

# **Malnutrition in Hospitals**

*The Quality of Nutritional Care  
Focusing on Education and Malnutrition Screening*

**Doris Eglseer**

*Institute of Nursing Science, Medical University Graz*

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Supervisors:

Univ. Prof. Dr. Christa Lohrmann

Associate Prof. Dr. Ruud J. G. Halfens

## Declaration

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

Graz, 2019

Doris Eglseer, eh

## Disclosures

Chapter 3 of this thesis has been published in Doris Eglseer, Ruud J.G. Halfens, Sandra Schüssler, Marjolein Visser, Dorothee Volkert, Christa Lohrmann. Is the topic of malnutrition in older adults addressed in the European nursing curricula? A MaNuEL study. *Nurse Education Today*. 2018;68:13-18. This article was reproduced with the permission of the Journal *Nurse Education Today* (Elsevier).

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### **Co-authors**

Christa Lohrmann, Institute of Nursing Science, Medical University of Graz

Ruud J. G. Halfens, CAPRHI Care and Public Health Research Institute, Maastricht University

Sandra Schüssler, Institute of Nursing Science, Medical University of Graz

Daniela Schoberer, Institute of Nursing Science, Medical University of Graz

Marjolein Visser, Department of Health Sciences, Vrije Universiteit Amsterdam

Dorothee Volkert, Institute for Biomedicine of Aging, Friedrich-Alexander-University Erlangen-Nurnberg

All co-authors have explicitly agreed to the use of their data in this thesis.

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## **LIST OF ABBRIVATIONS**

BMI	Body Mass Index
CDS	Care Dependency Scale
CG	Control Group
DGEM	Deutsche Gesellschaft für Ernährungsmedizin
ESPEN	European Society for Clinical Nutrition and Metabolism
GMS	Graz Malnutrition Screening Tool
HCI	Dutch Health Care Inspectorate
ICC	Intraclass Correlation Coefficient
ICD 10	International Classification of Diseases and Related Health Problems
ICU	Intensive care unit
IG	Intervention Group
KA	Knowledge and Attitudes
KAP	Knowledge, Attitudes and perceived Practices
LPZ	National Prevalence Measurement of Quality of Care
M	Mean
MaNuEL	Malnutrition in the Elderly Knowledge Hub, Healthy Diet for Healthy Life Joint Programming Initiative
MNA	Mini Nutritional Assessment
MNA-SF	Mini Nutritional Assessment-Short Form
MOOC	Massive Open Online Course
MUST	Malnutrition Universal Screening Tool
NRS	Nutritional Risk Screening

ONS	Oral Nutritional Supplements
p	p-Value
P	Perceived Practices
QoNC	Quality of Nutritional Care Model
SD	Standard Deviation
UEMS	European Union of Medical Specialists
WHO	World Health Organization









## GENERAL INTRODUCTION

In 1974, Charles Butterworth published the article ‘the skeleton in the hospital closet’, which received a great deal of attention <sup>1,2</sup>. In this article, he indicated that many hospitalized patients suffered from malnutrition. He criticized the poor quality of nutritional care in hospitals and highlighted undesirable nutritional practices, e.g., the failure to assess and document weight and height, the failure to observe patients’ food intake, the failure to recognise malnutrition, the lack of communication and interactions between different healthcare professionals and the lack of awareness regarding malnutrition. Furthermore, Butterworth recognised that the quality of nutritional care affected the patients’ outcomes <sup>2</sup>.

Now, more than four decades later, malnutrition remains a serious problem in hospitals with prevalence rates up to 40 %, depending on the underlying definition and the specialisation of the ward <sup>3-5</sup>. Up until now, no definition of malnutrition has been internationally accepted <sup>6,7</sup>. In the literature, malnutrition is most commonly defined as ‘an acute or chronic condition whereby a lack of energy, protein or other nutrients causes measurable and adverse effects on body composition, function, and clinical outcomes’ <sup>8,9</sup>. In this doctoral thesis, this definition specifically refers to undernutrition. The risk of malnutrition can be measured by valid and reliable screening tools <sup>9</sup> that include different determinants of malnutrition, e.g., weight loss, low BMI, or low nutritional intake <sup>9,10</sup>.

