% of the hospitalized patients and 76.9% of the nursing home residents. This difference has been corroborated by the Dutch study by Meijers et al. (9), which also found that nursing homes documented weight changes over time more often than hospitals. The short length of stay in hospitals might be a possible explanation for the low rate of weight-change measurements. Nutritional screening or assessment tools were used in fewer than 15% of the hospitalized patients and fewer than 30% of the nursing home residents. In contrast, a Dutch study showed considerably higher screening rates using a screening tool (about 43%) in hospitals and in nursing homes (9).

There was a high rate of missing information on nutritional interventions in malnourished patients/residents, especially in hospitals, which impeded the interpretation of the results. It is not known if the patients/residents without information on interventions received interventions other than those mentioned in the questionnaire, received no intervention, or if the interventions were performed but not documented in the patient files.

Providing adequate oral nutrition (quality and quantity) should be the first choice when treating malnutrition (11). Austrian hospitals and nursing homes preferred the oral route of nutrition, e.g., oral nutritional supplements and energy- and protein-enriched diets and snacks, to enteral and parenteral nutrition. When looking at the differences between hospitals and nursing homes, Austrian hospitals, as expected, administered enteral and parenteral nutrition significantly more often than nursing homes. This could be explained by the fact that nursing home residents are usually referred to a hospital for enteral or parenteral nutrition. Nursing home residents were provided more often with energy- and protein-enriched diets and snacks and with texture-modified diets. According to the literature, dietitians are rarely consulted in cases of

malnutrition or risk of malnutrition (8, 23, 28), although the involvement of dietitians in nutritional therapy has been shown to improve the nutritional screening and nutritional intake of patients (16, 17). Dietitians were employed in all hospitals and about 85% of the nursing homes; nevertheless, they did not seem to be routinely involved in the process of nutritional therapy, because fewer than 30% of the malnourished hospitalized patients and about 75% of the malnourished nursing home residents were referred to dietitians. A possible explanation for this might be that the number of dietitians employed per institution was not known or that in some institutions one dietitian alone is responsible for a large number of patients. This can lead to the dietitian not being able to attend to every malnourished patient/resident. Health care workers' lack of adequate nutritional knowledge might also contribute to this situation, because it is known from the literature that nurses are often not aware of risk factors for malnutrition, such as recent weight loss (28). Thus, health care workers' knowledge and awareness should be heightened to realize the importance of nutrition and the risks of malnutrition (1) and to enable them to react adequately, for instance, by referring patients/residents at risk to dietitians. Therefore, it is strongly recommended that additional training programs for health care workers should be provided and nutritional education should be included in the basic nursing education to a greater degree (2, 19, 28).

With regard to the limited available information on nutritional interventions, the rate of malnourished patients who received nutritional interventions was higher in hospitals than in nursing homes, which is confirmed by the results of Meijers et al. (9).

In this study, there are some limitations that might have influenced the obtained results. The measurement yielded data from only 8% of the hospitals and 4% of the nursing homes in Austria, which does not provide a comprehensive picture of the Austrian health care situation. Participation was voluntary and the reason for an institution's participation and the selection of the participating wards are unknown to the authors, which may be regarded as a possible selection bias. Another limitation is the fact that data on the structural indicators of nutritional care from four hospitals had to be excluded, which might have led to an overestimation of the rates of available structural indicators. To avoid this in the future, the training program for the coordinators, especially on the subject of structural indicators, will be improved. Furthermore, there were missing values in the questionnaire about the kind of nutritional intervention.

It is not ascertainable if those patients/residents received nutritional interventions other than those that were mentioned, no intervention at all, or if the interventions were performed but not documented in the patient files. To prevent this in the future, the possible answers for this question will be modified.

For the nursing practice, implementing routine nutritional screening at admission is recommended, preferably by a nutritional screening tool. This can lead to an appropriate documentation of nutritionally relevant parameters and to an improvement of the availability of nutritional care plans (22), which are necessary to ensure adequate and comprehensive nutritional interventions in every patient/resident in need (14, 15). There are nutritional screening tools available (e.g., the British Nutrition Screening Tool) that do not require any calculation of the BMI or the percentage of recent weight loss and therefore might facilitate screening in daily practice (29). The present study showed that nutritional screening with a screening tool was not performed on a regular basis and that nutritional interventions were not provided to every malnourished patient/resident. Therefore, the use of guidelines for prevention and treatment is recommended for the two settings (1, 11), although there is still limited evidence on their effect and only trends toward improvements in the adequacy of nutritional performance are available (19-21).

The design of this study does not allow a comprehensive conclusion about the relation among the structural, process, and outcome indicators of nutritional care. More research is needed to determine which structural indicators contribute to the degree of the process and outcome indicators of nutritional care. Because of the identified differences between hospitals and nursing homes, it would also be interesting to analyze whether differences in patients' and residents' characteristics might lead to differences in the process indicators (screening and intervention). In addition, it is deemed necessary to conduct longitudinal analyses to investigate the changes in the structural and process indicators of nutritional care and in the prevalence of malnutrition over time. This study is going to be repeated annually, which will enable such longitudinal comparisons in the future.

CONCLUSION

Austrian nursing homes fulfilled more structural indicators and performed nutritional screening at admission more often than hospitals. Nevertheless, the

prevalence of malnutrition was high in the two settings. This study increases nutritional knowledge and shows the need for improvements in the structural and process indicators of nutritional care in Austrian hospitals and nursing homes.

ACKNOWLEDGMENTS

REFERENCES

1. Arvanitakis M, Beck A, Coppens P, De Man F, Elia M, Hebuterne X, Henry S, Kohl O, Lesourd B, Lochs H, Pepersack T, Pichard C, Planas M, Schindler K, Schols J, Sobotka L, van Gossum A. Nutrition in care homes and home care: how to implement adequate strategies (report of the Brussels Forum (22-23 November 2007)). Clin Nutr 2008; 27: 481-488.

2. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5-15.

3. Banks M, Bauer J, Graves N, Ash S. Malnutrition and pressure ulcer risk in adults in Australian health care facilities. Nutrition 2010; 26: 896-901.

4. Russel CA. The impact of malnutrition on healthcare costs and economic considerations for the use of oral nutritional supplements. Clin Nutr Suppl 2007; 2: 25-32.

5. Hiesmayr M, Schindler K, Pernicka E, Schuh C, Schoeniger-Hekele A, Bauer P, Laviano A, Lovell AD, Mouhieddine M, Schuetz T, Schneider SM, Singer P, Pichard C, Howard P, Jonkers C, Grecu I, Ljungqvist O, the NutritionDay Audit Team. Decreased food intake is a risk factor for mortality in hospitalised patients: the NutritionDay survey 2006. Clin Nutr 2009; 28: 484-491.

6. Valentini L, Schindler K, Schlaffer R, Bucher H, Mouhieddine M, Steininger K, Tripamer J, Handschuh M, Schuh C, Volkert D, Lochs H, Sieber CC, Hiesmayr M. The first NutritionDay in nursing homes: participation may improve malnutrition awareness. Clin Nutr 2009; 28: 109-116.

7. Stratton RJ, Green CJ, Elia M. Disease-related malnutrition: an evidence-based approach to treatment. 1st ed. Cambridge: CABI Publishing; 2003.

8. Bartholomeyczik S, Reuther S, Luft L, van Nie N, Meijers J, Schols J, Halfens R. Prevalence of malnutrition, interventions and quality indicators in German nursing homes - first results of a nationwide pilot study. Gesundheitswesen 2010; 72: 868-874.

9. Meijers JMM, Halfens RJG, van Bokhorst-de van der Schueren MAE, Dassen T, Schols JMGA. Malnutrition in Dutch health care: prevalence, prevention, treatment and quality indicators. Nutrition 2009; 25: 512-519.

10. Donabedian A. Evaluating the quality of medical care. Milbank Mem Fund Q 1966; 44: 166-206.

11. Council of Europe Committee of Ministers. Resolution ReAP on food and nutritional care in hospitals. Straßbourg: Council of Europe; 2003.

12. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr 2003; 22: 415-421.

13. Deutsches Netzwerk für Qualitätsentwicklung in der Pflege (DNQP). Expertenstandard Ernährungsmanagement zur Sicherstellung und Förderung der oralen Ernährung in der Pflege. Osnabrück: Schriftenreihe des Deutschen Netzwerks für Qualitätsentwicklung in der Pflege; 2009.

14. Milne AC, Avenell A, Potter J. Meta-analysis: protein and energy supplementation in older people. Ann Intern Med 2006; 144: 37-48.

15. Jie B, Jiang Z-M, Nolan MT, Efron DT, Zhu S-N, Yu K, Kondrup J. Impact of nutritional support on clinical outcome in patients at nutritional risk: a multicenter, prospective cohort study in Baltimore and Beijing teaching hospitals. Nutrition 2010; 26: 1088-1093.

16. Schindler K, Pernicka E, Laviano A, Howard P, Schütz T, Bauer P, Grecu I, Jonkers C, Kondrup J, Ljungqvist O, Mouhieddine M, Pichard C, Singer P, Schneider S, Schuh C, Hiesmayr M, the NutritionDay Audit Team. How nutritional risk is assessed and managed in European hospitals: a survey of 21,007 patients' findings from the 2007-2008 cross-sectional NutritionDay survey. Clin Nutr 2010; 29: 552-559.

17. Rüfenacht U, Rühlin M, Wegmann M, Imoberdorf R, Ballmer PE. Nutritional counseling improves quality of life and nutrient intake in hospitalized undernourished patients. Nutrition 2010; 26: 53-60.

18. Brantley SL. Implementation of the enteral nutrition practice recommendations. Nutr Clin Pract 2009; 24: 335-343.

19. Caccialanza R, Klersy C, Marinelli M, Cameletti B, Chiara B, Montagna E, Zugnoni M, Rava ML, Curti C, Calvi M, Dionigi P. A 4-year survey of the activity of a malnutrition task force in an Italian research hospital. Nutrition 2010; 26: 575-578.

20. Heyland DK, Cahill NE, Dhaliwal R, Sun X, Day AG, McClave SA. Impact of enteral feeding protocols on enteral nutrition delivery: results of a multicenter observational study. JPEN 2010; 34: 675-684.

21. Doig GS, Simpson F, Finfer S, Delaney A, Davies AR, Mitchell I, Dobb G, for the Nutrition Guidelines Investigators of the ANZICS Clinical Trials Group. Effect of evidence-based feeding guidelines on mortality of critically ill adults. JAMA 2008; 300: 2731-2741.

22. Rasmussen HH, Kondrup J, Staun M, Ladefoged K, Lindorff K, Jørgensen LM, Jakobsen J, Kristensen H, Wengler A. A method for implementation of nutritional therapy in hospitals. Clin Nutr 2006; 25: 515-523.

23. Lamb CA, Parr J, Lamb EIM, Warren MD. Adult malnutrition screening, prevalence and management in a United Kingdom hospital: cross-sectional study. Br J Nutr 2009; 102: 571-575.

24. Tannen A, Schütz T, Dassen T, van Nie-Visser N, Meijers J, Halfens R. Malnutrition in German nursing homes and hospitals - care dependency and nursing interventions. Aktuel Ernaehr Med 2008; 33: 177-183.

25. Lohrmann C, Dijkstra A, Dassen T. Care dependency: testing the German version of the care dependency scale in nursing homes and on geriatric wards. Scand J Caring Sci 2003; 17: 51-55.

26. Brouwers M, Stacey D, O'Connor A. Knowledge creation: synthesis, tools and products. CMAJ 2010; 182: E68-72.

27. Bartholomeyczik S. Sinn und Unsinn von Pflegestandards. Heilberufe 2002; 5: 12-16.

28. Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unossen M, Rothenberg E, Irtun Ø, The Scandinavian Nutrition group. Insufficient nutritional knowledge among health care workers? Clin Nutr 2008; 27: 196-202.

29. Mirmiran P, Hosseinpour-Niazi S, Mehrabani HH, Kavian F, Aziza F. Validity and reliability of a nutrition screening tool in hospitalized patients. Nutrition 2011; 27: 647-652.

Chapter 4

Changes in nutritional status in nursing home residents and associated factors in nutritional status decline: a one-year panel study

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ABSTRACT

Background & Aims: The maintenance of good nutritional status is important for nursing home residents. Therefore risk factors for a decline in nutritional status must be known in order to enable early prevention. This study aims to describe changes in nutritional status of nursing home residents over a period of one year and to identify factors associated with a decline in nutritional status.

Methods: This panel study involving 157 residents was performed in three purposively selected nursing homes. A standardized and tested questionnaire was used for data collection at baseline and after one year.

Results: The comparison between baseline and one year later showed that the nutritional status of 22.8% of the residents declined and in 6.5% of the cases it improved. BMI and changes in BMI were significantly different between residents with stable/improved and declined nutritional status. The multivariate logistic regression analysis showed that care dependency (OR 0.965), length of stay (OR 1.197), changes in BMI (OR 0.532) and malnutrition risk at baseline (OR 5.307) were significantly associated with a decline in nutritional status.

Conclusions: This study showed that being at risk of malnutrition at baseline is the most important risk factor for a decline in nutritional status. Therefore health care professionals should identify malnutrition risk and take action as early as possible. Furthermore, emphasis on malnutrition in basic and further education is highly recommended, which may ensure the better and earlier identification of nursing home residents at risk and thus contribute to maintaining good nutritional status.

Keywords: Nutritional status, malnutrition, changes, decline, associated factors, nursing home

INTRODUCTION

Good nutritional status is fundamental for healthy aging (1). Nevertheless, malnutrition is a prevalent phenomenon especially in older multimorbid people living in nursing homes (2). In several international publications, malnutrition was found to occur in up to 85% of nursing home residents (3, 4). It is often called a 'geriatric syndrome', having multiple causes and requiring a multi-factorial approach (5). Malnutrition is associated with several serious conse-quences, like increased morbidity and mortality; higher risk of complications, like pressure ulcers or infections; reduced quality of life, prolonged hospital stays, and increased health care costs (1, 6-8). Freijer et al. (7) found that the total additional costs of managing malnutrition in Dutch nursing homes in 2011 were € 453 million.

In order to avoid the extensive consequences of malnutrition, nursing home residents should maintain good nutritional status (9). In order to do so, risk factors for the incidence of malnutrition risk and malnutrition itself need to be identified at an early stage (1, 2, 8). To accomplish this, health care staff must be aware of the course of nutritional status and of the different factors contrib-uting to a decline in nutritional status in nursing home residents. This would allow early identification of groups in need of special attention. If the identifica-tion is followed by adequate nutritional intervention, it could potentially con-tribute to the conservation of muscle function and strength and herewith to the maintenance of independence, quality of life and possibly prolonged survival (10). In the international literature, several cross-sectional studies have identi-fied risk factors for malnutrition in nursing home residents, including higher age, being female, having certain diseases (like dementia and cancer) and being care dependent (11, 12). Nevertheless, there is a lack of panel stud-ies focusing on changes in nutritional status and associated factors related to a decline in nutritional status in nursing home residents. This knowledge would support the planning of early-stage prevention strategies to lower the incidence of malnutrition.

The objective of this study is to address the following research questions:

How does nutritional status change in nursing home residents over a period of one year?

What factors are associated with a decline in nutritional status in nursing home residents over a period of one year?

MATERIALS AND METHODS

Design

We conducted a secondary data analysis of the International Prevalence Measurement of Care Problems (LPZ Landelijke Prevalentiemeting Zorgprob-lemen) in Austria. This measurement is an annual multicenter cross-sectional survey in which data on pressure ulcers, incontinence, malnutrition, intertrigo, falls and restraints in different health care institutions are collected on one day. The design of this study had been previously described in depth (13). The present study was a panel study focusing on malnutrition data collected from 2009 to 2013 in nursing homes.

Setting and sample

All Austrian hospitals and nursing homes identified through an Austrian gov-ernmental database (14) were invited yearly via post and e-mail to participate in the International Prevalence Measurement of Care Problems. To be consid-ered for this panel study, nursing homes had to take part in the measurement for at least four years. Data from three purposively sampled nursing homes were used in which two of them participated in the measurement from 2010 to 2013 and one from 2009 to 2013. Date of birth, date of admission and sex were checked for all nursing home residents in order to find out which had par-ticipated in the measurement more than once. For this panel study, residents were selected who had taken part in the measurement two years in a row (e.g. 2010 and 2011 or 2011 and 2012) and for whom complete data on body weight and height as well as on weight loss were available.

Instrument and data collection

Data were collected using a standardized and tested questionnaire. The original Dutch questionnaire, which was developed by consulting experts and based on the relevant literature, was translated to German by professional translators and back translated and double-checked for nomenclature and cultural differences (13). The questionnaire measures at three levels: institu-tion, ward and patient. For this analysis, only patient level data were used.

Among them, sex, age, BMI (Body Mass Index), kind of diseases (according to the International Classification of Diseases, 10th Revision) and care dependency (using the Care Dependency Scale (CDS)) were assessed. The CDS consists of 15 items which are assessed by a 5-point Likert scale. Sum scores range from 15 to 75, with a low score indicating high care dependency (15). Body weight was measured while residents wore light clothing and no shoes. If height could not be measured owing to the residents' immobility, it was calculated based on the knee height and the length of the forearm or demi-span. In addition, unintentional weight loss and the amount of nutritional intake were recorded.

Nutritional status was operationalized according to the definition of Meijers et al. (16). Residents were assessed as malnourished when meeting one or more of the following criteria:

- BMI ≤ 18.5 kg/m^2 in patients 18 to 64 years old or a BMI ≤ 20 kg/m^2 in those 65 years or older,
- unintentional weight loss (>6 kg in the previous six months or >3 kg in the previous month) and/or
- no nutritional intake for three days or a decreased intake for more than a week combined with a BMI of 18.5 to 20 kg/m^2 in patients 18 to 64 years old or 20 to 23.9 kg/m^2 in those 65 years or older.

Residents were defined as being at risk of malnutrition when one or more of the following criteria were met:

- BMI of 21 to 23.9 kg/m^2 and/or
- not having eaten or having hardly eaten for three days or not having eaten normally for longer than one week.

These definitions were based on literature and the opinion of malnutrition experts and were tested for good face- and criterion validity (16). Stable nutritional status was defined as remaining either normally nourished, at risk of malnutrition or malnourished. Improved nutritional status was defined as either a change from malnutrition to malnutrition risk, from malnutrition risk to normally nourished or from malnutrition to normally nourished. Declined nutritional status was defined as either a change from normal nutritional status to malnutrition risk, from malnutrition risk to malnutrition or from normal nutritional status to malnutrition.

Each participating institution appointed a study coordinator who was trained by the researchers and provided with training material to ensure correct completion of the questionnaire. Data collection was performed by a team of two nurses (one from the ward and one from another ward) who were trained by the study coordinator. If there were disagreements, the nurse from the other ward made the final decision in order to ensure objectivity. Data were collected with a printed questionnaire by directly examining the resident on one day in April each year and afterwards were entered into an online program.

Data collection procedures and instruments did not change over the years and are comparable.

Ethical statement

Written informed consent was acquired from each participating resident or their legal representative. Ethical approval from the ethics committee of the Medical University of Graz was obtained.

Statistical considerations

Statistical analyses were performed with IBM SPSS version 22.0 (IBM, Armonk, NY, USA). Separate data files of the individual measurements were combined into one single file. Differences in sample characteristics between T0 (baseline) and T1 (one year later) were analyzed using Wilcoxon signed-rank test for metric variables and McNemar test for categorical variables. The comparison of resident characteristics between stable/improved and declined nutritional status was analyzed using Mann-Whitney-U test for non-parametric variables, unpaired t-test for parametric variables and Chi^2 test for categorical variables. Univariate logistic regression analysis was performed with stable/improved or declined nutritional status as the dependent variable. Prior to analysis, data were assessed for congruence with logistic regression assumption. After the univariate logistic regression, the independent variables were checked for possible multicollinearity. Finally, a stepwise backward multivariate logistic regression analysis was performed with variables fulfilling the assumptions and with p ≤0.200 (results from the univariate analysis). Odds-ratios with 95% confidence intervals were calculated and Hosmer-Lemeshow goodness of fit test was used to indicate the fit of the final model. P values were based on two-sided tests and values lower than 0.05 were considered statistically significant.

RESULTS

Sample characteristics

Of the 157 nursing home residents assessed, 83.4% were female, mean age at T0 was 83.9 years and mean length of stay at T0 was 2.1 years. The most prevalent diseases were cardiovascular diseases, dementia and motor diseases at both data collection points. Nursing home residents were significantly more care dependent, had a lower BMI and significantly more comorbidities at T1 compared to T0 (Table 1).

Table 1: Sample characteristics at baseline (T0) and one year later (T1)

	T0 (N=157)	T1 (N=157)	p[a]
CDS (sum score)	36.0 (25.0-52.0)	29.0 (18.0-43.0)	0.000
BMI (kg/m^2)	25.0 (21.5-27.7)	24.3 (21.1-27.7)	0.020
Comorbidities (n)	4.0 (3.0-5.0)	5.0 (4.0-6.0)	0.001
Cardiovascular diseases (%)	73.9	73.2	1.000
Dementia (%)	73.9	75.2	0.754
Motor diseases (%)	48.4	47.1	0.864
Diseases of the eye and ear (%)	32.5	40.8	0.015
Kidney diseases (%)	30.6	33.1	0.571

Data are presented as median [25th-75th] or percentages.
CDS Care Dependency Scale was used for the measurement of care dependency. Sum scores range from 15 to 75, with a low score indicating high care dependency.
BMI Body Mass Index
[a] p values according to Wilcoxon signed-rank test or McNemar test

Nutritional status

At T0, 26.1% of the residents were at risk of malnutrition and 21.7% were malnourished. At T1, 24.2% had a risk of malnutrition and 25.5% were malnourished. For further analysis, the 34 malnourished residents (21.7%) at T0 were excluded because their nutritional status could not decline further. A comparison between baseline and one year later showed that the nutritional status of 70.7% of the residents remained stable, 6.5% of the residents improved and 22.8% declined. Stable and improved nutritional status were combined for

further analysis, because only factors associated with a decline in nutritional status were of interest.

Comparison of sample characteristics and stable/improved and declined nutritional status

There was a significant difference between residents with stable/improved and declined nutritional status with regard to BMI, meaning that residents with a stable/improved nutritional status had a significantly higher BMI than residents with a declined nutritional status. In addition, residents with a declined nutritional status had a significantly greater change in BMI than residents with a stable/improved nutritional status. The percentage of residents with a declined nutritional status was higher in residents at risk of malnutrition than residents with a normal nutritional status. Furthermore, residents with a declined nutritional status had a lower CDS sum score, meaning that they were more care dependent. However, these results were not significant (Table 2).

Univariate and multivariate logistic regression analysis

In the univariate analysis length of stay, care dependency, nutritional status at T0, BMI and changes in BMI had a $p \leq 0.200$ and were later included in the multivariate analysis (Table 3). BMI had to be excluded because of multicollinearity. In the multivariate analysis, the Hosmer-Lemeshow test demonstrated a reasonably good fit of the model (6.161) and the overall explained variables were 83.7%. All included variables were significant. Length of stay and nutritional status at T0 were risk factors. With each additional year in the nursing home, the risk of a decline in nutritional status increased (OR 1.197). Residents at risk for malnutrition at baseline had a 5.307 times higher risk of a decline in nutritional status than residents with a normal nutritional status. Care dependency was a protecting factor, meaning that the higher the CDS sum score (indicating lower care dependency) the lower the risk of a decline in nutritional status (OR .965). Changes in BMI was also a predicting factor, meaning that the less BMI decreased and the more BMI increased, the lower the risk of a decline in nutritional status (OR .532) (Table 4).

Table 2: Comparison of sample characteristics and stable/improved and declined nutritional status

	Stable/improved nutritional status (N=95)	Declined nutritional status (N=28)	p[a]
Female (%)	81.0	19.0	0.656
Male (%)	76.5	23.5	
Age (years)	86 (79.0-89.0)	85.5 (77.0-90.0)	0.918
Length of stay (years)	1.0 (1.0-2.0)	1.5 (1.0-3.0)	0.097
CDS (sum score)	38.0 (26.0-54.0)	30.5 (20.0-49.0)	0.117
Changes of CDS between T0 and T1 (sum score)	-3.0 (-11.0-.0.0)	-2.5 (-11.0-0.0)	0.666
Normal nutritional status (%)	81.7	18.3	0.094
Malnutrition risk (%)	68.3	31.7	
BMI (kg/m^2)	26.4 (23.4-29.5)	24.9 (22.2-25.5)	0.002
Changes in BMI between T0 and T1 (kg/m^2)	-0.24 (± 2.2)	-2.5 (± 2.2)	0.000
Comorbidities (n)	4.0 (3.0-6.0)	4.5 (3.0-6.0)	0.377
Changes in comorbidities between T0 and T1 (n)	0.0 (-1.0-1.0)	1.0 (0-2.0)	0.275

Data are presented as median [25th-75th], mean (± SD), counts or percentages.
CDS Care Dependency Scale was used for the measurement of care dependency. Sum scores range from 15 to 75, with a low score indicating high care dependency.
BMI Body Mass Index
T0 Baseline
T1 One year later
[a] p values according to Mann-Whitney-U test for non-parametric variables, unpaired t-test for parametric variables or Chi^2 test for categorical variables

Table 3: Univariate logistic regression with stable/improved or declined nutritional status as the dependent variable (N=123)

	OR	95% CI	p
Sex[a]	0.765	0.235-2.492	0.656
Age (years)	1.003	0.953-1.055	0.919
Length of stay (years)	1.119	0.981-1.276	0.094
CDS (sum score)	0.980	0.954-1.007	0.151
Changes of CDS (sum score)	0.976	0.938-1.015	0.222
Nutritional status at T0[b]	2.074	0.874-4.919	0.098
BMI (kg/m^2)	0.803	0.696-0.928	0.003
Changes in BMI (kg/m^2)	0.638	0.510-0.798	0.000
Comorbidities (n)	1.065	0.851-1.334	0.582
Changes in comorbidities (n)	1.188	0.884-1.597	0.253

OR Odds Ratio
CI Confidence Interval
CDS Care Dependency Scale was used for the measurement of care dependency. Sum scores range from 15 to 75, with a low score indicating high care dependency.
T0 Baseline
BMI Body Mass Index
[a] Female as reference category
[b] Normal nutritional status as reference category

Table 4: Multivariate logistic regression with stable/improved or declined nutritional status as the dependent variable (N=123)

	OR	95% CI	p
CDS (sum score)	0.965	0.933-0.998	0.039
Changes in BMI (kg/m^2)	0.532	0.404-0.701	0.000
Length of stay (years)	1.197	1.029-1.394	0.020
Nutritional status at T0[a]	5.307	1.710-16.468	0.004

R^2 Cox & Snell .262 R^2 Nagelkerke .398 Hosmer-Lemeshow test Chi^2 6.161; df=8; p=0.629
OR Odds Ratio
CI Confidence Interval
CDS Care Dependency Scale was used for the measurement of care dependency. Sum scores range from 15 to 75, with a low score indicating high care dependency.
BMI Body Mass Index
T0 Baseline
[a] Normal nutritional status as reference category

DISCUSSION

This was one of the first studies to analyze changes in nutritional status and factors contributing to a decline in nutritional status in nursing home residents over a period of one year. One of the main results was that nutritional status declined in 22.8% of the nursing home residents over a period of one year. Factors associated with this decline were care dependency, changes in BMI, length of stay and being at risk of malnutrition at T0.

One study from Japan also analyzed factors associated with a decline in nutritional status measured by the Mini Nutrition Assessment-Short Form in 392 nursing home residents and found an increase in malnutrition from 19.9% to 37.2% and a decrease in malnutrition risk from 60.2% to 49.2% (9). These results are higher than those found in our study, which may be explained by the longer investigation period (2 years) in the study by Izawa et al. (9) Therein, 66.3% maintained their status, 6.1% improved and 27.6% declined (9), which is only slightly different from the results in our study.

One of the most interesting results of our study is that risk of malnutrition at T0 emerged as being the most important risk factor for a decline in nutritional status after one year. This underlines the importance of protecting nursing home residents from approaching even the risk of malnutrition, because once nutritional status starts to decline, a vicious cycle begins, from which it is hard to escape (1). This can also be seen in the fact that nutritional status improved in only 6.5% of the residents. Nurse professionals play an important role here, because of their constant presence and close contact to residents (1). Nevertheless, it is known from the international literature that nurses have insufficient knowledge of risk factors in particular (1, 17) and do not consider nutritional care to be an important task (17). This contributes to ignorance and non-detection of surrounding nutritional problems especially early signs of malnutrition risk (2, 17). Health care professionals tend to overestimate the nutritional status of nursing home residents which often leads to residents who have only minor eating problems not being referred to other specialists (18, 19). The early identification of residents at risk of malnutrition would also contribute to cost savings (1, 7). As a response to this, the Council of Europe and several international studies have argued that health care professionals in nursing homes need to be better educated on malnutrition (1, 2, 20).

Our study has shown that the less care dependent the resident, the lower the risk of a decline in nutritional status. In addition, it was found that residents with declined nutritional status had a lower CDS sum score, meaning that they were more care dependent than residents with stable/improved nutritional status, although these results were not significant. In their multivariate analysis, Izawa et al. (9) also found that having the lowest basic ADL (Activities of Daily Living) status was associated with a decline in nutritional status. It is already known from the literature that nutritional factors and ADL functions or care dependency, however they are called, influence each other (21) and that the deterioration of functional status is associated with a worse nutritional status (21, 22). Nevertheless, the exact causal relationship remains controversial (9). This makes it important to also promote independence and facilitate individual resources in nursing home residents (23), because this may also influence nutritional status.

It was not surprising that BMI and changes in BMI were also found to be significantly associated factors in a decline in nutritional status particularly because BMI was included in the operationalization of malnutrition. Cereda et al. (24) also found that malnutrition risk was associated with lower BMI. Nevertheless, the international literature discusses the fact that BMI does not indicate age-related changes in body composition and that it is therefore not the most appropriate predictor of morbidity and mortality in the elderly (10, 25). Nevertheless, BMI continues to be used in clinical practice as an indicator for nutritional status because of its easy use and application (4).

It is already known from the literature that malnutrition leads to prolonged hospital stays (8, 24) and that the length of nursing home stay is associated with increased malnutrition risk (11, 26). The results of the present study found that with each year the resident stays in the nursing home, the risk of a decline in nutritional status increased by 1.197 times. This may be explained by the fact that the longer the residents stay in the nursing home, the older, the more multimorbid and the more care dependent they become.

This study underlines the fact that a decline in nutritional status is influenced by several factors, making it a complex problem. Therefore it is recommended that nutritional status assessment methods for nursing homes address the multifactorial problem of malnutrition including dietary factors, care dependency, environment, oral health as well as general and anthropometric factors

(10). It may be that the general condition of nursing home residents is more predictive of the outcome than a single tool because the multicausal nature of malnutrition is so complex (10, 25). This is especially true for elderly nursing home residents, where nutritional screening tools do not perform well and a comprehensive geriatric assessment after initial screening is necessary to obtain more information on underlying causes of malnutrition (10).

One of the limitations of this study is the low sample size and the data collection period of only one year. It was not possible to make comparisons over more than one year because the sample size would then have been even lower. The sample consisted of 3 purposively selected nursing homes that participated in a quality improvement project (International Prevalence Measurement of Care Problems). This may have resulted in an underestimation of the prevalence rates, since it is known from the literature that participation in quality improvement projects in nursing homes leads to decreased prevalence rates of malnutrition (27). This may also explain the greater increase in malnourished residents and number of residents with declined nutritional status in the Izawa et al. (9) study compared to our study.

One of the strengths of our study is that its consistent use of the same methodology and investigation of the same residents enabled a longitudinal comparison over time. This study allowed factors to be identified that were associated with a decline in nutritional status before nutritional problems appeared and became worse. Identification of these residents would allow for appropriate nutritional management in conjunction with comprehensive geriatric assessment (10, 28). Furthermore, this study is one of the first to identify that of all the risk factors, malnutrition risk is the most predictive for nursing home residents becoming malnourished and that this risk factor is even more important than well-known ones like care dependency or length of stay (11, 12).

Further research should investigate the factors that contribute to a decline in nutritional status; namely from nursing home admission to several years in using a larger sample. Preventing malnutrition is a great challenge (29) and it is important to actively support and promote good nutritional status and avoid waiting for the first signs of malnutrition to appear. Therefore it is highly recommended to emphasize malnutrition in basic and further nursing education, which may contribute to the better and earlier identification of nursing home residents at risk. The relationship between malnutrition risk and care depend-

ency highlights the need to sensitize nursing personnel to nutritional problems, especially in functionally impaired residents, to initiate early intervention and thus, avoid further nutritional and functional deterioration (30).

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STATEMENT OF AUTHORSHIP

SB, RJGH and CL designed the study; SB and CL organized the data collection; SB analyzed the data; SB, RJGH and CL were responsible for data interpretation; SB wrote the article; SB, RJGH and CL critically revised the article and approved the final article.

CONFLICT OF INTEREST STATEMENT

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REFERENCES

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

2. Volkert D, Saeglitz C, Gueldenzoph H, Sieber CC, Stehle P. Undiagnosed malnutrition and nutrition-related problems in geriatric patients. J Nutr Health Aging 2010; 14: 387-392.

3. Bell CL, Tamura BK, Masaki KH, Amella EJ. Prevalence and measures of nutritional compromise among nursing home patients: weight loss, low body mass index, malnutrition, and feeding dependency, a systematic review of the literature. J Am Med Dir Assoc 2013; 14: 94-100.

4. Stratton RJ, Green CJ, Elia M. Disease-related malnutrition: an evidence-based approach to treatment. 1st ed. Cambridge: CABI Publishing; 2003.

5. van Asselt DZB, van Bokhorst-de van der Schueren MAE, van der Cammen TJM, Disselhorst LGM, Janse A, Lonterman-Monasch S, Maas, HAAM, Popescu ME, Schölzel-Dorenbos CJM, Sipers WMWH, Veldhoven CMM, Wijnen HH, Olde Rikkert MGM. Assessment and treatment of malnutrition in Dutch geriatric practice: consensus through a modified Delphi study. Age Ageing 2012; 41: 399-404.

6. Banks M, Bauer J, Graves N, Ash S. Malnutrition and pressure ulcer risk in adults in Australian health care facilities. Nutrition 2010; 26: 896-901.

7. Freijer K, Tan SS, Koopmanschap MA, Meijers JMM, Halfens RJG, Nuijten MJC. The economic costs of disease related malnutrition. Clin Nutr 2013; 32: 136-141.

8. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5-15.

9. Izawa S, Enoki H, Hasegawa J, Hirose T, Kuzuya M. Factors associated with deterioration of mini nutritional assessment-short form status of nursing home residents during a 2-year period. J Nutr Health Aging 2014; 18: 372-377.

10. van Bokhorst-de van der Schueren MAE, Guaitoli PR, Jansma EP, de Vet HCW. A Systematic Review of Malnutrition Screening Tools for the Nursing Home Setting. J Am Med Dir Assoc 2014; 15: 171-184.

11. Meijers JMM, Schols JMGA, van Bokhorst-de van der Schueren MAE, Dassen T, Janssen MAP, Halfens RJG. Malnutrition prevalence in The Netherlands: results of the Annual Dutch National Prevalence Measurement of Care Problems. Br J Nutr 2009a; 101: 417-423.

12. van Nie-Visser NC, Meijers J, Schols J, Lohrmann C, Bartholomeyczik S, Spreeuwenberg M, Halfens R. Which characteristics of nursing home residents influence differences in malnutrition prevalence? An international comparison of The Netherlands, Germany and Austria. Br J Nutr 2014; 28: 1129-1136.

13. van Nie-Visser NC, Schols JMGA, Meesterberends E, Lohrmann C, Meijers JMM, Halfens RJG. An International prevalence measurement of care problems: study protocol. J Adv Nurs 2013; 60: e18-e29.

14. BMASK (Bundesministerium für Arbeit, Soziales und Konsumentenschutz) Infoservice Altenu. Pflegeheime (info service residential-and nursing homes). https://www.infoservice.bmask.gv.at/InfoService2/;jsessionid=11B0BBDC484FD2646BF0FB9E17B97EEB?execution=e1s4 (accessed 30 January 2015).

15. Lohrmann C, Dijkstra A, Dassen T. Care dependency: testing the German version of the Care Dependency Ccale in nursing homes and on geriatric wards. Scand J Caring Sci 2003; 17: 51-56.

16. Meijers JMM, Halfens RJG, van Bokhorst-de van der Schueren MAE, Dassen T, Schols JMGA. Malnutrition in Dutch health care: prevalence, prevention, treatment, and quality indicators. Nutrition 2009b; 25: 512-519.

17. Eide HD, Halvorsen K, Almendingen K. Barriers to nutritional care for the undernourished hospitalized elderly: perspectives of nurses. J Clin Nurs 2014; 24: 696-706.

18. 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: 440-448.

19. Ross LJ, Mudge AM, Young AM, Banks M. Everyone's problem but nobody's job: Staff perceptions and explanations for poor nutritional intake in older medical patients. Nutrition & Dietetics 2011; 68: 41-46.

20. Verbrugghe M, Beeckman D, Van Hecke A, Vanderwee K, Van Herck K, Clays E, Bocquaert I, Derycke H, Geurden B, Verhaeghe S. Malnutrition and associated factors in nursing home residents: A cross-sectional, multi-centre study. Clin Nutr 2013; 32: 438-443.

21. Izawa S, Enoki H, Hirakawa Y, Iwata M, Hasegawa J, Iguchi A, Kuzuya M. The longitudinal change in anthropometric measurements and the association with physical function decline in Japanese community-dwelling frail elderly. Br J Nutr 2010; 103: 289-294.

22. Zuliani G, Romagnoni F, Volpato S, Soattin L, Leoci V, Bollini MC, Buttarella M, Lotto D, Fellin R. Nutrition parameters, body composition, and progression of disability in older disabled residents living in nursing homes. J Gerontol A Biol Sci Med Sci 2001; 56: M212-M216.

23. OECD (Organisation for economic co-operation and development). A Good Life in Old Age? Monitoring and Improving Quality in Long-term Care. 2013, http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/a-good-life-in-old-age_9789264194564-en#page39 (accessed 30 January 2015).

24. Cereda E, Klersy C, Pedrolli C, Cameletti B, Bonardi C, Quarleri L, Cappello S, Bonoldi A, Bonadeo E, Caccialanza R. The Geriatric Nutritional Risk Index predicts hospital length of stay and in-hospital weight loss in elderly patients. Clin Nutr 2015; 34: 74-78.

25. Holst M, Yifter-Lindgren E, Surowiak M, Nielsen K, Mowe M, Carlsson M, Jacobsen B, Cederholm T, Fenger-Groen M, Rasmussen H. Nutritional screening and risk factors in elderly hospitalized patients: association to clinical outcome? Scand J Caring Sci 2013; 27: 953-961.

26. Suominen M, Muurinen S, Routasalo P, Soini H, Suur-Uski I, Peiponen A, Finne-Soveri H, Pitkala KH. Malnutrition and associated factors among aged residents in all nursing homes in Helsinki. Eur J Clin Nutr 2005; 59: 578-583.

27. Meijers JMM, Tans F, Schols JMGA, Halfens, RJG. Nutritional care; do process and structure indicators influence malnutrition prevalence over time? Clin Nutr 2014; 33: 459-465.

28. Dent E, Visvanathan R, Piantadosi C, Chapman I. Nuritional screening tools as predictors of mortality, functional decline, and move to higher level care in older people: a systematic review. J Nutr Gerontol Geriatr 2012; 31: 97-145.