The reasons for the high prevalence of malnutrition are multifactorial. Factors associated with an increased risk of malnutrition are having acute or chronic diseases such as cancer, dementia, depression, gastrointestinal diseases, infection, or inflammation <sup>11,12</sup>. Other factors are polypharmacy, care dependency, needing assistance to eat, poor oral health, dysphagia, or loss of interest in life <sup>11,13</sup>. Moreover, social factors such as low income or isolation may contribute to the development of malnutrition <sup>11-13</sup>.

Older adults are particularly strongly affected by malnutrition, since the aging process brings along age-related changes that affect nutritional intake, e.g., diminishing sensory perceptions, changes in appetite regulation, inflammation, or the development of chronic diseases <sup>14</sup>.

Recent studies have revealed that hospitalisation itself may be a risk factor for malnutrition<sup>12, 15</sup>. There are several reasons that the nutritional status of hospitalized persons may deteriorate, which include acute stress, surgery and other procedures that cause prolonged fasting phases, poor food services, poor appetite and reduced food intake<sup>12</sup>. Even if patients have a normal nutritional status, the risk of losing weight and becoming malnourished in the hospital is high<sup>16</sup>. Data from the *NutritionDay worldwide* project, which is an annually conducted, one-day, cross-sectional audit, show that more than half of the patients admitted to hospital do not eat their full meal<sup>17</sup>.

Malnutrition is associated with severe consequences for the affected patients, including poor wound healing, more complications, higher morbidity and a diminished quality of life<sup>11, 18-21</sup>. In addition, malnutrition is related to higher mortality<sup>11, 21</sup>. Follow-up data from the *NutritionDay worldwide* showed that decreased food intake on *NutritionDay* is associated with increased mortality after three months<sup>17</sup>. Furthermore, malnutrition leads to longer lengths of hospital stays<sup>18, 22, 23</sup> and, therefore, to additional healthcare costs up to € 6000 per patient<sup>24, 25</sup>. However, several systematic reviews of intervention studies have implicated that an investment in nutritional therapy can improve nutritional patient outcomes such as weight or body composition<sup>26-28</sup> and other patient outcomes such as complication rates<sup>28, 29</sup>, physical function<sup>26</sup>, or mortality<sup>30</sup> and finally can save money in the healthcare systems<sup>29, 31</sup>.

Based on this literature, several professional associations and expert groups have published guidelines for the identification and treatment of patients with (risk of) malnutrition<sup>9, 10, 32-38</sup>. These guidelines state that the nutritional management of malnourished patients should be standardised and structured, guided by the nutrition care process. It includes malnutrition risk screening, nutritional assessment, diagnostic procedure, nutritional care planning, nutritional care, monitoring, evaluation and documentation<sup>9, 39</sup>. In particular, evidence-based guidelines recommend the implementation of a malnutrition risk screening process as a crucial starting point for the successful nutritional management of malnourished patients<sup>10, 35-37</sup>.