29. Johansson L, Sidenvall B, Malmberg B, Christensson L. Who will become malnourished? A prospective study of factors associated with malnutrition in older persons living at home. J Nutr Health Aging 2009; 13: 855-861.

30. Stange I, Poeschl K, Stehle P, Sieber CC, Volkert D. Screening for malnutrition in nursing home residents: comparison of different risk markers and their association to functional impairment. J Nutr Health Aging 2013; 17: 357-363.

Chapter 5

Development and psychometric evaluation of the Knowledge of Malnutrition - Geriatric (KoM-G) questionnaire to measure malnutrition knowledge among nursing staff in Austrian nursing homes

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ABSTRACT

Introduction: Malnutrition is an internationally prevalent healthcare phenomenon in nursing home residents entailing serious consequences for those who are affected. Lack of knowledge among nursing staff is often discussed as a reason for deficits in nutritional practice. For this reason, a valid and reliable tool is necessary to assess knowledge of malnutrition (KoM) care. The objective of this study was to develop and psychometrically evaluate a questionnaire aimed at assessing the KoM care among nursing staff in Austrian nursing homes.

Methods: This study follows a psychometric methodological design. The dimensions and items of the questionnaire were derived from a literature review. The content validity was evaluated using a Delphi technique with eight international experts in the field of malnutrition. Item validity in terms of distribution of response alternatives, item difficulty and discrimination index, construct validity in terms of a comparison between predefined known groups and internal consistency using Kuder-Richardson 20 were analysed in a sample of 1152 registered nurses/nurse aides from 66 Austrian nursing homes.

Results: The Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire consists of 20 items with six answer options including 'I don't know' with established content validity. The quality of response alternatives ranged from 0.3 to 96.9%. The item difficulty of the total questionnaire was 59.3% and the discrimination index was 0.37, whereas one item had a discrimination index below 0.20 and was therefore deleted. Significant differences in percentage of correct answers between registered nurses and nurse aides, nursing staff with training in nutrition and without as well as between nursing staff with positive attitudes towards nutritional care and neutral or negative attitudes were found. The Kuder-Richardson 20 was 0.69.

Conclusion: The KoM-G shows acceptable psychometric properties covering a wide range of items regarding malnutrition and can be applied in nursing home practice, education and research.

INTRODUCTION

'Malnutrition is a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein and other nutrients causes measureable adverse effects on tissue/body function (shape, size and composition) and function, and clinical outcome' (1). Older people living in nursing homes who are suffering from comorbidities are especially at risk of malnutrition (2-4). Bell et al. (5) found in their systematic review that according to the Mini-Nutritional Assessment (MNA) up to 71% of nursing home residents are malnourished. Results from a recently performed Austrian study indicated that the prevalence of malnutrition in Austrian nursing homes was 26.2% (6). Adequate prevention, in terms of routine screening and assessment, and subsequent timely treatment for malnutrition are necessary (4) in order to avoid serious consequences such as increased mortality, and complications such as pressure ulcers and reduced quality of life (7-9).

Despite the high prevalence rates and importance of proper prevention and treatment for malnutrition, there is evidence in the international literature that the quality of malnutrition care in nursing homes is insufficient (4). International studies of nursing homes found that validated nutritional screening tools were used infrequently (6, 10) leading to poor recognition of malnutrition in residents (4, 11, 12). Furthermore, the literature shows enormous deficits in nutritional interventions with both residents at risk of malnutrition and malnourished residents (3, 6, 10).

Many factors can influence the quality of malnutrition care in nursing practice. Donabedian's model showed that the structure of a setting (e.g. knowledge of nursing staff) can influence the process (e.g. routine nutritional screening), which in turn has an impact on the outcomes of residents or patients (e.g. prevalence of malnutrition) in this institution (13). In the international literature, inadequate knowledge, insufficient interest and attitudes as well as badly defined responsibilities among nursing staff are seen as the main barriers on structural level to adequate nutritional practice (14-16).

In order to improve nursing practice, it is necessary to better understand the current malnutrition knowledge of nursing staff. A considerable number of studies on nursing staff knowledge have been undertaken, but most of these studies were conducted in acute care settings (15, 17, 18). Studies on nursing staff knowledge in nursing homes are rare. Stanek et al. (19) developed a

questionnaire by consulting a teaching guide on nutrition and pilot tested this questionnaire with 16 staff nurses. The final questionnaire was validated by two dieticians and the director of a nursing faculty. A Cronbach's alpha of 0.52 was found. In their survey, they examined 71 directors and 24 staff nurses of long-term care facilities and found that only 45% felt confident in answering nutritional-related questions from the older residents. Crogan et al. (20) used a questionnaire which was developed and subsequent content validated by three nurses and three dieticians. Four nurses ensured clarity, readability and relevance, and Cronbach's alpha was 0.52. They applied the questionnaire to 44 nurses (registered nurses and licensed practical nurses) in nursing homes and found that they had difficulties with the screening of nutritional status and calculating energy requirements. Twenty per cent of the respondents knew that nutritional intake is an important indicator for nutritional status and licensed practical nurses scored significantly lower on the whole questionnaire than registered nurses (20). Beattie et al. (16) used a questionnaire which was based on the questionnaires developed by Crogan et al. (20) and Stanek et al. (19). They explored knowledge of 30 nurses and found deficits in knowledge above all regarding food and nutrients requirements in older residents (16).

These studies in nursing homes provide some insight into knowledge deficits but were performed with low sample sizes and mixed samples consisting of nursing staff and directors of nursing facilities. The tools used to assess nursing staff knowledge were neither developed systematically nor were comprehensively psychometrically evaluated. For this reason, a valid and reliable tool is necessary to adequately assess nursing staff knowledge of malnutrition (KoM) care. These results may in the future enable tailored nutritional education which may improve malnutrition care in the long run.

The aim of this study was to develop and to psychometrically evaluate a questionnaire to assess KoM care among nursing staff in Austrian nursing homes.

METHODS

Design
This study follows a psychometric methodological design (21).
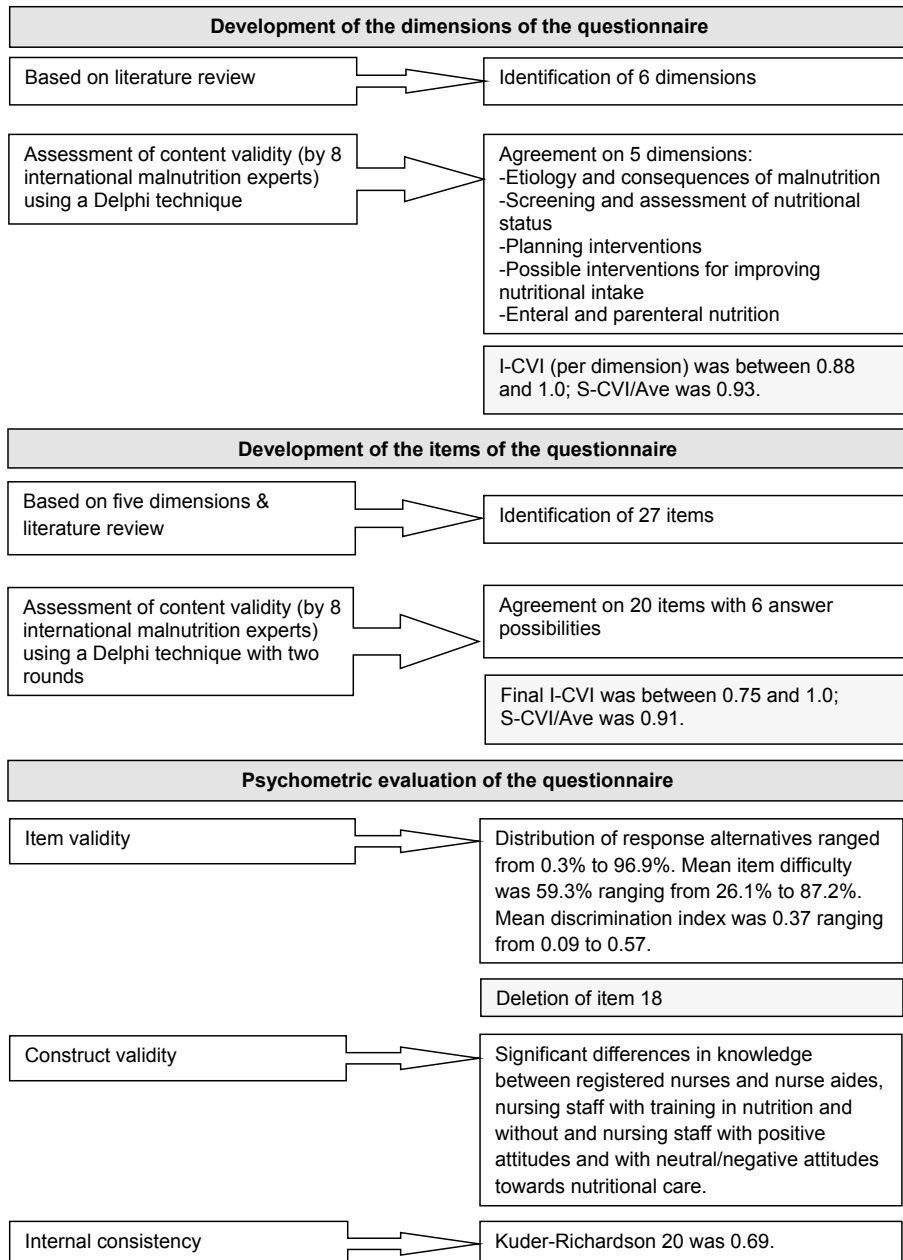
Instrument development

The development consisted of three steps based on methodological literature (21, 22) as well as the development process carried out by Beeckman et al. (23) for developing a questionnaire to measure knowledge of pressure ulcer prevention.

1. Development of the dimensions of the questionnaire
2. Development of the items of the questionnaire
3. Psychometric evaluation of the questionnaire

An outline of the steps including the results is provided in Figure 1.

Development of the dimensions of the questionnaire. A literature review was performed with the aim of finding and evaluating currently used question-naires to assess malnutrition knowledge among nursing staff. A further aim was that of identifying guidelines and standards and subsequently important themes and topics which were relevant for malnutrition care in nursing home residents. The filtered out dimensions were reviewed by a panel of eight in-ternational malnutrition experts using a Delphi technique. Experts for the pur-pose of this study were purposively sampled in order to ensure heterogene-ity in disciplines and functions and with the aim of gaining a comprehensive overview. It was predefined that those experts would have more than 5 years of experience with malnutrition in nursing homes. Finally, three of the eight ex-perts were experienced registered nurses in long-term care and malnutrition researchers. The other experts were a dietician in long-term care also work-ing in nursing education; a registered nurse and initiator of different additional trainings for registered nurses; a medical doctor in long-term care and a well-known researcher in the field of malnutrition; an experienced dietician in long-term care and a nursing researcher with extensive experience in malnutrition research. These experts originated from Austria, the Netherlands and Germa-ny. They were asked to evaluate the relevance of the dimensions on a 4-point Likert scale (1=not relevant, 2=somewhat relevant, 3=quite relevant, 4=highly relevant). In addition, they had the chance to offer additional comments and remarks. The Item-Content Validity Index (I-CVI) was used to evaluate the agreement among the experts on the relevance of each dimension, and the Scale-Content Validity Index average (S-CVI/Ave) was used to evaluate the agreement among the experts on the relevance of the whole scale. The I-CVI was calculated by the number of experts who gave a rating of 3 or 4, divided by the total number of experts. The S-CVI/Ave was calculated by averaging

Development of the dimensions of the questionnaire

| Based on literature review | → | Identification of 6 dimensions |

| Assessment of content validity (by 8 international malnutrition experts) using a Delphi technique | → | Agreement on 5 dimensions:
-Etiology and consequences of malnutrition
-Screening and assessment of nutritional status
-Planning interventions
-Possible interventions for improving nutritional intake
-Enteral and parenteral nutrition |

I-CVI (per dimension) was between 0.88 and 1.0; S-CVI/Ave was 0.93.

Development of the items of the questionnaire

| Based on five dimensions & literature review | → | Identification of 27 items |

| Assessment of content validity (by 8 international malnutrition experts) using a Delphi technique with two rounds | → | Agreement on 20 items with 6 answer possibilities |

Final I-CVI was between 0.75 and 1.0; S-CVI/Ave was 0.91.

Psychometric evaluation of the questionnaire

| Item validity | → | Distribution of response alternatives ranged from 0.3% to 96.9%. Mean item difficulty was 59.3% ranging from 26.1% to 87.2%. Mean discrimination index was 0.37 ranging from 0.09 to 0.57. |

Deletion of item 18

| Construct validity | → | Significant differences in knowledge between registered nurses and nurse aides, nursing staff with training in nutrition and without and nursing staff with positive attitudes and with neutral/negative attitudes towards nutritional care. |

| Internal consistency | → | Kuder-Richardson 20 was 0.69. |

I-CVI Item-Content Validity Index; S-CVI/Ave Scale-Content Validity Index/Average

Figure 1: Outline of the development and psychometric evaluation of the Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire

the I-CVIs. An I-CVI higher than 0.78 and an S-CVI/Ave higher than 0.90 were judged to be acceptable (24).

Development of the items of the questionnaire. The items of the questionnaire were developed based on the results of the first Delphi round and the literature review. The same expert panel as in the first step was asked to evaluate whether the items are relevant, comprehensible and accurate on a 4-point Likert scale (1=not relevant, 2=somewhat relevant, 3=quite relevant, 4=highly relevant). In addition, they had the chance to provide additional comments and remarks. Again, an I-CVI higher than 0.78 and an S-CVI/Ave higher than 0.90 were judged to be acceptable (24).

Psychometric evaluation of the questionnaire. The psychometric evaluation of the questionnaire consists of the assessment of different aspects of validity and reliability. The item validity was analysed in terms of distribution of response alternatives, item difficulty and discrimination index. The distribution of response alternatives shows the rate of respondents selecting each answer option. According to Labeau et al. (25), who developed a questionnaire to measure knowledge on evidence-based guidelines among critical care nurses, values of response alternatives should be between 0.1 and 99.9%. The item difficulty refers to the percentage of respondents who provide a correct answer among all respondents. If an item was correctly answered by more than 90%, it was considered to be too easy, and if an item was correctly answered by less than 10%, it was considered to be too difficult (26). The discrimination index refers to the ability of an individual item to discriminate between those who do well on the questionnaire and those who do not well. It was analysed by calculating the percentage of correct answers in the best group (upper 30%) minus the percentage of correct answers in the worst group (lower 30%) of respondents. Values above 0.20 constitute the minimum and values above 0.40 are desirable (22, 26). The construct validity was analysed and refers to whether a tool measures the construct that it intends to measure (27). To evaluate construct validity, a comparison of knowledge between predefined groups (known groups technique) was performed (22, 28). Based on the authors' hypotheses, different groups were predefined: registered nurses vs. nurse aides, nursing staff with more than 5 years of nursing experience vs. nursing staff with less than 5 years of nursing experience, nursing staff with additional training in nutrition vs. nursing staff without additional training in nutrition and nursing staff with positive attitudes towards nutritional care

vs. nursing staff with neutral or negative attitudes towards nutritional care. Training was defined as being advanced and lasting at least 2 hours. The attitudes towards nutritional care were measured using the German version of the Staff Attitude to Nutritional Nursing Care-Geriatric (SANN-G) Scale (29). The English version of the SANN-G was forward and back translated into German by two independent translators. Afterwards, both English versions were compared, but only minor differences with regard to language were found along with no impact on the meaning of the items. The scale comprises 18 items representing five subscales: norms, habits, assessment, intervention and individualisation. All items are scored on a 5-point Likert scale culminating in maximum of 90 points and minimum of 18 points with higher scores indicating more positive attitudes. Sum scores are classified as ≤53 points indicating negative attitudes, 54-71 points indicating neutral attitudes and ≥72 points indicating positive attitudes (29). The reliability was analysed in terms of internal consistency with calculating Kuder-Richardson 20 in which values between 0.70 and 0.90 were considered achievable (22, 27).

Setting and data collection

The psychometric evaluation of the questionnaire was performed between November 2012 and February 2013 in a convenience sample of 66 Austrian nursing homes. The ethical approval from the ethics committee of the Medical University of Graz was obtained. The nursing and ward directors of the participating nursing homes were fully informed about the study and its procedure by the primary investigator. The primary investigator provided the questionnaires including the informed consents and boxes for data collection. The ward directors distributed the questionnaires to all registered nurses and nurse aides (subsequently summarised as nursing staff) which were accessible within the data collection period of 4 weeks. Along with the questionnaires, nursing staff was informed that participation in the study was voluntary and anonymous and that the questionnaire should be filled inside the institution. Additional information on the importance to filling in the questionnaire without other resources (like the Internet or help from colleagues) was provided. All verbal information was additionally provided in the written form on the questionnaire. The nursing staff was required to give their informed consent on the first page of the questionnaire. The questionnaires were collected in a secured and closed box on the ward. After 4 weeks, the ward directors sent the box back to the Institute of Nursing Science at the Medical University of Graz.

Data analysis

The statistical analyses were performed with IBM SPSS, version 20.0 (IBM, Armonk, NY, USA). The data were coded and prepared for analysis by checking for discrepancies, logical inconsistencies and missing responses. Descriptive statistics were used to calculate I-CVI and S-CVI/Ave, to analyse sample characteristics as well as item validity. Questionnaires wherein five of the six answer options were correctly answered were scored as correct. All other variants were scored as not correct. Differences between groups were identified using the Mann-Whitney U-test. p-Values were based on two-sided tests, and values ≤0.05 were considered statistically significant.

RESULTS

An overview of the results is provided in Figure 1.

Development of the dimensions of the questionnaire

Based on a literature review, six dimensions of the questionnaire were derived. The judgment of the relevance done by the expert panel revealed an I-CVI between 0.75 and 1.0. The third dimension (characteristics in nutritional intake and nutritional requirements in older residents) revealed an I-CVI of 0.75 and was therefore deleted. Finally, five dimensions with I-CVIs between 0.88 and 1.0 and an S-CVI/Ave of 0.93 were agreed upon (Figure 1).

Development of the items of the questionnaire

Based on the identified five dimensions and the literature review, 27 multiple-choice items were developed with six answer options including 'I don't know' in order to prevent guessing. The multiple-choice items were developed so that one, two, three, four or all answers could be correct. Since the first Delphi round on the items revealed low I-CVI (0.57-1.0), and an S-CVI/Ave of 0.79, items were modified based on the experts' comments and subjected to a second Delphi round. After the second Delphi round, the final questionnaire consisted of 20 items in five dimensions. The final I-CVI ranged between 0.75 and 1.0, and the S-CVI/Ave was 0.91 (Fig. 1). Two items had an I-CVI below 0.78 but were not deleted because the authors decided for content reasons to maintain both items (Table 1).

Table 1: Distribution of response alternatives, Item–Content Validity Index, Item Difficulty and Discrimination Index

Dimensions	Aetiology and consequences of malnutrition				Screening and assessment of nutritional status						Planning interventions					Possible interventions for improving nutritional intake			Enteral and parenteral nutrition	
	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20
Answer 1 (%)	66.1[a]	12.2	92.5[a]	88.2[a]	89.2[a]	1.1	4.9	4.1	16.6[a]	70.8[a]	6.0	30.4	23.5	88.8[a]	32.4[a]	96.9[a]	82.9[a]	0.3	92.8[a]	88.2[a]
Answer 2 (%)	87.1[a]	80.2[a]	55.7[a]	27.2	52.7[a]	83.6[a]	34.4	50.8[a]	94.9[a]	52.9[a]	43.5	39.4[a]	65.3[a]	16.0	95.8[a]	1.5	77.6[a]	65.5[a]	8.3	8.4
Answer 3 (%)	16.1	86.2[a]	63.8[a]	92.7[a]	23.9	74.6[a]	32.0[a]	23.5	93.0[a]	94.7[a]	39.9[a]	20.0	59.2[a]	12.1	44.5[a]	92.0[a]	96.8[a]	39.6[a]	7.1	11.0[a]
Answer 4 (%)	81.9[a]	88.6[a]	80.3[a]	21.4	77.3[a]	39.1[a]	11.9	6.9	90.3[a]	64.5[a]	3.2	68.8[a]	19.8	19.0	9.8	58.6[a]	94.8[a]	48.7	76.0[a]	12.8
Answer 5 (%)	61.4[a]	76.8[a]	11.1	93.5[a]	83.7[a]	16.0	1.1	2.2	20.4[a]	86.3[a]	5.4	4.7	73.5[a]	11.2	8.7	90.0[a]	82.7[a]	4.2	80.5[a]	52.3[a]
I don't know (%)	1.0	0.6	0.5	1.6	2.6	2.4	21.4	18.1	0	0	9.7	1.8	3.2	7.0	0.3	0.3	0.4	3.1	0.4	1.2
n	1146	1147	1150	1147	1143	1141	1110	1116	1149	1148	1118	1139	1134	1129	1145	1143	1143	1147	1146	1129
I-CVI[b]	1.0	1.0	0.88	1.0	1.0	0.88	0.88	0.88	1.0	1.0	0.88	0.88	0.75	0.75	0.88	1.0	1.0	0.88	0.86	0.86
ID (%)[c]	66.9	80.7	65.3	80.8	68.2	63.3	31.6	50.0	26.1	56.8	39.4	47.2	52.9	73.8	41.2	87.2	82.1	48.5	85.5	38.6
DI[c]	0.46	0.43	0.52	0.20	0.41	0.31	0.33	0.34	0.36	0.57	0.41	0.46	0.45	0.20	0.46	0.34	0.41	0.09	0.27	0.31

I-CVI, Item Content Validity Index; ID, item difficulty; DI, discrimination index
[a] Correct answer
[b] n=8 experts in the Delphi round
[c] n=1008 questionnaires without missing values

Psychometric evaluation of the questionnaire

Next, the resulting Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire was psychometrically evaluated in 66 Austrian nursing homes.

General characteristics

Of the 1936 members of the nursing staff who were asked, 1152 (59.5%) gave their informed consent and filled out the questionnaire. 42.1% of the respondents were registered nurses. The general characteristics of the respondents are described in Table 2. Most of the registered nurses and nurse aides were female and between 41 and 50 years of age (40.8%, 37.9%, respectively). Registered nurses had significantly more years of experience than nurse aides, and significantly more registered nurses (29.7%) had already had additional training in nutrition compared to nurse aides (13.7%).

Table 2: Characteristics of respondents

	Registered nurses (%)	Nurse aides (%)
Gender	n=458	n=619
Female	89.5	85.9
Age	n=429	n=578
≤30 years	14.0	22.0
31-40 years	27.7	20.8
41-50 years	40.8	37.9
≥51 years	17.5	19.4
Mean age in years (SD)	42.0 (9.3)	41.0 (10.5)
Years of experience*	n=400	n=501
≥6 years	81.8	69.7
Mean years of experience (SD)	17.8 (11.2)	10.8 (7.9)
Additional training in nutrition*	n=451	n=619
Yes	29.7	13.7

* $p < 0.000$

Psychometric evaluation of the questionnaire

The distribution of response alternatives ranged from 0.3 to 96.9%. The item difficulty of the total questionnaire was 59.3% ranging from 26.1 to 87.2%. None of the items had an item difficulty of less than 10% or above 90%. The discrimination index of the total questionnaire was 0.37 ranging from 0.09 to 0.57. Item 18 had a discrimination index below 0.20 and was therefore deleted for further analysis (Table 1).

Table 3: Known groups technique

Predefined known groups	Correct answers % (SD)
Degree (n=967)	
Registered nurses	65.6 (16.1)
Nurse aides	57.3 (17.7)
p value	<0.000
Years of experience (n=804)	
≥6 years	61.4 (17.4)
≤5 years	63.8 (14.6)
p value	0.249
Additional training in nutrition (n=965)	
Yes	65.2 (16.7)
No	59.6 (17.6)
p value	<0.000
Attitudes towards nutritional care (n=902)	
Positive attitudes	67.3 (14.6)
Neutral or negative attitudes	57.0 (18.1)
p value	<0.000

Attitudes towards nutritional care assessed with SANN-G; ≤71 points=negative or neutral attitudes; ≥72 points=positive attitudes

The analysis of predefined known groups of the 19-item questionnaire revealed significant differences in knowledge between registered nurses and nurse aides, showing that 65.6% of registered nurses had correct answers compared to 57.3% of nurse aides. Furthermore, nursing staff with training in nutrition had significantly better knowledge (65.2% correct answers) than nursing staff without training (59.6% correct answers) in nutrition. The great-

est difference in correct answers was found between nursing staff with positive attitudes towards nutritional care and nursing staff with neutral or negative attitudes, showing that nursing staff with positive attitudes had 67.3% correct answers compared to nursing staff with neutral or negative attitudes which had 57.0% correct answers (Table 3).

The Kuder-Richardson 20 for the 19-item questionnaire was 0.69.

DISCUSSION

In the international literature, little insight into knowledge among nursing staff is available. Most studies were conducted with low sample sizes and mixed samples based on different questionnaires with limited psychometric properties. Therefore, the aim of this study was to develop and psychometrically evaluate the KoM-G questionnaire to assess the KoM care among nursing staff in Austrian nursing homes.

The questionnaire was developed systematically and then subjected to rigorous psychometric evaluation. First, the dimensions and then the items of the questionnaire were developed and confirmed using a Delphi technique. Studies on nursing staff knowledge of pressure ulcer care (23, 30), urinary incontinence (31), venous leg ulcer lifestyle (32) or evidence-based guidelines for preventing ventilator-associated pneumonia (25) in various settings served to emphasise the usefulness and practicability of the Delphi technique in developing knowledge questionnaires. In addition to judging the relevance of the dimensions and items, the experts in this study were able to provide additional comments or remarks on the dimensions and items. This was mostly used by the experts and the given comments and remarks, for example on wording, were considered in the further development of the questionnaire.

Due to the number of different answer options, the authors are aware that the questionnaire was not easy to answer and that the knowledge being sought was very complex. Since malnutrition in older people is a very complex phenomenon requiring complex and in-depth knowledge (12, 20), it would not have been appropriate to make the items easier. For this reason, the authors decided to consider items that had more than five correct answers out of six possible answers as correct. This scoring system allows the judging of an item

as correct, even when one answer option (out of six possible answer options) was not correctly answered.

The item validity was analysed in terms of distribution of response alternatives, item difficulty and discriminating index. The distribution of response alternatives showed that each item was checked by at least some respondents and that no one answer option was checked by every respondent, leading to the conclusion that no item was completely obviously wrong nor completely obviously correct (25). The item difficulty ranged from 26.1 to 87.2% and indicates that the questionnaire was neither too easy (no values over 90%) nor too difficult (no values below 10%) (26). When interpreting item difficulty, the type of scoring system used should be considered, because item difficulty would have been very low if only totally correct items had been considered. It can be discussed that this approach leads to a questionnaire which might be too easy, although no item had an item difficulty above 90%. Although this scoring system was used, the mean item difficulty of this questionnaire (59.3%) is not much different from the results found in the international literature. It was found that 65% and 55% of the nurses working in nursing homes on average gave correct answers in Crogan et al.'s (20) and Beattie et al.'s (16) studies, respectively. Furthermore, Stanek et al. (19) found that 60% of directors and staff nurses in nursing homes on average gave correct answers. The comparison with these studies supports the assumption that the questionnaire was truly complex and difficult to answer and that therefore the scoring approach used was a proper solution.

The discrimination index of the total questionnaire was 0.37 and ranged from 0.09 to 0.57. The item 18 had a discrimination index below 0.20 (22, 26) and therefore had to be deleted. Due to a lack of studies on questionnaires measuring nursing staff malnutrition knowledge using discrimination index, other topics may be considered for comparison purposes. Beeckman et al. (23) developed a questionnaire measuring registered nurses' and student nurses' pressure ulcer prevention knowledge and revealed discrimination indexes between 0.10 and 0.65, whereas three items had a discrimination index below 0.20 and were therefore deleted. Van Hecke et al. (32) developed a questionnaire focusing on registered nurses' and student nurses' venous leg ulcer lifestyle knowledge and found discrimination indexes between 0.04 and 0.55, wherein four items had to be deleted because of low discrimination indexes.

Since these results are comparable to results found in this study, it can be assumed that the discrimination index is acceptable.

Furthermore, differences in knowledge between previously defined known groups were analysed. The results show that registered nurses, nursing staff with additional training in nutrition and nursing staff with positive attitudes towards nutritional care had a significantly higher percentage of correct answers than nurse aides, nursing staff without training in nutrition and nursing staff with neutral or negative attitudes towards nutritional care. Crogan et al. (20) also found that registered nurses had a significantly higher percentage of correct answers than licensed practical nurses in nursing homes. Boaz et al. (17) analysed nutritional knowledge among nursing staff in hospitals and also indicated that nursing staff in hospitals with more positive attitudes towards nutritional care had a higher percentage of correct answers. The number of years of experience did not significantly influence the percentage of correct answers, which is in accordance with results from studies in nursing homes and hospitals (17, 19). Crogan & Evans (33) even found that registered nurses with fewer years of experience tend to have better knowledge than more experienced registered nurses in nursing homes. This result is similar to results from this study, because nursing staff with fewer years of experience had somewhat, but not significantly, better knowledge than nursing staff with more years of experience. Possible explanations could be that the knowledge of those with less experience was somehow better because their basic nursing training was more recent and is therefore more accessible and up to date.

The reliability of the questionnaire was analysed in terms of internal consistency. The Kuder-Richardson 20 was calculated, although it is known in the scientific community that Kuder-Richardson 20 respectively Cronbach's alpha is only useful for unidimensional constructs. Since malnutrition knowledge is a multidimensional construct, Kuder-Richardson 20 does not necessarily matter in this case (34). Nevertheless, Kuder-Richardson 20 of the 19-item questionnaire was 0.69 and, while considering the multidimensionality of malnutrition knowledge, nearly achievable (22, 27). When compared to Stanek et al. (19) and Crogan et al. (20), both indicated a Cronbach's alpha of 0.52, and Beeckman et al. (23) found a Cronbach's alpha of 0.77, the Kuder-Richardson 20 for the KoM-G is acceptable.

Nevertheless, there are some limitations influencing the results. Even though all nursing and ward managers were asked to inform the nursing staff about the importance of answering items without the use of other resources and about anonymity and confidentiality of the results, it is possible that some respondents used other resources (like the Internet, books or help of colleagues) to answer the items. Additionally, it could have been possible for respondents not to have read the item accurately because of difficulties in concentration or may not answer honestly because of an attempt to 'fake' a response for some reason (22). Furthermore, some respondents left individual items blank leading to missing data (Table 1).

To the authors' knowledge, this is one of the first studies to have developed a questionnaire systematically measuring KoM care among nursing staff and to evaluate the psychometric properties of this questionnaire with such a big sample. It can be considered a strength of this study that nursing homes with different sizes covering each state in Austria participated. In addition, the response rate was quite high (59.5%), compared to, for example, the study of Beattie et al. (16) who had a response rate of 33% or Stanek et al. (19) with a response rate of 38%, which can also be seen as a strength in these results.

Further research on different aspects of psychometric properties of the KoM-G such as stability or responsiveness is recommended. With regard to this, it would be of interest to use the KoM-G for the evaluation of the effect of education sessions aimed at improving nursing staff KoM. Moreover, the KoM-G can also be modified and evaluated for use in other settings, for example a hospital setting. The field of nursing practice can use the results to conduct tailored trainings based on previously defined knowledge of the nursing staff, which may help to improve the quality of malnutrition care in the long run.

CONCLUSION

The KoM-G was systematically developed, and the psychometric properties were evaluated in a large sample of registered nurses/nurse aides in Austrian nursing homes. Results show acceptable psychometric properties of the questionnaire which covers a wide range of items on the topic of malnutrition care and which can be used for different purposes in nursing practice, education and research.

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AUTHOR CONTRIBUTIONS

All authors have participated in study conception and design, data collection and statistical analysis, drafting of manuscript and critical revisions.

ETHICAL APPROVAL

Ethical approval with the reference number 24-359 ex 11/12 was obtained from the ethics committee of the Medical University of Graz.

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REFERENCES

1. Elia M. Principles of Clinical Nutrition: contrasting the practice of nutrition in health and disease. In Clinical Nutrition, 1st ed. (Gibney MJ, Elia M, Ljungqvist O, Dowsett J eds). Oxford: Blackwell Sciences Ltd; 2005: 1-14.

2. Stratton RJ, Green CJ, Elia M. Disease-related malnutrition: an evidence-based approach to treatment. 1st ed. Cambridge: CABI Publishing; 2003.

3. Valentini L, Schindler K, Schlaffer R, Bucher H, Mouhieddine M, Steininger K, Tripamer J, Handschuh M, Schuh C, Volkert D, Lochs H, Sieber CC, Hiesmayr M. The first Nutrition-Day in nursing homes: participation may improve malnutrition awareness. Clin Nutr 2009; 28: 109-116.

4. Volkert D, Saeglitz C, Gueldenzoph H, Sieber CC, Stehle P. Undiagnosed malnutrition and nutrition-related problems in geriatric patients. J Nutr Health Aging 2010; 14: 387-392.

5. Bell CL, Tamura BK, Masaki KH, Amella EJ. Prevalence and measures of nutritional compromise among nursing home patients: weight loss, low Body Mass Index, malnutrition, and feeding dependency, a systematic review of the literature. J Am Med Dir Assoc 2013; 14: 94-100.

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

7. Banks M, Bauer J, Graves N, Ash S. Malnutrition and pressure ulcer risk in adults in Australian health care facilities. Nutrition 2010; 26: 896-901.

8. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5-15.

9. Törmä J, Winblad U, Cederholm T, Saletti A. Does undernutrition still prevail among nursing home residents? Clin Nutr 2013; 32: 562-568.

10. Meijers JMM, Halfens RJG, van Bokhorst-de van der Schueren MAE, Dassen T, Schols JMGA. Malnutrition in Dutch health care: prevalence, prevention, treatment and quality indicators. Nutrition 2009; 25: 512-519.

11. Suominen MH, Sandelin E, Soini H, Pitkala KH. How well do nurses recognize malnutrition in elderly patients? Eur J Clin Nutr 2009; 63: 292-296.

12. 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: 208-215.

13. Donabedian A. Evaluating the quality of medical care. Milbank Mem Fund Q 1996; 44: 166-206.

14. Bjerrum M, Tewes M, Pedersen P. Nurses' self-reported knowledge about and attitude to nutrition - before and after a training programme. Scand J Caring Sci 2012; 26: 81-89.

15. Lindorff-Larsen K, Rasmussen HH, Kondrup J, Staun M, Ladefoged K, The Scandinavian Nutrition Group. Management and perception of hospital undernutrition - A positive change among Danish doctors and nurses. Clin Nutr 2007; 26: 371-378.

16. 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 2013; 9: 54-64.

17. Boaz M, Rychani L, Barami K, Houri Z, Yosef R, Siag A, Berlovitz Y, Leibovitz E. Nurses and nutrition: a survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. J Contin Educ Nurs 2013; 44: 357-364.

18. Holst M, Rasmussen HH, Unossen M. The Scandinavian Nutrition Group. Well-established nutritional structure in Scandinavian hospitals is accompanied by increased quality of nutritional care. e-SPEN 2009; 4: e22-29.

19. Stanek K, Powell C, Betts N. Nutritional knowledge of nurses in long-term health care facilities. J Nutr Elder 1991; 10: 35-48.

20. Crogan NL, Shultz JA, Massey LK. Nutrition knowledge of nurses in long-term care facilities. J Contin Educ Nurs 2001a; 32: 171-176.

21. LoBiondo-Wood G, Harber J. Nursing Research: Methods and Critical Appraisal for Evidence-Based Practice. 7th ed. Missouri: Mosby Elsevier; 2010.

22. Streiner DL, Norman GR. Health Measurement Scales A Practical Guide to their Development and Use. 3rd ed. New York: Oxford University Press; 2003.

23. Beeckman D, Vanderwee K, Demarré L, Paquay L, Van Hecke A, Defloor T. Pressure ulcer prevention: development and psychometric validation of a knowledge assessment instrument. Int J Nurs Stud 2010; 47: 399-410.

24. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Res Nurs Health 2007; 30: 459-467.

25. Labeau S, Vandijck DM, Claes P, Van Aken P, Blot SI. Critical care nurses' knowledge of evidence-based guidelines for preventing ventilator-associated pneumonia: an evaluation questionnaire. Am J Crit Care 2007; 16: 371-377.

26. McAlpine M. A Summary of Methods of Item Analysis. 2002, http://caacentre.lboro.ac.uk/dl-docs/Bp2final.pdf (accessed 18 December 2013).

27. Polit DF, Beck CT. Nursing Research - Generating and Assessing Evidence for Nursing Practice. 9th ed. Philadelphia: Lippincott, Williams & Wilkins; 2012.

28. Parmenter K, Wardle J. Evaluation and design of nutrition knowledge measures. J Nutr Educ 2000; 32: 269-277.

29. 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: 2007-2014.

30. Pancorbo-Hidalgo PL, García-Fernández FP, López-Medina IM, Lopez-Ortega J. Pressure ulcer care in Spain: nurses' knowledge and clinical practice. J Adv Nurs 2007; 58: 327-338.

31. Saxer S, de Bie RA, Dassen T, Halfens RJG. Nurses' knowledge and practice about urinary incontinence in nursing home care. Nurse Educ Today 2008; 28: 926-934.

32. Van Hecke A, Goeman C, Beeckman D, Heinen M, Defloor T. Development and psychometric evaluation of an instrument to assess venous leg ulcer lifestyle knowledge among nurses. J Adv Nurs 2011; 67: 2574-2585.

33. Crogan NL, Evans BC. Nutrition assessment: experience is not a predictor of knowledge. J Contin Educ Nurs 2001b; 32: 219-222.

34. Kottner J, Streiner DL. Internal consistency and Cronbach's a: a comment on Beeckman et al. (2010). Int J Nurs Stud 2010; 47: 926-928.

Chapter 6

Knowledge and attitudes of nursing staff towards malnutrition care in nursing homes: a multicentre cross-sectional study

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ABSTRACT

Background: The international literature shows that there are considerable deficits in nutritional care provision in nursing homes. Limited knowledge and negative attitudes can contribute to these deficits but international studies on knowledge and attitudes among nursing staff are rare.

Objective: The study aimed to assess the knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes.

Design: This study followed a multicentre, cross sectional design.

Setting and Participants: The study was performed in 66 Austrian nursing homes with 1152 participants.

Measurements: The validated Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire and the Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) scale were used for data collection.

Results: On average, 60.6% of the respondents answered the questions correctly, whereas registered nurses knew significantly more (65.6%) than nurse aides (57.3%). The question that was answered correctly by most dealt with the factors that positively affect oral nutritional intake (87.2%) while the question which was incorrectly answered by most was on the professions involved in malnutrition treatment (26.1%). 39.2% of respondents had positive attitudes towards nutritional care. Registered nurses displayed more positive attitudes (48.1%) than nurse aides (33.6%). The most positive attitudes were shown in the 'Intervention' subscale while the least positive attitudes were indicated in the 'Norms' subscale. A medium positive correlation between knowledge and attitudes was found (r=.423, p<0.000).

Conclusion: This study identified specific knowledge deficits and areas of negative attitudes in registered nurses and nurse aides, which will enable tailored training programmes to be developed.