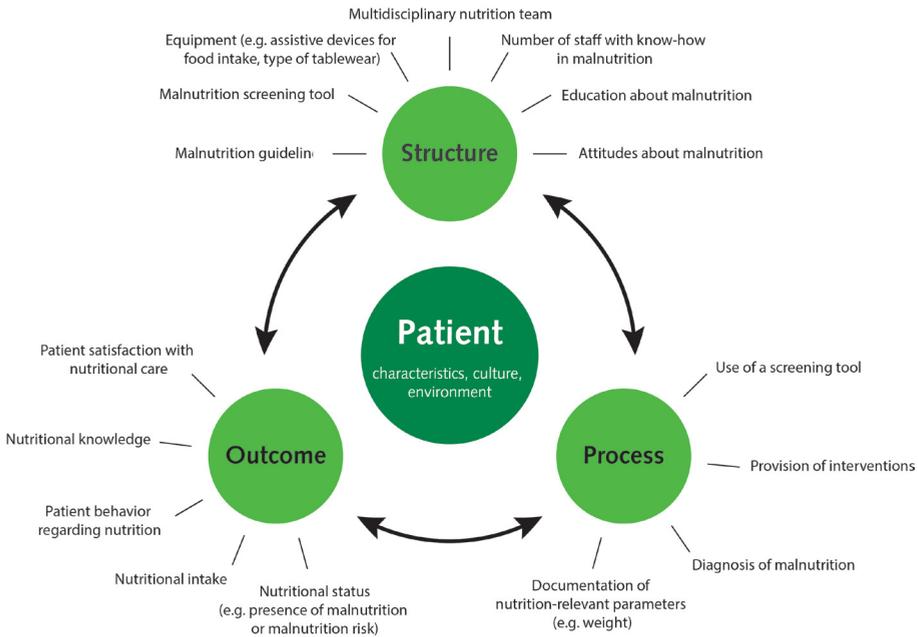
Malnutrition is a multidisciplinary problem. Therefore, adequate nutritional care can only be successful if different healthcare professionals, such as dietitians, nurses and physicians, act together<sup>40</sup>. Dietitians are the experts in clinical nutrition and receive comprehensive training on the topic of malnutrition

during their period of basic education <sup>41</sup>. Even if dietitians are responsible for nutritional therapy in hospitals and are responsible for developing nutritional care plans and conducting dietary counselling, the implementation of the interventions related to these care plans requires the involvement of all the health professionals involved in patient care <sup>40</sup>.

However, studies have revealed that ‘the skeleton is still in the hospital closet’ in several hospitals, which means that embedding screening and evidence-based nutritional interventions for malnourished patients or patients at risk of malnutrition are often lacking <sup>42, 43</sup>. The reasons for this are manifold and, in some respects, are similar to those mentioned by Charles Butterworth in 1974 <sup>2</sup>. Frequently mentioned barriers include the lack of multidisciplinary cooperation, an unsupportive organisational culture and environment, low prioritisation of nutrition, lack of time and other resources, or poor knowledge and a lack of education with regard to malnutrition <sup>44-48</sup>.

## **THEORETICAL FRAMEWORK**

Donabedian’s model for the quality of care has been modified for use during the research described in this doctoral thesis <sup>49</sup>. The modified model is called the *Model for the Quality of Nutritional Care* (QoNC) (see Figure 1.1). The reason for the modification of Donabedian’s original model was the linear perspective of the original model <sup>50</sup>. Furthermore, the original model does not address the patients’ characteristics, culture, or environment <sup>50, 51</sup> which may also be associated with the quality of nutritional care.



**Figure 1.1** The Quality of Nutritional Care (QoNC) model with regard to malnutrition, based on Donabedian’s model of quality of care  
The examples in this figure are not a complete list but are exemplary.

Based on Donabedian’s original model, the quality of care consists of three factors: structure, process and outcome <sup>49</sup>. Structure refers to the characteristics of the environment in which care takes place. These include the personnel and material resources such as buildings, existing equipment, instruments, money and the number or qualifications of the health care staff. Process refers to all interventions that are actually performed, e.g., by the healthcare staff or the patients. Outcome refers to the health status of the patients, including the patient’s knowledge or behavior <sup>49</sup>. Donabedian’s original model assumes that structure influences processes, and processes, furthermore, influence outcomes <sup>49</sup>.

In the modified model (QoNC) that was applied in this doctoral thesis work, structure refers to attributes of material and human resources as well as of organisational structure with regard to nutrition. Examples for the specific topic of malnutrition are the presence of a malnutrition guideline, the presence of a valid and reliable screening tool, equipment (e.g. assistive devices for food intake), the presence of a multidisciplinary nutrition team, the number

of healthcare staff with know-how in malnutrition, the education of healthcare staff about malnutrition and the knowledge and attitudes of healthcare staff regarding malnutrition.