Keywords: knowledge, attitudes, nursing staff, malnutrition, nursing homes

INTRODUCTION

Malnutrition has a significant influence on patient health outcomes (1, 2) and was found in a recent review to occur in up to 71% of nursing home residents (3). Halfens et al. (4) reported a prevalence rate of 23% in Austrian nursing homes and 14% in Dutch nursing homes. International clinical practice guidelines (CPGs) provide recommendations on how to screen nutritional status and prevent and treat malnutrition (5-7). Nevertheless, several international studies have reported a lack in the use of validated nutritional screening tools (8-10) leading to poor recognition of malnutrition and its risk factors in residents (11, 12). Furthermore the literature identifies deficits in nutritional interventions, like the provision of energy-enriched diets to malnourished residents or those at risk (8-10).

One important precondition of adherence to CPG recommendations is the presence of adequate and sufficient knowledge of and positive attitudes towards malnutrition care in health care professionals (13-15). According to Donabedian's model, structures (e.g. knowledge and attitudes of the staff) can influence processes (e.g. routine screening and subsequent interventions), which in turn impact the outcomes of residents or patients (e.g. prevalence or incidence of a problem) in an institution (16).

In 2009, the Council of Europe claimed that health care professionals in care homes need to be better educated on malnutrition (17), because insufficient knowledge, limited interest and negative attitudes toward nutrition are perceived as the most common barriers to adequate nutritional practice (14, 18). Among health care professionals, nursing staff is in the best position to provide adequate nutrition (17, 19), therefore their knowledge and attitudes with regard to malnutrition play a fundamental role in the provision of nutritional care in nursing homes (13-15).

Studies on the knowledge and attitudes of nursing staff in nursing homes are rare, however. Stanek, Powell & Betts (20), Crogan, Shultz & Massey (21) and Beattie et al. (22) examined this knowledge using small sample sizes between 24 and 44 registered nurses and licensed practical nurses, respectively. The greatest knowledge deficits were found in nutritional status screening (21) and nutrient and food requirements in older residents (21, 22). Only Crogan, Shultz & Massey (21) analysed differences between registered nurses and licensed practical nurses and found that licensed practical nurses had sig-

nificantly less knowledge than registered nurses. Bachrach-Lindström et al. (23) and Bonetti et al. (24) investigated attitudes towards nutritional care in 252 registered nurses and nurse aides respectively 33 registered nurses with the Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) scale. Bachrach-Lindström et al. (23) found that 33% of the 252 respondents displayed positive attitudes. Both found that respondents had the most positive attitudes in the 'Intervention' subscale and the lowest positive attitudes in the 'Norms' subscale (23, 24). Furthermore Bachrach-Lindström et al. (23) found that registered nurses had better attitudes towards nutritional care than did nurse aides.

To conclude, it is known from previous studies that there are considerable deficits in nutritional practice in nursing homes (9, 10, 12) but information on nursing staff knowledge and attitudes, which play a fundamental role in providing adequate nutritional practice (11, 25), is only limited. Most of the studies conducted were based on small sample sizes and did not use systematically developed and psychometrically evaluated questionnaires. In addition, a large part of the studies conducted only concentrated on registered nurses or combined the results of nurses with other staff, e.g. facility directors or kitchen staff (20, 22). Most did not include nurse aides, despite the fact that they are the main care givers in nursing homes (26, 27). Registered nurses are not always aware of the residents' daily problems, meaning that the nurse aides must function as the "eyes and ears of nurses" and thus have to be trained accordingly (27, 28). Having more detailed information on knowledge and attitudes would enable the planning of targeted training programmes to improve knowledge and attitudes of registered nurses and nurse aides as well as long-term malnutrition care. Consequently, the aims of this study were to assess the knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes, as well as to look at differences in knowledge and attitudes with regard to general characteristics like gender, age and years of working experience.

METHODS

Design
This study followed a multicentre, cross-sectional design.

Setting and sample

All Austrian nursing homes with more than 50 beds (n=470) were invited by e-mail and letter to participate in the study. The average number of beds in these nursing homes is 99 (29). A total sample of 66 Austrian nursing homes, with an average number of 95 beds, agreed to participate. All registered nurses and nurse aides (subsequently referred to as nursing staff) who were available during the 4-week data collection period in these nursing homes were asked to participate. In Austria, registered nurses attend a 3-year program with 30 lessons in nutrition and diets in their first year and nurse aides attend a 1-year program with 25 lessons in nutrition and diets. Registered nurses are primary educated in schools in which they are awarded a diploma upon graduation. In recent years some universities and universities of applied science have begun to offer bachelor-level programs where graduates are awarded a diploma and a Bachelor of Nursing Science (BSc) (30, 31). To date, registered nurses in Austria with Bachelor's certificates are few.

Data collection

Data were collected between November 2012 and February 2013. The nursing and ward directors were personally informed about the study and its procedures by the primary investigator. They were provided with the questionnaires including the informed consent forms and boxes for data collection as well as with instructions on how to distribute the questionnaires. The ward directors distributed the questionnaires to nursing staff, informed them about the study and emphasized the importance of filling in the questionnaire without the assistance of other resources (like Internet or help from others). The questionnaires were delivered securely and anonymously in sealed data collection boxes. The nursing directors returned the completed questionnaires to the Institute of Nursing Science of the Medical University of Graz by mail four weeks after receiving them.

Instruments

The knowledge was measured with the Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire. The KoM-G was developed by the authors using a Delphi technique with input from eight international malnutrition experts and afterwards was psychometrically evaluated. The KoM-G is a 19-item multiple-choice questionnaire where each question has six answer options including 'I

don't know'. Questions wherein five of the six answer options were correctly answered were scored as correct, while all other variants were scored as not correct. Hence, these scores range between 19 and 114, with higher scores reflecting higher knowledge. The psychometric evaluation revealed a Scale-Content Validity Index Average (S-CVI/Ave) of 0.91. Furthermore, the KoM-G had an item difficulty of 60.6% and a discrimination index of 0.38. The analysis of previously defined known groups revealed significant differences with regard to nursing degree, additional training in malnutrition as well as attitudes towards nutritional care. The result of the Kuder-Richardson 20 for the whole questionnaire was 0.69 (32).

The attitudes of nursing staff were assessed using the SANN-G scale developed by Christensson & Bachrach-Lindström (25). The permission to translate and use the SANN-G was obtained from the developers. For the purpose of this study, the SANN-G was translated by a professional translator from English to German and back from German to English by another professional translator. The primary English version and the translated English version were then compared by the primary author and only minor differences in language were found with no impact on meaning. The SANN-G scale consists of 18 items representing five subscales: 'Norms' (e.g. It is best that the staff serves food on plates without help from the residents); 'Habits' (e.g. One prepared warm meal/day is enough for people aged 70 or more); 'Assessment' (e.g. It is meaningless to assess body weight of all residents); 'Intervention' (e.g. No special knowledge or experience is needed when helping a resident to eat) and 'Individualization' (e.g. Mealtimes do not need to be individually adjusted). All items are negatively worded statements. Answers are given on a Likert-scale where 1 represents 'completely agree' and 5 'completely disagree'. The scores range between 18 and 90 where a score below 54 reflect a negative attitude and a score of 72 or higher represent a positive attitude. The original and the German version of the SANN-G revealed a Cronbachs Alpha of 0.83 (25).

Furthermore, general characteristics like gender, age, nursing degree, years of working experience and additional training in malnutrition were gathered. Additional training in malnutrition was defined as advanced and lasting at least two hours with no further details on content.

Ethical considerations

The ethical approval from the ethics committee of the Medical University of Graz and written informed consent from the participating nursing staff was obtained.

Data analysis

The statistical analyses were performed with IBM SPSS, version 20.0 (IBM, Armonk, NY, USA). Data were coded and prepared for analysis by checking for discrepancies, logical inconsistencies and missing responses. The knowledge of nursing staff was assessed according to the percentage of correct answers and median values. The attitudes of nursing staff were assessed as percentage of positive attitudes and median values. The analysis between groups was performed using Mann-Whitney U and chi-square tests. The Spearman rank order correlation between knowledge and attitudes was analysed. Correlation coefficients between .30 and .49 were considered medium correlations and between .50 and 1.0 were judged as large correlations (33). P-values were based on two-sided tests, and values lower than 0.05 were considered statistically significant. Only complete questionnaires on knowledge respectively attitudes were used for comparisons between groups.

RESULTS

General characteristics

The response rate of the nursing staff from the 66 participating nursing homes was 59.5% meaning that 1152 participants gave informed consent and filled in the questionnaire. 458 registered nurses and 619 nurse aides participated, while 75 participants did not indicate their level of education. Most of the respondents were female and the mean age was 41.4 years (Table 1). Registered nurses, as opposed to nurse aides, had significantly more years of working experience and also confirmed significantly more often having attended additional training in malnutrition.

Knowledge of nursing staff

Of the 1008 registered nurses and nurse aides who filled in the KoM-G completely, an average of 60.6% questions were answered correctly (Table 2). 87.2% of the whole sample knew which factors positively affect oral nutritional

intake. Furthermore, more than 80% of the respondents knew possible conse-quences and signs of malnutrition, factors that negatively affect oral nutritional intake and possible interventions in residents with dysphagia at risk of mal-nutrition. The question with the lowest percentage of correct answers related to the involvement of different professions in malnutrition treatment, which was known by 26.1% of the respondents. In addition, the question about the 'normal' and healthy Body Mass Index (BMI) in older residents was known by 31.6%. Registered nurses knew significantly more (65.6%) than nurse aides (57.3%). The items on risk factors for and consequences of malnutrition, signs of dehydration, BMI, weight loss, almost all items on planning nutritional inter-ventions and factors that negatively affect oral nutritional intake were known significantly more often by registered nurses than nurse aides. The percentage of correct answers and median values did not differ significantly with regard to gender, age and years of working experience (Table 3). Additional training in malnutrition made a significant difference by showing that those with training in malnutrition knew more than those without training in malnutrition.

Table 1: Characteristics of respondents (in %)

	Total	Registered nurses	Nurse aides	p-value
Gender	n=1104	n=458	n=619	
Female	87.5	89.5	85.9	0.080
Age	n=1020	n=429	n=578	
≤30 years	18.6	14.0	22.0	
31-40 years	23.8	27.7	20.8	
41-50 years	39.1	40.8	37.9	
≥51 years	18.6	17.5	19.4	
Mean age in years (SD)	41.4 (10.1)	42.0 (9.3)	41.0 (10.5)	0.246
Years of working experience	n=907	n=400	n=501	
≥6 years	75.1	81.8	69.7	
Mean years of working experience (SD)	13.9 (10.1)	17.8 (11.2)	10.8 (7.9)	<0.000
Additional training in malnutrition	n=1092	n=451	n=619	
Yes	20.6	29.7	13.7	<0.000

Table 2: Correct answers per item on the Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire (in %)

Dimension	Item
Etiology and consequences of malnutrition	What are possible risk factors for malnutrition?
	What are possible consequences of malnutrition?
	What are possible signs of malnutrition?
	What are possible signs of dehydration?
Screening and assessment of nutritional status	What indicators should be assessed in nutritional screening?
	When should residents be nutritionally screened?
	What is a 'normal' and healthy BMI (Body Mass Index) of older residents (over 65 years old)?
	What % of unintentional weight loss in the past 3 months is a possible sign of malnutrition?
Planning interventions	Which professions should be involved when necessary in treating malnourished residents?
	A resident lost 3 kg in the past month. What steps can be initiated?
	To what extent do the energy and nutrient requirements change for older residents (over 65 years old)?
	The daily fluid requirements of a person are…?
	What factors can lead to higher energy and protein requirements?
	What specific nutrient requirements do residents with pressure ulcers have?
	Why should nurses keep a food and fluid log?
Possible interventions for improving nutritional intake	What factors can positively affect oral nutritional intake?
	What factors can negatively affect oral nutritional intake?
Enteral and parenteral nutrition	What interventions should be ideally done for a resident with mild dysphagia at risk of malnutrition?
	For which residents is tube feeding appropriate?
Total	Total percentage of correct answers

Total (n=1008)	Registered nurses (n=420)	Nurse aides (n=547)	p-value
66.9	80.6	64.7	0.003
80.7	88.1	79.0	<0.000
65.3	70.2	64.9	0.080
80.8	86.9	76.2	<0.000
68.2	71.4	69.3	0.470
63.3	65.0	61.6	0.279
31.6	36.2	28.7	0.013
50.0	55.7	45.7	0.002
26.1	33.1	22.1	<0.000
56.8	62.6	54.7	0.013
39.4	46.0	35.6	0.001
47.2	58.3	41.1	<0.000
52.9	67.9	45.2	<0.000
73.8	83.6	66.0	<0.000
41.2	42.4	41.7	0.827
87.2	90.5	86.8	0.080
82.1	88.3	80.4	0.001
85.5	88.6	86.1	0.256
38.6	38.3	38.4	0.985
60.6	65.6	57.3	<0.000

Table 3: Knowledge (Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire) and attitudes (Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) scale) presented as percentage of correct answers/percentage of positive attitudes and median values per sample characteristics

	Knowledge			Attitudes		
	%	Median	p-value	%	Median	p-value
Gender						
Female	61.0	93.0	0.617	40.1	69.0	0.349
Male	60.4	93.0		35.8	68.0	
Age						
≤30 years	61.8	93.0	0.648	38.2	69.0	0.940
31-40 years	59.8	93.0		39.4	68.0	
41-50 years	61.9	94.0		40.8	69.0	
≥51 years	60.9	94.0		39.9	69.0	
Years of working experience						
≥6 years	61.4	94.0	0.314	39.5	69.0	0.086
≤5 years	63.8	94.0		46.5	71.0	
Additional training in malnutrition						
Yes	65.2	95.0	<0.000	45.6	70.0	0.089
No	59.6	93.0		38.3	69.0	

Table 4: Attitudes per subscale of Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) scale presented as percentages of positive attitudes and median values (Q1, Q3)

	Break point for positive attitudes	Total (n=1005)			Registered nurses (n=414)			Nurse aides (n=548)			p-value
		% positive attitudes	Median	Q1-Q3	% positive attitudes	Median	Q1-Q3	% positive attitudes	Median	Q1-Q3	
Norms (5-25)	20	35.6	18.0	15.0-21.0	42.0	19.0	16.0-21.0	31.6	18.0	15.0-20.0	<0.000
Habits (4-20)	16	41.0	15.0	12.0-17.0	47.1	15.0	13.0-18.0	37.2	14.0	12.0-16.0	<0.000
Assessment (4-20)	16	60.2	16.0	14.0-18.0	67.4	17.0	15.0-18.0	54.9	16.0	14.0-18.0	<0.000
Intervention (3-15)	12	71.7	13.0	11.0-14.0	79.2	13.0	12.0-14.0	66.6	12.0	11.0-14.0	<0.000
Individualization (2-10)	8	55.7	8.0	6.0-9.0	60.1	8.0	6.0-10.0	53.5	8.0	6.0-9.0	0.036
Total (18-90)	72	39.2	69.0	61.0-76.0	48.1	71.0	64.0-78.0	33.6	67.0	60.0-74.0	<0.000

Attitudes of nursing staff

39.2% of the respondents had positive attitudes, 51.7% displayed neutral attitudes and 9.1% showed negative attitudes towards nutritional care. 71.7% of the respondents displayed positive attitudes in the 'Intervention' subscale whereas 35.6% displayed positive attitudes in the 'Norms' subscale (Table 4). 48.1% of the registered nurses and 33.6% of the nurse aides had positive attitudes towards nutritional care. Registered nurses and nurse aides differed significantly in their attitudes in the total score as well as in all subscales. The general characteristics of the respondents (gender, age, years of working experience and additional training in malnutrition) were not significantly related to their attitudes (Table 3).

A medium positive correlation between knowledge and attitudes was found for the whole sample (r=.423, p<0.000) as well as for registered nurses (r=.411, p<0.000) and nurse aides (r=.441, p<0.000) individually.

DISCUSSION

Internationally, this study was one of the first to measure knowledge and attitudes towards malnutrition care on the parts of registered nurses and nurse aides in nursing homes. Previously conducted studies on knowledge and attitudes were mostly based on low sample sizes and concentrated only on registered nurses or mixed samples. The results of this study indicated that registered nurses had better knowledge and more positive attitudes than nurse aides. The main knowledge deficits were found to be in involving professionals in nutritional care as well as screening and assessment of nutritional status. Furthermore, most negative attitudes were found in the 'Norms' subscale, which deals with the organisation of mealtimes and involving residents in mealtime preparation.

On average, 60.6% of the respondents answered the questions in the KoM-G correctly, which is in line with Stanek, Powell & Betts (20) who reported a mean of 60% correct answers. In addition to this, the study revealed a significant difference in knowledge between registered nurses and nurse aides, which can be explained by their different education and the amount of nutritional training received. Similar results were shown by Crogan, Shultz & Massey (21) with a mean of 65% correct answers, while licensed practical nurses scored significantly lower (56%) than registered nurses (68%). Fur-

thermore, additional training in malnutrition was related to increased knowledge, whereas gender, age and years of working experience were not related to knowledge. Stanek, Powell & Betts (20) also found that years of working experience did not influence knowledge significantly. In contrast, Crogan & Evans (34) found that nurses with fewer years of working experience had more knowledge than more experienced nurses in nursing homes. Although not significant, our study also showed that nurses with fewer years of working experience had more knowledge and also more positive attitudes than nursing staff with more years of working experience. This may partly be explained by their more recent basic education and therefore more accessible and current knowledge. Crogan & Evans (34) noted that these results may lead to problems, as experienced nurses may function as role models for nurse aides and have more responsibilities because of their experience, e.g. performing nutritional assessment, even though their knowledge level might be worse compared to their less experienced colleagues.

The question with the lowest percentage of correct answers dealt with the professions potentially involved in treating malnourished residents. This supports findings from the literature which showed that responsibilities in the nutritional process are badly defined and that there is a lack of awareness of their own and the others' role in nutrition within the team. This constitutes one of the main barriers to adequate nutritional care (18, 35). Since screening and assessment are essential for enabling good nutritional practice (6), relevant indicators for nutritional status should be well known. The question on the 'normal' BMI of older residents was only correctly answered by 31.6% of the respondents. Crogan, Shultz & Massey (21) also found deficits regarding knowledge on nutritional screening and assessment. Knowledge on etiology and consequences of malnutrition as well as factors influencing oral nutritional intake and possible interventions in residents at risk of malnutrition was high, both for registered nurses and nurse aides. Beattie et al. (22) also found high knowledge scores e.g. on questions regarding feeding strategies for dementia residents, which emphasized that knowledge on practical aspects of nutritional interventions among nursing staff, for example, was generally high. Interestingly, the items which were known or not known by most of the nursing staff were similar between registered nurses and nurse aides.

In the present study, 39.2% displayed positive attitudes towards nutritional care, which is a little higher than the result reported by Bachrach-Lindström et

al. (23) where 33% displayed positive attitudes. This study revealed significant differences in attitudes between registered nurses and nurse aides whereas no significant differences with regard to gender, age, years of working experience and additional training were found.

Nursing staff displayed the most positive attitudes toward the 'Intervention' subscale, while the most negative attitudes were found in the 'Norms' subscale, which is both in line with Bachrach-Lindström et al. (23) and Bonetti et al. (24). This was true for the entire nursing staff as well as for registered nurses and nurse aides individually. The low percentage of positive attitudes in the 'Norms' subscale showed that nursing staff, especially nurse aides, believe that the organisation of mealtimes should focus mainly on relieving staff's workload and that residents should not be involved in preparing or arranging mealtimes. During mealtimes, the perspectives and needs of two different actors, the nursing staff and the resident, come together. The primary interest of the nursing staff is to manage their workload during mealtimes, which is difficult due to limited time and nursing staff (22, 35). On the other hand, mealtimes are a sign of normality and personal identity for the residents and function as a compass during the day in nursing homes. Since mealtimes also offer opportunities to foster the independence and wellbeing of residents (36-38), the implementation of extra staff during mealtimes or soliciting the help of relatives is recommended. Even such slight changes in mealtime organisation can potentially improve the situation of residents, which may also lead to a slight relief in the workload of nursing staff during mealtimes (37, 38). As already indicated with regard to nursing staff knowledge, the subscales with high values of positive attitudes and negative attitudes were similar between registered nurses and nurse aides. This leads to the conclusion that, although registered nurses still knew significantly more and had significantly more positive attitudes than nurse aides, the areas of knowledge/knowledge deficits and positive/negative attitudes were similar.

The results of this study revealed a medium positive correlation between knowledge and attitudes. This was also underlined by the relationship between the results on the subscales of the SANN-G and the results on the individual items of the KoM-G. For example, it was shown that knowledge regarding nutritional interventions was high among the nursing staff and that attitudes of nursing staff were quite positive in the 'Intervention' subscale.

This study also had several limitations. The nursing directors decided whether an institution should participate or not, which entails a potential bias in that those who participated may have already had an interest in nutritional care. Furthermore, the nursing directors may have also influenced to whom the questionnaire was given and how it was filled in. Factor analysis has not yet been conducted, but is recommended for further studies. Additionally, not all questionnaires were complete, leading to missing data.

However, this study provided detailed information on knowledge and attitudes of registered nurses and nurse aides. It was based on a large sample of nursing staff from nursing homes of different sizes covering every Austrian state. There is no available data on non-respondents and subsequently on representativeness, which is common in these types of studies. Nevertheless the mean number of beds at the participating nursing homes compared to all nursing homes in Austria was found to be similar, which enhances generalizability. Furthermore, the response rate was quite high, compared to the studies by Beattie et al. (22) (33%) or Stanek, Powell & Betts (20) (38%).

For the purposes of nursing research, the authors recommend modifying the KoM-G used here for other settings, like hospitals and home care. Since the demand for knowledge about malnutrition differs between settings, the items on the KoM-G should be evaluated with regard to content and relevance. It would also be of interest to compare knowledge and attitudes between different settings in order to establish whether areas of knowledge deficits are similar. It would also be important to not only look at knowledge and attitudes in other settings, but rather to also compare them with daily nursing care, because there is already a discussion about the discrepancy between what is known and what is actually practiced in daily nursing care, which should be pursued further (21, 22). In addition, forthcoming studies should focus on team composition and skill mix, because not only the knowledge of individual nurses, but also their combination and the composition of teams are important when aiming to improve nutritional care.

This study demonstrated the differences between registered nurses and nurse aides with regard to knowledge and attitudes. Since nurse aides perform most of the direct care in nursing homes, nurse aide training is a cornerstone of good quality care provision (27, 28). The information from this study will enable the development of tailored training programmes for registered nurses and

nurse aides, potentially helping to improve nutritional care in the long term. Multidisciplinary nutritional care as well as screening and assessment of nutritional status are among the topics definitively deserving coverage, because these were the topics that lacked knowledge among nursing staff. However, malnutrition should also be more heavily emphasized in basic and further education for both registered nurses and nurse aides.

Ethical standards

All measures comply with the current laws of Austria.

Declaration of interest

The authors declare that there are no conflicts of interest in relation to the current study.

REFERENCES

1. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5-15.

2. Banks M, Bauer J, Graves N, Ash S. Malnutrition and pressure ulcer risk in adults in Australian health care facilities. Nutrition 2010; 26: 896-901.

3. Bell CL, Tamura BK, Masaki KH, Amella EJ. Prevalence and measures of nutritional compromise among nursing home patients: weight loss, low body mass index, malnutrition, and feeding dependency, a systematic review of the literature. J Am Med Dir Assoc 2013; 14: 94-100.

4. Halfens RJG, Meesterberends E, van Nie-Visser NC, Lohrmann C, Schönherr S, Meijers JMM, Hahn S, Vangelooven C, Schols JMGA. International prevalence measurement of care problems: results. J Adv Nurs 2013; 69: e5-e17.

5. NICE. Nutrition Support for Adults Oral Nutrition Support, Enteral Tube Feeding and Parenteral Nutrition. 2006, http://www.nice.org.uk/nicemedia/live/10978/29981/29981.pdf (accessed 10 February 2014).

6. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr 2003; 22: 415-421.

7. Volkert D, Berner YN, Berry E, Cederholm T, Coti Bertrand P, Milne A, Palmblad J, Schneider St, Sobotka L, Stanga Z, DGEM: Lenzen-Grossimlinghaus R, Krys U, Pirlich M, Herbst B, Schütz T, Schröer W, Weinrebe W, Ockenga J, Lochs H. ESPEN Guidelines on Enteral Nutrition: Geriatrics. Clin Nutr 2006; 25: 330-360.

8. Valentini L, Schindler K, Schlaffer R, Bucher H, Mouhieddine M, Steininger K, Tripamer J, Handschuh M, Schuh C, Volkert D, Lochs H, Sieber CC, Hiesmayr M. The first NutritionDay in nursing homes: participation may improve malnutrition awareness. Clin Nutr 2009; 28: 109-116.

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

10. Meijers JMM, Halfens RJG, van Bokhorst-de van der Schueren MAE, Dassen T, Schols JMGA. Malnutrition in Dutch health care: prevalence, prevention, treatment, and quality indicators. Nutrition 2009; 25: 512-519.

11. Suominen MH, Kivisto SM, Pitkala KH. The effects of nutrition education on professionals' practice and on the nutrition of aged residents in dementia wards. Eur J Clin Nutr 2007; 61: 1226-1232.

12. Volkert D, Saeglitz C, Gueldenzoph H, Sieber CC, Stehle P. Undiagnosed malnutrition and nutrition-related problems in geriatric patients. J Nutr Health Aging 2010; 14: 387-392.

13. Bjerrum M, Tewes M, Pedersen P. Nurses' self-reported knowledge about and attitude to nutrition - before and after a training programme. Scand J Caring Sci 2012; 26: 81-89.

14. Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unossen M, Rothenberg E, Irtun Ø, the Scandinavian Nutrition group. Insufficient nutritional knowledge among health care workers? Clin Nutr 2008; 27: 196-202.

15. Fletcher A, Carey E. Knowledge, attitudes and practices in the provision of nutritional care. Br J Nurs 2011; 20: 570-574.

16. Donabedian A. Evaluating the quality of medical care. Milbank Mem Fund Q 1996; 44: 166-206.

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

18. Lindorff-Larsen K, Rasmussen HH, Kondrup J, Staun M, Ladefoged K, Scandinavian Nutrition Group. Management and perception of hospital undernutrition - a positive change among Danish doctors and nurses. Clin Nutr 2007; 26: 371-378.

19. Kim H, Choue R. Nurses' positive attitudes to nutritional management but limited knowledge of nutritional assessment in Korea. Intern Nurs Rev 2009; 56: 333-339.

20. Stanek K, Powell C, Betts N. Nutritional Knowledge of Nurses in Long-Term Health Care Facilities. J Nutr Elder 1991; 10: 35-48.

21. Crogan NL, Shultz JA, Massey LK. Nutrition knowledge of nurses in long-term care facilities. J Contin Educ Nurs 2001a; 32: 171-176.

22. 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 2013; doi: 10.1111/opn.12016.

23. 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: 2007-2014.

24. Bonetti L, Bagnasco A, Giuseppe A, Sasso L. Validation of the Staff Attitudes to Nutritional Nursing Care Geriatric scale in Italian. Int Nurs Rev 2013; 60: 389-396.

25. Christensson L, Bachrach-Lindström M. Adapting 'the Staff Attitudes to Nutritional Nursing Care scale' to geriatric nursing care. J Nutr Health Aging 2009; 13: 102-107.

26. Barry T, Brannon D, Mor V. Nurse aide empowerment strategies and staff stability: effects on nursing home resident outcomes. Gerontologist 2005; 45: 309-317.

27. Crogan NL, Evans BC. Nutrition education for nursing assistants: an important strategy to improve long-term care. J Contin Educ Nurs 2001c; 32: 216-218.

28. Crogan NL, Shultz JA, Adams CE, Massey LK. Barriers to nutrition care for nursing home residents. J Gerontol Nurs 2001d; 27: 25-31.

29. BMASK Bundesministerium für Arbeit, Soziales und Konsumentenschutz/Federal Ministry of Labour, Social Affairs and Consumer Protection. 2012, https://www.infoservice.sozialministerium.at/InfoService2/;jsessionid=54810920010441A08E87AA19C48407CD?execution=e1s4 (accessed 28 May 2014).

30. § 92 GuKG Gesundheits- und Krankenpflegegesetz BGBl I Nr. 108/1997.

31. § 41 GuKG Gesundheits- und Krankenpflegegesetz BGBl I Nr. 108/1997.

32. Schönherr S, Halfens RJG, Lohrmann C. Development and psychometric evaluation of the Knowledge of Malnutrition - Geriatric (KoM-G) questionnaire to measure malnutrition knowledge among nursing staff in Austrian nursing homes. Scand J Caring Sci 2014; doi: 10.1111/scs.12133.

33. Field A. Discovering statistics using SPSS. 2nd ed. London: SAGE Publications Ltd.; 2005.

34. Crogan NL, Evans BC. Nutrition assessment: experience is not a predictor of knowledge. J Contin Educ Nurs 2001b; 32: 219-222.

35. Ross LJ, Mudge AM, Young AM, Banks M. Everyone's problem but nobody's job: Staff perceptions and explanations for poor nutritional intake in older medical patients. Nutrition & Dietetics 2011; 68: 41-46.

36. Palacios-Ceña D, Losa-Iglesias ME, Cachón-Pérez JM, Gómez-Pérez D, Gómez-Calero C, Fernández-de-las-Peñas C. Is the mealtime experience in nursing homes understood? A qualitative study. Geriatr Gerontol Int 2013; 13: 482-489.

37. Barnes S, Wasielewska A, Raiswell C, Drummond B. Exploring the mealtime experience in residential care settings for older people: an observational study. Health Soc Care Community 2013; 21: 442-450.

38. Nijs KAND, de Graaf C, Kok FJ, van Staveren WA. Effect of family style mealtimes on quality of life, physical performance, and body weight of nursing home residents: cluster randomised controlled trial. BMJ 2006; 332: 1180-1184.

Chapter 7

General discussion

GENERAL DISCUSSION

The overall aims of this doctoral thesis were (1) to describe structural and process indicators of nutritional care in hospitals and nursing homes; (2) to describe changes in nutritional status in nursing home residents; and (3) to assess knowledge and attitudes of nursing staff in nursing homes towards malnutrition. The following chapter summarises and discusses the main results of the doctoral thesis. A methodological reflection of the applied methods is given and finally, recommendations for nursing research and nursing practice are provided.

Summary of the main results

Study 1 described structural and process indicators of nutritional care in Austrian hospitals and nursing homes and compared these between the two settings. The use of guidelines for prevention and treatment of malnutrition was low in both settings. Nutritional screening tools were used more often for nursing home residents (28.9%) than for hospital patients (14.5%). Oral nutritional support was preferred to enteral and parenteral nutrition in both settings. Dietitians were consulted for 27.5% of the malnourished hospitalized patients and 74.7% of the malnourished nursing home residents. The prevalence of malnutrition was reported to be 23.2% in hospitals and 26.2% in nursing homes.

Study 2 investigated the change in nutritional status in nursing home residents over a period of one year and the factors which were associated with a decline in nutritional status in nursing home residents over this period. Results showed that between baseline and one year later, the nutritional status of 22.8% of the residents declined and for 6.5% of the residents it improved. The multivariate logistic regression analysis indicated that care dependency (OR 0.965), length of stay (OR 1.197), changes in Body Mass Index (BMI) (OR 0.532) and malnutrition risk at baseline (OR 5.307) were significantly associated with a decline in nutritional status.

In study 3, part I, a questionnaire to assess knowledge of malnutrition care among nursing staff in nursing homes was developed and psychometrically evaluated in terms of content validity, item validity, construct validity and internal consistency. The Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire consisted of 20 items with six answer options. Content validity was shown to be good. The item difficulty of the total questionnaire was 59.3% and

the discrimination index was 0.37. One item had a discrimination index below 0.20 and was therefore deleted. Significant differences were identified in the percentage of correct answers between registered nurses and nurse aides, nursing staff with training in malnutrition and without as well as between nursing staff with positive attitudes towards nutritional care and neutral or negative attitudes. The Kuder-Richardson 20 was 0.69.

In study 3, part II, knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes was investigated. It was found that, on average, 60.6% of the respondents answered the items correctly, whereas registered nurses knew significantly more (65.6%) than nurse aides (57.3%). The item that was answered correctly by most dealt with the factors that positively affect oral nutritional intake (87.2%), while the item regarding professions involved in malnutrition treatment was incorrectly answered by most (26.1%). 39.2% of respondents had positive attitudes towards nutritional care. Registered nurses displayed more positive attitudes (48.1%) than nurse aides (33.6%). Of the five subscales, the most positive attitudes were shown in the 'Intervention' subscale (e.g., No special knowledge or experience is needed when helping a resident to eat) while the least positive attitudes were indicated in the 'Norms' subscale (e.g., It is best that the staff serves food on plates without help from the residents).

Discussion of the main results

Structural and process indicators of nutritional care in hospitals and nursing homes

The use of guidelines for prevention and treatment of malnutrition is recommended for all health care settings (1, 2). The study at hand found that guidelines for prevention and treatment of malnutrition were seldom used in both hospitals and nursing homes, which is in line with the study from Meijers et al. (3). In addition, Meijers et al. (3) found that nursing homes in the Netherlands used guidelines more often than hospitals, which contradicts the results found in the present study. In the study of Valentini et al. (4), guidelines were used more often in Austrian and German nursing homes than in the study at hand. The difference in the results may be explained by the different terminologies (e.g., protocols, standards) and definitions regarding guidelines used, especially in German (5). In general, the low use of guidelines in the present study can be explained by the potentially low awareness of national

and international guidelines as well as the low priority of malnutrition in health care institutions (6-8).

The identification of persons with malnutrition or risk of malnutrition should be done by using validated nutritional screening tools (9). The present study found that nutritional screening or assessment tools were used in about 15% of the hospitalized patients and about 30% of the nursing home residents. Meijers et al. (3) found higher screening rates in Dutch hospitals and nursing homes. This may partly be explained by the fact that in the Netherlands prevalence measurements (including malnutrition) have already been performed for several years which may have led to improved awareness and could have positively influenced process indicators (10, 11). The British Society for Parenteral and Enteral Nutrition (BAPEN) also found a higher use of nutritional screening tools in UK hospitals and nursing homes; perhaps because of BAPEN's extensive efforts to introduce routine nutritional screening in health care institutions (12).

After the identification of patients and residents at risk of malnutrition or with malnutrition, oral nutrition and its manifold variations (e.g., protein and energy enriched diets, high caloric snacks, etc.) should always be the first choice of treatment (13-15). This was taken into consideration by the participating nursing homes, as oral nutritional support was preferred to enteral or parenteral nutrition. Comparable results were found in other studies (3, 16, 17). Another recommended intervention is the involvement of dietitians with patients and residents at malnutrition risk or with malnutrition, as this can improve nutritional care (18, 19). Nevertheless, the present study as well as international literature showed that dietitians were not routinely consulted in cases of malnutrition or risk of malnutrition (16, 20, 21). This may be explained by a possibly low awareness or deficits in knowledge of nutritional care among nursing staff (22-24). In addition, there might be problems in interdisciplinary teamwork and the number of dietitians per institution might have been too low to consult each patient/resident in need. This may have resulted in dietitians not being able to attend to every malnourished patient/resident.

Changes in nutritional status and factors associated with a decline in nutritional status in nursing home residents

The nutritional status of 22.8% of the residents declined and improved in 6.5%, which is comparable to the study of Izawa et al. (25). This study identi-

fied several factors that contribute to a decline in nutritional status; namely malnutrition risk at baseline, care dependency, length of stay and changes in BMI. Malnutrition risk at baseline was the most important risk factor for a decline in nutritional status. Once nutritional status starts to decline, a vicious cycle begins, from which it is - especially in the elderly - hard to escape (13), because it is difficult for elderly people to restore their nutritional status (e.g., to gain weight again after unintentional weight loss) (26). Therefore it is important to protect nursing home residents from even approaching a risk of malnutrition. In this vein, adequate knowledge of early risk factors of malnutrition risk among nurse professionals is important. Nevertheless, many nurses have insufficient knowledge and do not see nutritional care as an important task (13, 24), which may contribute to the high and increasing prevalence of malnutrition in nursing homes (12, 27).

In addition to malnutrition risk at baseline, care dependency was associated with the risk of a decline in nutritional status, which was also found by Izawa et al. (25). Althrough it is known that nutritional factors and care dependency influence each other (28, 29), the exact causal relationship between the two problems remains controversial (25). Therefore care independency should be promoted (30) and health care professionals should be educated on the association between care dependency and nutrition in order to prevent a deterioration of both.

Development and psychometric evaluation of a questionnaire to assess knowledge of malnutrition care

Different psychometric properties of the KoM-G questionnaire have been evaluated in the present study. The item difficulty and the discrimination index of the KoM-G questionnaire, both part of the item validity, were analysed. The mean item difficulty of the whole questionnaire was 59.3%. The item difficulty of the individual items was within the desired range (below 90% and above 10%) and therefore no item had to be deleted. The mean discrimination index was 0.37, but the discrimination index of one item was below 0.20 and therefore was deleted. Other studies (on malnutrition or other health-related topics) also calculated item difficulty and discrimination index and found similar results (8, 31-34). Construct validity was analysed in terms of differences in knowledge between previously defined known groups. All but one hypothesis was verified, meaning that nursing staff with more years of experience did not

have better knowledge scores than nursing staff with fewer years of experience. This result is in accordance with results from other studies (32, 35). Crogan & Evans (36) even found nurses with fewer years of experience to have a tendency towards better knowledge than more experienced nurses, which is similar to results of the present study. A possible explanation for this could be that the knowledge of the less experienced nurses was somehow better because their basic training was more recent and up to date.

Knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes

On average, 59.3% of the items were answered correctly. The knowledge of malnutrition care was significantly different between registered nurses and nurse aides and between nursing staff with additional training in malnutrition and those without. This is in line with previously performed studies (31, 32). The difference in knowledge between registered nurses and nurse aides can be explained by their different education and the amount of nutritional training in their basic education (37, 38). In the total group, years of working experience did not significantly influence knowledge among nursing staff. As already mentioned, it was found that nurses with fewer years of experience had slightly better knowledge than more experienced nurses, which is in line with Crogan & Evans (36). This may lead to problems because experienced nurses function as role models in daily practice and can therefore have a negative influence on the knowledge and attitudes of younger nurses. In addition, they often have advanced responsibilities, e.g., performing nutritional assessment, even though their knowledge might be worse compared to their less experienced colleagues (36). Results of this could include nutritional assessment not being performed correctly or maybe not for every resident in need.

In general, the deficits in knowledge may be explained by the non-comprehensive and non-detailed nutritional training in basic education (37, 38). In addition to basic education, the low availability and even less frequent use of additional training programs on malnutrition in Austria could provide another possible explanation for the deficits in knowledge.

The item with the highest number of correct answers dealt with factors influencing oral nutritional intake. Beattie et al. (8) also found high knowledge scores on questions regarding feeding strategies for residents with dementia. These results can be explained by the fact that the practical aspects of nutri-

tional interventions seem to be easier to understand. The item with the lowest number of correct answers was on the professions potentially involved in treating malnutrition. This is underlined by the fact that responsibilities in the nutritional process are badly defined as well as the lack of awareness of the health care professions' roles in nutritional care (39, 40).

On average, 39.2% of the nursing staff had positive attitudes, which was slightly higher than the results found in another study (22). Registered nurses had not only better knowledge but also more positive attitudes than nurse aides. It is already known from the *Theory of Planned Behavior* that knowledge and attitudes are related to each other (41), which can also be underlined by the positive correlation of knowledge and attitudes found in the present study.

The most positive attitudes were shown in the 'Intervention' subscale (e.g., No special knowledge or experience is needed when helping a resident to eat) and the least positive attitudes were shown in the 'Norms' subscale (e.g., It is best that the staff serves food on plates without help from the residents), which is in line with previous studies (22, 42). Knowledge regarding interventions among nursing staff was high and attitudes in the 'Intervention' subscale among nursing staff were also quite positive. That underlines what is already known from the *Theory of Planned Behavior* (41) as well as the positive correlation of knowledge and attitudes.

Methodological reflection

The overall strengths and limitations of this doctoral thesis are summarized below. A detailed description of the strengths and limitations of the individual studies can be found in chapters three to six.

Strengths of the studies conducted

Main strengths of study 1:

1. The cross-sectional design of the study provided comprehensive insight into the structural and process indicators of nutritional care in Austrian hospitals and nursing homes and showed areas in need of improvement.
2. The multicenter nature of the study increased generalizability because participants from hospitals and nursing homes of different sizes and in different geographical locations were included.

Main strengths of study 2:

1. The use of available data through the performance of a secondary data analysis saved time and costs, which would not have been possible when conducting primary research.
2. The primary data came from repeated cross-sectional studies. For the purpose if this panel study, the whole data set was scanned through systematically and residents who participated twice were marked. This enabled a longitudinal comparison over time, which facilitated the identification of factors contributing to a decline in nutritional status in nursing home residents before nutritional problems appeared and became worse. The knowledge gained allows the planning and implementation of early nutritional intervention.

Main strengths of study 3 (parts I and II):

1. The systematic development (Delphi study including eight international malnutrition experts) and comprehensive psychometric evaluation (content validity, item validity, construct validity, internal consistency) of the KoM-G questionnaire enabled the collection of valid and reliable data.
2. Nursing homes (n=66) of different sizes covering each state in Austria participated, which increased generalizability.
3. The high sample size (n=1152 nursing staff) and the involvement of registered nurses and nurse aides increased the scientific merit of the results.

Limitations of the studies conducted

Main limitation of study 1:

Participation was voluntary and the reasons behind an institution's participation are unknown. Institutions who participated could have had more interest in malnutrition or were already focused more on malnutrition than non-participating institutions. This may have resulted in a possible selection bias.

Main limitations of study 2:

1. The study was a secondary data analysis and not primarily designed for this purpose, which restricted the available data (e.g., no data on

previous hospitalizations were available) and therefore also influenced the possibilities for data analysis.

2. The data collection period of only one year is regarded as a limitation. It was not possible to make comparisons over more than one year because the sample size would then have been even lower, due to the fact that the nursing home residents might have dropped out.

Main limitations of study 3 (parts I and II):

1. The nursing directors decided whether or not their institution should participate, which entails a potential selection bias in that those who participated may have already had an interest in nutritional care.

2. All nursing and ward managers were asked to inform the nursing staff about the importance of answering items without the use of other resources and about the anonymity and confidentiality of the results. Nevertheless, it is possible that some respondents used other resources (like the Internet, books or the help of colleagues) to answer the items, which may have led to biased results.

General recommendations for nursing research

More experimental research is needed to determine which structural and process indicators influence process and outcome indicators of nutritional care. This knowledge might help when giving explicit recommendations on the most important indicators (e.g., whether the use of guidelines as a structural indicator or performing a nutritional screening as a process indicator most influence outcome indicators).

Further research should also investigate the factors that contribute to a decline in nutritional status more in depth. In order to accomplish this, a larger sample than in the present study would be needed, specifically one that draws on patient data beginning from nursing home admission up to several years later. Such modifications could help to produce further recommendations on specific risk groups for nursing practice, enabling early nutritional interventions to be initiated for these groups.

The problem of malnutrition is relevant to all health care settings, but the demand for knowledge about malnutrition differs between settings. Therefore the items of the KoM-G questionnaire should be evaluated with regard to content and relevance for use in other health care settings. It is also recommended

to compare knowledge and attitudes between different settings in order to establish whether knowledge and attitudes are similar. With this information, it would be possible to plan tailored training programs for different settings. In addition, it would be of interest to focus on team composition and skill mix, because not only the knowledge and attitudes of individual nurses, but also their combination and the composition of teams are important when aiming to improve nutritional care.

General recommendations for nursing practice

Based on the studies conducted, the use of evidence-based guidelines for prevention and treatment in hospitals and nursing homes can be recommended, because deficits in structural indicators were identified in both settings. For this purpose, several international evidence-based guidelines exist, like the guideline of the European Society for Parenteral and Enteral Nutrition (ESPEN) (9, 43) or from the National Institute for Health and Care Excellence (NICE) (44). These guidelines recommend, among other things, to perform nutritional screening with validated nutritional screening tools (e.g., The Mini Nutritional Assessment (MNA) is recommended for use in the elderly) (9). These recommendations should be adhered to, because some research has already shown that nutritional screening is one of the most important indicators in decreasing malnutrition prevalence (11).

Probably the most important recommendation for nursing practice is to conduct tailored training programs based on the identified knowledge deficits and areas of negative attitudes. Comprehensive further training programs should be offered more frequently and their usage should be supported by heads of health care institutions. Multidisciplinary malnutrition care as well as screening and assessment of nutritional status are among the topics definitively deserving coverage in these trainings, because these were the topics in which nursing staff lacked knowledge. With regard to this, special focus should be put on the improvement of knowledge among experienced nurses, because these specific deficits may have far-reaching consequences and may influence future nursing staff. Nursing staff should also be sensitized about risk factors (like care dependency) for decline in nutritional status, because this might help to initiate early interventions and thus avoid further nutritional deterioration. Such training programs are needed for nursing staff but also for kitchen staff and medical doctors, because nutritional care is a multidisciplinary topic

involving many different professions (2, 13). Furthermore, malnutrition should also be more heavily emphasized in basic education for both registered nurses and nurse aides (21, 45, 46). This may contribute to the better and earlier identification and appropriate treatment of hospital patients and nursing home residents at risk.

REFERENCES

1. Ljungqvist O, van Gossum A, Sanz ML, de Man F 2010. The European fight against malnutrition. Clin Nutr 2010; 29: 149-150.

2. Volkert D. Malnutrition in older adults - urgent need für action: A plea for improving the nutritional situation of older adults. Gerontology 2013b; 59: 328-333.

3. Meijers JMM, Halfens RJG, van Bokhorst-de van der Schueren MAE, Dassen T, Schols JMGA. Malnutrition in Dutch health care: prevalence, prevention, treatment and quality indicators. Nutrition 2009a; 25: 512-519.

4. Valentini L, Schindler K, Schlaffer R, Bucher H, Mouhieddine M, Steininger K, Tripamer J, Handschuh M, Schuh C, Volkert D, Lochs H, Sieber CC, Hiesmayr M. The first NutritionDay in nursing homes: participation may improve malnutrition awareness. Clin Nutr 2009; 28: 109-116.

5. Bartholomeyczik S. Sinn und Unsinn von Pflegestandards. Heilberufe 2002; 5: 12-16.

6. Holst M, Staun M, Kondrup J, Bach-Dahl C, Rasmussen HH. Good nutritional practice in hospitals during an 8-year period: The impact of accreditation. e-SPEN 2014; 9: e155-e160.

7. Bjerrum M, Tewes M, Pedersen P. Nurses' self-reported knowledge about and attitude to nutrition - before and after a training programme. Scand J Caring Sci 2012; 26: 81-89.

8. 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 2013; 9: 54-64.

9. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr 2003; 22: 415-421.

10. Meijers JMM, Candel MJMM, Schols JMGA, van Bokhorst-de van der Schueren MAE, Halfens RJG. Decreasing trend in malnutrition prevalence rates explained by regular audits and feedback. J Nutr 2009b; 139: 1381-1386.

11. Meijers JMM, Tans F, Schols JMGA, Halfens, RJG. Nutritional care; do process and structure indicators influence malnutrition prevalence over time? Clin Nutr 2014; 33: 459-465.

12. BAPEN. Nutrition Screening Survey in the UK and Republic of Ireland in 2011. 2012, http://www.bapen.org.uk/pdfs/nsw/nsw-2011-report.pdf (accessed 08 May 2015).

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

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

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

16. Halfens RJG, Meesterberends E, van Nie-Visser NC, Lohrmann C, Schönherr S, Meijers JMM, Hahn S, Vangelooven C, Schols JMGA. International prevalence measurement of care problems: results. J Adv Nurs 2013; 69: e5-e17.

17. Smoliner C, Volkert D, Wirth R. Management of malnutrition in geriatric hospital units in Germany. Z Gerontol Geriatr 2013; 46: 48-55.

18. Schindler K, Pernicka E, Laviano A, Howard P, Schütz T, Bauer P, Grecu I, Jonkers C, Kondrup J, Ljungqvist O, Mouhieddine M, Pichard C, Singer P, Schneider S, Schuh C, Hiesmayr M, the NutritionDay Audit Team. How nutritional risk is assessed and managed in European hospitals: a survey of 21,007 patients' findings from the 2007-2008 cross-sectional NutritionDay survey. Clin Nutr 2010; 29: 552-559.

19. Rüfenacht U, Rühlin M, Wegmann M, Imoberdorf R, Ballmer PE. Nutritional counseling improves quality of life and nutrient intake in hospitalized undernourished patients. Nutrition 2010; 26: 53-60.

20. Lamb CA, Parr J, Lamb EIM, Warren MD. Adult malnutrition screening, prevalence and management in a United Kingdom hospital: cross-sectional study. Br J Nutr 2009; 102: 571-575.

21. Mowe M, Bosaeus I, Rasmussen HH, Kondrup J, Unossen M, Rothenberg E, Irtun Ø, the Scandinavian Nutrition group. Insufficient nutritional knowledge among health care workers? Clin Nutr 2008; 27: 196-202.

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: 2007-2014.

23. 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: 208-215.

24. Eide HD, Halvorsen K, Almendingen K. Barriers to nutritional care for the undernourished hospitalized elderly: perspectives of nurses. J Clin Nurs 2014; 24: 696-706.

25. Izawa S, Enoki H, Hasegawa J, Hirose T, Kuzuya M. Factors associated with deterioration of mini nutritional assessment-short form status of nursing home residents during a 2-year period. J Nutr Health Aging 2014; 18: 372-377.

26. Bauer JM, Wirth R, Volkert D, Werner H, Sieber CC. Malnutrition, Sakropenie und Kachexie im Alter - von der Pathophysiologie zur Therapie. Dtsch Med Wochenschr 2008; 133: 305-310.

27. Bell CL, Tamura BK, Masaki KH, Amella EJ. Prevalence and measures of nutritional compromise among nursing home patients: weight loss, low Body Mass Index, malnutrition, and feeding dependency, a systematic review of the literature. J Am Med Dir Assoc 2013; 14: 94-100.

28. Izawa S, Enoki H, Hirakawa Y, Iwata M, Hasegawa J, Iguchi A, Kuzuya M. The longitudinal change in anthropometric measurements and the association with physical function decline in Japanese community-dwelling frail elderly. Br J Nutr 2010; 103: 289-294.

29. Zuliani G, Romagnoni F, Volpato S, Soattin L, Leoci V, Bollini M C, Buttarella M, Lotto D, Fellin R. Nutrition parameters, body composition, and progression of disability in older disabled residents living in nursing homes. J Gerontol A Biol Sci Med Sci 2001; 56: M212-M216.

30. OECD (Organisation for economic co-operation and development). A Good Life in Old Age? Monitoring and Improving Quality in Long-term Care. 2013, http://www.keepeek.com/Digital-Asset-Management/oecd/social-issues-migration-health/a-good-life-in-old-age_9789264194564-en#page39 (accessed 30 January 2015).

31. Crogan NL, Shultz JA, Massey LK. Nutrition knowledge of nurses in long-term care facilities. J Contin Educ Nurs 2001a; 32: 171-176.

32. Stanek K, Powell C, Betts N. Nutritional knowledge of nurses in long-term health care facilities. J Nutr Elder 1991; 10: 35-48.

33. Beeckman D, Vanderwee K, Demarré L, Paquay L, Van Hecke A, Defloor T. Pressure ulcer prevention: development and psychometric validation of a knowledge assessment instrument. Int J Nurs Stud 2010; 47: 399-410.

34. Van Hecke A, Goeman C, Beeckman D, Heinen M, Defloor T. Development and psychometric evaluation of an instrument to assess venous leg ulcer lifestyle knowledge among nurses. J Adv Nurs 2011; 67: 2574-2585.

35. Boaz M, Rychani L, Barami K, Houri Z, Yosef R, Siag A, Berlovitz Y, Leibovitz E. Nurses and nutrition: a survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. J Contin Educ Nurs 2013; 44: 357-364.

36. Crogan NL, Evans BC. Nutrition assessment: experience is not a predictor of knowledge. J Contin Educ Nurs 2001b; 32: 219-222.

37. § 92 GuKG Gesundheits- und Krankenpflegegesetz BGBl I Nr. 108/1997.

38. § 41 GuKG Gesundheits- und Krankenpflegegesetz BGBl I Nr. 108/1997.

39. Lindorff-Larsen K, Rasmussen HH, Kondrup J, Staun M, Ladefoged K, The Scandinavian Nutrition Group. Management and perception of hospital undernutrition - A positive change among Danish doctors and nurses. Clin Nutr 2007; 26: 371-378.

40. Ross LJ, Mudge AM, Young AM, Banks M. Everyone's problem but nobody's job: Staff perceptions and explanations for poor nutritional intake in older medical patients. Nutrition & Dietetics 2011; 68: 41-46.

41. Ajzen I, Madden TJ. Prediction of goal-directed behavior: attitudes, intentions, and perceived behavioral control. J Exp Soc Psychol 1986; 22: 453-474.

42. Bonetti L, Bagnasco A, Giuseppe A, Sasso L. Validation of the Staff Attitudes to Nutritional Nursing Care Geriatric scale in Italian. Int Nurs Rev 2013; 60: 389-396.

43. Volkert D, Bauer JM, Frühwald T, Gehrke I, Lechleitner M. Lenzen-Großimlinghaus R, Wirth R, Sieber C und das DGEM Steering Committee. Klinische Ernährung in der Geriatrie. Aktuel Ernahrungsmed 2013a; 38: e1-e48.

44. National Collaborating Centre for Acute Care. Nutrition support in adults Oral nutrition support, enteral tube feeding and parenteral nutrition. 2006, http://www.nice.org.uk/guidance/cg32 (accessed 08 May 2015).

45. Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008; 27: 5-15.

46. Caccialanza R, Klersy C, Marinelli M, Cameletti B, Chiara B, Montagna E, Zugnoni M, Rava ML, Curti C, Calvi M, Dionigi P. A 4-year survey of the activity of a malnutrition task force in an Italian research hospital. Nutrition 2010; 26: 575-578.

Chapter 8

Summary

SUMMARY

Malnutrition is a complex and highly prevalent phenomenon that has to be identified early and adequately treated. The overall aims of this doctoral thesis are (1) to describe structural and process indicators of nutritional care in hospitals and nursing homes; (2) to describe changes in nutritional status in nursing home residents; and (3) to assess knowledge and attitudes of nursing staff in nursing homes towards malnutrition.

The **first chapter** provides background information and describes the theoretical framework of this doctoral thesis. Additionally the research gaps in the international literature and, on this basis, the overall aims of the doctoral thesis are presented. Finally, the detailed aims and research questions of the studies conducted and the outline of this doctoral thesis are illustrated.

In the **second chapter**, methodological aspects of the studies conducted (design, sample, setting, data collection and analysis) are presented.

Chapter three describes the structural and process indicators of nutritional care in hospitals and nursing homes. A multicenter, cross-sectional study with 2326 hospital patients and 1487 nursing home residents was conducted in April 2010. For data collection purposes a standardized questionnaire was used. Each patient/resident was simultaneously assessed by two nurses. The results of this investigation indicated that guidelines for the prevention and treatment of malnutrition were seldom used in both settings. Nutritional screening tools were applied more often for nursing home residents than for hospital patients. The prevalence of malnutrition was 23.2% in hospitals and 26.2% in nursing homes. Based on the identified deficits in structural, process and outcome indicators both in hospitals and in nursing homes, the conclusion was drawn that there is a need for improvement in nutritional care.

Chapter four illustrates the changes in nutritional status and factors associated with a decline in nutritional status in nursing home residents over a period of one year. A secondary data analysis was conducted with 157 nursing home residents, who participated two consecutive years in a measurement (from 2010 - 2013). For data collection purposes, a standardized questionnaire was used. Each resident was simultaneously assessed by two nurses. The results showed that the nutritional status of 22.8% of the residents declined and improved in 6.5% of the cases. Care dependency, length of stay, changes in

Body Mass Index (BMI) and malnutrition risk at baseline were significantly associated with a decline in nutritional status. To conclude, being at risk of malnutrition at baseline is the most important risk factor for a decline in nutritional status in nursing home residents. Therefore risk of malnutrition should be identified and preventive actions should be taken as early as possible.

Chapter five describes the development and psychometric evaluation of a questionnaire to assess knowledge of malnutrition care among nursing staff in nursing homes. A psychometric methodological study with 1152 registered nurses and nurse aides was executed in 2012/2013. The dimensions and items of the questionnaire were developed within a Delphi study including eight international malnutrition experts. For the psychometric evaluation of the questionnaire in terms of item validity, construct validity and internal consistency nursing staff filled in the newly developed Knowledge of Malnutrition-Geriatric (KoM-G) questionnaire and the Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) scale. As a result, the KoM-G questionnaire consisted of 20 items with six answer options. Content validity was shown to be good. The item difficulty of the total questionnaire was 59.3% and the discrimination index was 0.37. Significant differences in percentage of correct answers were found between registered nurses and nurse aides and nursing staff with training in malnutrition and without. In addition, significant differences in correct answers were found between nursing staff with positive attitudes towards nutritional care and those with neutral or negative attitudes. The KoM-G questionnaire showed acceptable psychometric properties covering a wide range of items regarding malnutrition and can be applied in nursing practice, education and research.

Chapter six illustrates the assessment of knowledge and attitudes of registered nurses and nurse aides towards malnutrition care in nursing homes. A multicenter, cross-sectional study with 1152 registered nurses and nurse aides was performed in 2012/2013. For data collection purposes, the KoM-G questionnaire and the SANN-G scale were utilized. It was found that, on average, 60.6% of the nursing staff answered the items correctly, whereas registered nurses knew significantly more than nurse aides. 39.2% of nursing staff had positive attitudes towards nutritional care and registered nurses displayed more positive attitudes than did nurse aides. This results will enable the development of adequate and tailored nutritional training programs, which may improve nutritional care in the long run.

Chapter seven briefly summarises and discusses the main results of this doctoral thesis. A methodological reflection on the applied methods including the strengths and limitations of the studies conducted is given. Finally, recommendations for nursing research and nursing practice are presented.

Chapter 9

Zusammenfassung

ZUSAMMENFASSUNG

Mangelernährung ist ein komplexes und häufig auftretendes Phänomen in Gesundheitseinrichtungen, welches früh identifiziert und adäquat behandelt werden muss. Die Hauptziele dieser Studie sind (1) die Beschreibung von Struktur- und Prozessindikatoren in Bezug auf Mangelernährung in Krankenhäusern und Pflegeheimen, (2) die Beschreibung, wie sich der Ernährungszustand von PflegeheimbewohnerInnen verändert, und (3), die Erfassung von Wissen und Einstellungen von Pflegepersonen in Pflegeheimen in Bezug auf Mangelernährung.

Das **erste Kapitel** liefert Hintergrundwissen und beschreibt den theoretischen Bezugsrahmen dieser Doktorarbeit. Im Anschluss werden die Forschungslücken in der internationalen Literatur, und aufbauend darauf, die Hauptziele der Doktorarbeit dargestellt. Abschließend werden die detaillierten Ziele und Forschungsfragen der durchgeführten Studien und die Gliederung der Doktorarbeit illustriert.

Im **zweiten Kapitel** werden die methodologischen Aspekte der durchgeführten Studien (Design, Stichprobe, Setting, Datensammlung und Datenanalyse) beschrieben.

In **Kapitel drei** werden Struktur- und Prozessindikatoren in Bezug auf Mangelernährung in Krankenhäusern und Pflegeheimen beschrieben. Es wurde eine multizentrische Querschnittstudie mit 2326 KrankenhauspatientInnen und 1487 PflegeheimbewohnerInnen im April 2010 durchgeführt. Zur Datensammlung wurde ein standardisierter Fragebogen ausgefüllt. JedeR PatientIn/BewohnerIn wurde gleichzeitig von zwei Pflegepersonen befragt. Die Ergebnisse der Untersuchung zeigten, dass Leitlinien zur Prävention und Behandlung von Mangelernährung in beiden Einrichtungsarten selten verwendet wurden. Screeninginstrumente zur Erfassung von Mangelernährung wurden häufiger bei PflegeheimbewohnerInnen als bei KrankenhauspatientInnen verwendet. Die Prävalenz von Mangelernährung lag bei 23,2% in Krankenhäusern und bei 26,2% in Pflegeheimen. Aufgrund der herausgefundenen Defizite hinsichtlich der Struktur-, Prozess- und Ergebnisindikatoren in Krankenhäusern und Pflegeheimen kann geschlussfolgert werden, dass Verbesserungen in der Ernährungsversorgung notwendig sind.

Kapitel vier beschreibt die Veränderungen des Ernährungszustandes und Faktoren, die mit einer Verschlechterung des Ernährungszustandes bei PflegeheimbewohnerInnen, über eine Zeit von einem Jahr, zusammenhängen. Es wurde eine Sekundärdatenanalyse mit 157 PflegeheimbewohnerInnen, die zweimal hintereinander an einer Erhebung (von 2010 bis 2013) teilgenommen haben, durchgeführt. Zur Datensammlung wurde ein standardisierter Fragebogen ausgefüllt. JedeR BewohnerIn wurde gleichzeitig von zwei Pflegepersonen befragt. Der Vergleich zwischen der ersten Erhebung und einem Jahr später zeigte, dass sich der Ernährungszustand von 22,8% der BewohnerInnen verschlechtert und von 6,5% der BewohnerInnen verbessert hat. Pflegeabhängigkeit, Aufenthaltsdauer, Veränderungen im Body Mass Index (BMI) und ein Mangelernährungsrisiko bei der ersten Erhebung wurden signifikant mit einer Verschlechterung des Ernährungszustandes assoziiert. Schlussfolgernd kann gesagt werden, dass ein Mangelernährungsrisiko bei der ersten Erhebung der wichtigste Risikofaktor für eine Verschlechterung des Ernährungszustandes bei PflegeheimbewohnerInnen ist. Daher sollte ein Mangelernährungsrisiko identifiziert und präventive Maßnahmen so früh wie möglich eingeleitet werden.

Kapitel fünf beschreibt die Entwicklung und psychometrische Evaluierung eines Fragebogens zur Erfassung von Wissen zu Mangelernährung bei Pflegepersonen in Pflegeheimen. Es wurde 2012/2013 eine psychometrische, methodologische Studie mit 1152 diplomierten Gesundheits- und Krankenschwestern/-pflegern und PflegehelferInnen durchgeführt. Die Dimensionen und Items des Fragebogens wurden im Zuge einer Delphistudie, mit acht internationen ExpertInnen auf dem Gebiet der Mangelernährung, entwickelt. Für die psychometrische Evaluierung des Fragebogens (Itemvalidität, Konstruktvalidität, interne Konsistenz) füllte das Pflegepersonal den neu entwickelten Knowledge of Malnutrition-Geriatric (KoM-G) Fragebogen und die Staff Attitudes to Nutritional Nursing Care-Geriatric (SANN-G) Skala aus. Der KoM-G Fragebogen bestand aus 20 Items mit sechs Antwortmöglichkeiten. Die Inhaltsvalidität war gut. Die Schwierigkeit der Items des gesamten Fragebogens lag bei 59,3% und der Diskriminierungsindex war 0,37. Es zeigten sich signifikante Unterschiede im Prozentsatz der richtigen Antworten zwischen diplomierten Gesundheits- und Krankenschwestern/-pflegern und PflegehelferInnen und Pflegepersonen, die Fortbildungen zu Mangelernährung absolviert hatten und Pflegepersonen ohne solche Fortbildungen. Zusätzlich gab es signifikante Unterschiede in

den richtigen Antworten zwischen Pflegepersonen mit positiven Einstellungen zur Ernährungsversorgung und Pflegepersonen mit neutralen bzw. negativen Einstellungen. Der KoM-G Fragebogen zeigte akzeptable psychometrische Eigenschaften, umfasst ein breites Spektrum an Items und kann in der Pflegepraxis, in der Ausbildung und in der Forschung verwendet werden.

In **Kapitel sechs** wird die Erfassung von Wissen und Einstellungen von Pflegepersonen in Pflegeheimen in Bezug auf Mangelernährung beschrieben. Es wurde 2012/2013 eine multizentrische Querschnittstudie mit 1152 diplomierten Gesundheits- und Krankenschwestern/-pflegern und Pflegehelferinnen durchgeführt. Der KoM-G Fragebogen und die SANN-G Skala wurden zur Datensammlung verwendet. Es zeigte sich, dass durchschnittlich 60,6% der Pflegepersonen die Items korrekt beantwortet haben, wobei diplomierte Gesundheits- und Krankenschwestern/-pfleger mehr Items korrekt beantwortet haben als PflegehelferInnen. 39,2% der Pflegepersonen hatten positive Einstellungen zur Ernährungsversorgung. Diplomierte Gesundheits- und Krankenschwestern/-pfleger zeigten häufiger positive Einstellungen als PflegehelferInnen. Diese Ergebnisse ermöglichen die Entwicklung von adäquaten und an die Zielgruppe angepassten Fortbildungsprogrammen zum Thema Mangelernährung, welche auf lange Sicht die Ernährungsversorgung verbessern können.

Kapitel sieben fasst die Ergebnisse der Doktorarbeit kurz zusammen und diskutiert diese. Eine methodologische Reflexion der angewandten Methoden mit den Stärken und Schwächen der durchgeführten Studien ist enthalten. Abschließend werden Empfehlungen für die Pflegepraxis und Pflegeforschung gegeben.

Chapter 10

Acknowledgements

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Chapter 11

Curriculum vitae

CURRICULUM VITAE

Silvia Bauer (formerly Schönherr) was born on the 13th of December 1985 in Graz. From 2004 to 2009, she pursued and obtained her bachelors' and masters' degrees in Nursing Science at the Medical University of Graz.

Since 2010 Silvia Bauer has been a member of the Institute of Nursing Science at the Medical University of Graz, where she works as a researcher and lecturer. Her particular research focus is malnutrition. In addition she is jointly responsible for the organisation of the *International Prevalence Measurement of Care Problems* (LPZ). Her teaching focus in the bachelor's and master's programs is reading and evaluating research articles and research methodologies.

In 2010 she also started her doctoral studies while participating in the *Doctoral Programme Nursing Science* of the Medical University of Graz (Austria), the University Maastricht (The Netherlands) and Charité-Universitätsmedizin Berlin (Germany).

Silvia Bauer is a member of different scientific societies and an author and reviewer in several national and international journals. In addition she is a member of the organization committee of the *European Doctoral Conference in Nursing Science* (EDCNS) and was involved in the organization of several other symposia.

Chapter 12

List of publications

PUBLICATIONS IN NATIONAL AND INTERNATIONAL JOURNALS

Bauer S, Halfens RJG, Lohrmann C. (2015) Knowledge and attitudes of nursing staff towards malnutrition care in nursing homes: a multicentre cross-sectional study. *The Journal of Nutrition, Health & Aging*, in press.

Bauer S, Kapeller C, Binder E, Lohrmann C. (2015) Pflegequalität in der Praxis - Erfahrungen teilnehmender Einrichtungen bei der österreichischen Pflegequalitätserhebung. *ProCare*, 01-02, 16-18.

Schönherr S, Halfens RJG, Lohrmann C. (2015) Development and psychometric evaluation of the Knowledge of Malnutrition - Geriatric (KoM-G) questionnaire to measure malnutrition knowledge among nursing staff in Austrian nursing homes. *Scandinavian Journal of Caring Science*, 29(1), 193-202.

Schönherr S, Halfens RJG, Lohrmann C. (2014) Mangelernährung in österreichischen Krankenhäusern und Pflegeheimen - Ergebnisse von wiederholten Querschnittstudien. *Aktuelle Ernährungsmedizin*, 39, 110-116.

Halfens R, Meesterberends E, van Nie-Visser NC, Lohrmann C, **Schönherr S**, Meijers J, Hahn S, Vangelooven C, Schols J. (2013) International prevalence measurement of care problems: results. *Journal of Advanced Nursing*, 69(9), e5-e17.

Schönherr S, Halfens R, Meijers J, Schols J, Lohrmann C. (2012) Structural and process indicators of nutritional care: A comparison between Austrian hospitals and nursing homes. *Nutrition*, 28(9), 868-873.

Mandl S, **Schönherr S**, Schüssler S, Lohrmann C. (2012) Mangelernährung in österreichischen Pflegeeinrichtungen: Das iCare Pathways Projekt bietet Leitlinien für die Praxis. *ProCare*, 8, 12-15.

Schönherr S, Mandl M, Lohrmann C. (2012) "GUTES sehen, GUTES hören, GUTES sagen" - Pflegequalität als ein Thema für Österreich. *Österreichische Pflegezeitschrift*, 12, 19-22.

Schönherr S, Eichhorn-Kissel J, Lohrmann C. (2011) Pflegequalität transparent machen. *ProCare*, 01-02, 36-38.

Großschädl F, Prieschl P, **Schönherr S**, Schüssler S, Sippola-Puster E, Lohrmann C. (2010) Die Bedeutung von Prävalenzerhebungen für die Pflege. *Österreichische Pflegezeitschrift*, 3, 8-10.

Schönherr S, Lohrmann C. (2010) Mangelernährung in sechs österreichischen Pflegeheimen - ein heimliches Leid. *ProCare*, 15(3), 3-8.

PRESENTATIONS ON NATIONAL AND INTERNATIONAL CONFERENCES

Bauer S, Lohrmann C. (2014) *Erkenntnisse und Erfolge aus 6 Jahren Pflegequalitätserhebung in Österreich*. Pflegekongress14, Wien/Austria, 27.-28.11.2014.

Schönherr S, Lohrmann C. (2013) *Wissen von Pflegepersonen zu Mangelernährung in Langzeitpflegeeinrichtungen in Österreich*. Pflegekongress13, Wien/Austria, 28.-29.11.2013.

Schönherr S, Lohrmann C. (2013) *Erfassung von Mangelernährung.* Ländlepflegetag 2013, LKH Feldkirch/Austria, 15.11.2013

Schönherr S, Halfens RJG, Lohrmann C. (2013) *Attitudes towards nutritional care among nurses in Austrian nursing homes: a multicenter cross-sectional study*. In: Clinical Nutrition Supplements 2013, 32(1). The 34th ESPEN Congress on Clinical Nutrition & Metabolism, Leipzig/Germany, 31.08. - 03.09.2013. [Poster]

Schönherr S, Halfens RJG, Lohrmann C. (2013) *Prevalence and prevention of pressure ulcers in malnourished and non-malnourished Austrian hospital patients and nursing home residents.* In: 16th Annual European Pressure Ulcer Advisory Panel Meeting Abstractbook. The 16th Annual European Pressure Ulcer Meeting, Wien/Austria, 28.-30.08.2013.

Schönherr S, Halfens RJG, Lohrmann C. (2013) *Pressure ulcer prevention in hospitals and nursing homes: a three years comparison.* In: 16th Annual European Pressure Ulcer Advisory Panel Meeting Abstractbook. The 16th Annual European Pressure Ulcer Meeting, Wien/Austria, 28.-30.08.2013. [Poster]

Mandl M, **Schönherr S**, Halfens RJG, Lohrmann C. (2013) *Comparison of the characteristics of pressure ulcer between Austrian hospitals and nursing homes in 2012.* In: 16th Annual European Pressure Ulcer Advisory Panel Meeting Abstractbook. The 16th Annual European Pressure Ulcer Meeting, Wien/Austria, 28.-30.08.2013.

Schönherr S, Halfens R, Lohrmann C. (2013) *Nutritional care in Austrian hospitals and nursing homes: A comparison of three years.* In: The Journal of Nutrition, Health & Aging 2013, 17(Suppl1). The 20th IAGG World Congress of Gerontology and Geriatrics, Seoul/Korea, 23.-27.06.2013.

Schönherr S, Halfens R, Lohrmann C. (2013) *Development and psychometric evaluation of a questionnaire to measure nutritional knowledge of nursing staff in Austrian nursing homes.* In: The Journal of Nutrition, Health & Aging 2013, 17(Suppl1). The 20th IAGG World Congress of Gerontology and Geriatrics, Seoul/Korea, 23.-27.06.2013.

Schönherr S, Lohrmann C. (2013) *Qualitätsmessungen in der Pflege.* Forum Pflege 2013, Wien/Austria, 11.06.2013.

Schönherr S, Lohrmann C. (2013) *Mangelernährung in österreichischen Langzeitpflegeeinrichtungen: ein lang verkanntes Problem in der Pflege?* In: Aktuelle Ernährungsmedizin 38. Ernährung 2013 Dreiländertagung der AKE, DGEM, GESKES Jahrestagung des SVDE, Zürich/Switzerland, 06.-08.06.2013.

Schönherr S, Lohrmann C. (2013) *Pflegeprobleme in österreichischen Krankenhäusern: Erkenntnisse aus der Europäischen Pflegequalitätserhebung.* 20. Österreichischer Gesundheits- und Krankenpflegekongress, Bregenz/Austria, 04.06.2013.

Schönherr S, Lohrmann C. (2013) *Mangelernährung.* Dialog Pflegeforschung und Praxis, Wien/Austria, 24.04.2013.

Schönherr S, Halfens R, Lohrmann C. (2013) *Pflegeprobleme in österreichischen Pflegeheimen: Ergebnisse der Europäischen Pflegequalitätserhebung.* Geriatriekongress, Wien/Austria, 21.-23.03.2013. [Posterprize]

Schönherr S, Lohrmann C. (2012) *Dekubitus in österreichischen Kranken-häusern: Verlauf von 2010 - 2012.* Symposium anlässlich des "Stop Pressure Ulcer Day", Graz/Austria, 16.11.2012.

Schönherr S, Lohrmann C. (2012) *Evidenzbasierte Leitlinien zu Mangel-ernährung: Ist-Zustand in österreichischen Gesundheitseinrichtungen und mögliche Verbesserungspotenziale.* Pflegekongress12, Wien/Austria, 08.-09.11.2012.

Schüssler S, Breimaier HE, Mandl M, **Schönherr S**, Lohrmann C. (2012) *Aktuelle Forschungsaktivitäten und alter(n)sbezogene Projektaktivitäten des Instituts für Pflegewissenschaft.* ÖPIA Atlas-Vernetzungsveranstaltung, Wien/Austria, 06.11.2012.

Schönherr S, Halfens R, Lohrmann C. (2012) *Nutritional care in Austrian hos-pitals and nursing homes: Results from two cross-sectional studies.* In: Clini-cal Nutrition Supplements 2012, 7(1). The 34th ESPEN Congress on Clinical Nutrition & Metabolism, Barcelona/Spain, 08.-11.09.2012. [Poster]

Schönherr S, Lohrmann C. (2012) *Europäische Pflegequalitätserhebung: Prävalenz, Prävention und Behandlung von Mangelernährung - Erkenntnisse aus mehreren Jahren.* In: Aktuelle Ernährungsmedizin 37. Ernährung 2012 Dreiländertagung der AKE, DGEM, GESKES und VDOe, Nürnberg/Germany, 14.-16.06.2012.

Schönherr S, Lohrmann C. (2012) *Mangelernährung: Was wird in österrei-chischen Gesundheitseinrichtungen getan?* Symposium "(Mangel)-Ernährung - ein Thema für die Pflege?!", Graz/Austria, 23.01.2012.

Schönherr S, Lohrmann C. (2011) *Prävalenz, Prävention und Behandlung von Mangelernährung - Erkenntnisse aus drei Jahren Europäische Pflege-qualitätserhebung.* Pflegekongress11, Wien/Austria, 03.-04.11.2011.

Schönherr S, Lohrmann C. (2011) *Dekubitus - Prävalenz, Prävention und vorhandene Qualitätsindikatoren in österreichischen Krankenhäusern und Pflegeheimen.* 2. APUPA Symposium, Linz/Austria, 20.10.2011.

Schönherr S, Lohrmann C. (2011) *Mangelernährung: Was wird in österrei-chischen Krankenhäusern und Pflegeheimen getan?* "Forschung trifft Praxis" 7. Symposium der Grazer Gesellschaft der Gesundheits- und Pflegewissen-schaft, Graz/Austria, 27.09.2011.

Schönherr S, Halfens R, Lohrmann C. (2011) *Guideline adaption and its relevance for nutritional care.* In: The 12th European Doctoral Conference in Nursing Science (EDCNS) Abstractbook. The 12th European Doctoral Conference in Nursing Science (EDCNS), Maastricht/The Netherlands, 16.-17.09.2011.

Schönherr S, Lohrmann C. (2011) *Appropriateness of nurses' clinical judgement in screening of nutritional status in Austrian hospitals and nursing homes.* In: Clinical Nutrition Supplements 2011, 6(1). The 33rd ESPEN Congress on Clinical Nutrition & Metabolism, Gothenburg/Sweden, 03.-06.09.2011. [Poster]

Schönherr S, Halfens R, Lohrmann C. (2011) *Mangelernährung - Prävalenz, Prävention, Behandlung und Qualitätsindikatoren in österreichischen Pflegeheimen.* Ernährung 2011 Dreiländertagung der AKE, DGEM und GESKES, Graz/Austria, 26.-28.05.2011. [Poster]

Schönherr S, Lohrmann C. (2011) *Malnutrition-related quality indicators in Austrian nursing homes.* VII. European Congress Healthy and Active Ageing for all Europeans, Bologna/Italy, 14.-17.04.2011.

Schönherr S, Lohrmann C. (2010) *Mangelernährung in Österreich - unerkannt und unbehandelt?* Wissenschaftliche Gesellschaft der Ärzte Steiermark, Graz/Austria, 02.12.2010.

Schüssler S, S**chönherr S**, Lohrmann C. (2010) *Prävalenz und Management der Inkontinenz am LKH - Univ. Klinikum Graz.* Symposium "Schluss mit Tabus" Behandlungsmöglichkeiten bei Inkontinenz, Graz/Austria, 11.11.2010.

Schönherr S, Lohrmann C. (2010) *Prevalence of malnutrition in Austrian hospitals and nursing homes.* In: The 11th European Doctoral Conference in Nursing Science (EDCNS) Abstractbook. The 11th European Doctoral Conference in Nursing Science, Berlin/Germany, 17.-18.09.2010.

BOOKS

Lohrmann C, **Bauer S**, Mandl M. (2014) *Pflegequalitätserhebung 08. April 2014.*

Lohrmann C, **Schönherr S**, Mandl M. (2013) *Pflegequalitätserhebung 09. April 2013.*

Lohrmann C, Mandl, M, **Schönherr S**, Schüssler, S. (2013) *iCare Pathways.*

Lohrmann C, **Schönherr S**, Mandl M. (2012) *Europäische Pflegequalitätser-hebung 17. April 2012.*

Lohrmann C, **Schönherr S**. (2012) *Europäische Pflegequalitätserhebung 05. April 2011.*

Lohrmann C, Eichhorn-Kissel J, **Schönherr S**, Schüssler S. (2010) *Europä-ische Pflegequalitätserhebung 13. April 2010.*

Lohrmann C, Tannen A, Klein S, **Schönherr S,** Schüssler S, Eichhorn-Kissel J, Großschädl F. Prieschl P, Schoberer D, Sippola-Puster E, Halfens R. (2010) *Europäische Pflegequalitätserhebung 07. April 2009.*