Process refers to the actions healthcare professionals actually perform with respect to nutritional care. For instance, these can include using a valid and reliable screening tool, providing interventions (e.g. documenting food and fluid intake, adapting diet/food, providing high energy/protein snacks, providing oral nutritional supplements, dietary counselling by registered dietitians, adjusting meal ambience, providing enteral/parenteral nutrition), diagnosing malnutrition, or documenting parameters relevant to nutritional care (weight, height, BMI).

Outcome in the QoNC model refers to nutritional patient outcomes, e.g., patient satisfaction with nutritional care, nutritional knowledge, patient behavior regarding nutrition, nutritional intake, or nutritional status. In a broader sense, outcomes may also include more general health outcomes such as mortality, physical functioning, complication rates and length of hospital stays. However, these general outcomes are not only influenced by nutritional care but also by other treatments (e.g. medication, physical training).

All three factors, structure, process and outcome influence each other, and not only in a linear progression. Structural factors, such as the availability of a guideline for malnutrition may influence processes including the use of a malnutrition screening tool or the provision of nutritional interventions and vice versa. Processes and outcomes constantly influence each other<sup>52-58</sup>, meaning that the provision of interventions is associated with the nutritional status of the patients. Therefore, the multiple arrows in Figure 1.1 representing influencing pathways were embedded in the model to increase its sensitivity to the delineation of all aspects of the quality of nutritional care.

Furthermore, the patient was placed in the center of the model. The patient is considered in a holistic way according to the World Health Organizations' (WHO) definition of health, which includes the physical, mental and social wellbeing of the patient<sup>59</sup>. We assume that the characteristics, culture and environment of the patient are constantly present and may also influence processes and outcomes, e.g., in terms of adherence to the recommended nutritional interventions such as consuming the prescribed oral nutritional supplements (ONS)<sup>60, 61</sup>. Characteristics, culture and environment include age,

mental ability, nutrition habits, beliefs and attitudes with regard to nutrition or nutritional preferences.

## RESEARCH GAPS

The high prevalence of malnutrition in hospitals and the numerous negative consequences highlight the important role of nutrition in the overall quality of care in hospitalized patients <sup>40</sup>. A growing number of studies deal with the problem of hospital malnutrition and malnutrition screening; however, there are still several research gaps. The research gaps addressed during the work described in this doctoral thesis are outlined below.

To improve nutritional care in hospitals, it is necessary to deal with existing structures, such as the education of healthcare staff on malnutrition <sup>49</sup>. A comprehensive literature search conducted by the author of this thesis revealed few studies that dealt with malnutrition and malnutrition screening in the education of European nurses and physicians. No studies were identified that addressed training on malnutrition during their basic education, even though poor knowledge is known to be a primary barrier to providing successful nutritional care to malnourished patients <sup>45, 48</sup>. One study could be identified that evaluated general nutritional education, but not with regard to malnutrition, provided to physicians in medical schools in fourteen European countries <sup>62</sup>. Recently, the European Society for Clinical Nutrition and Metabolism (ESPEN) conducted a survey of education on clinical nutrition in medical schools in 29 countries (22 in Europe, 4 in Asia, 2 in South America and 1 in Australia). The authors revealed that education on clinical nutrition existed in 73.3 % of the university centers surveyed, but the extent and content varied greatly between institutions <sup>63</sup>. However, clinical nutrition covers more than malnutrition, and data on the extent and content of malnutrition in the education of European nurses and physicians are still lacking.

Due to the underlying theoretical framework, quality indicators on the structural, process and outcome levels influence nutritional care. It may be assumed that the indicators on each level influence each other. However, at this time, it is not exactly known if and how existing structures in hospitals, for instance the presence of a malnutrition guideline or the presence of a valid and reliable screening tool, influence the processes and outcomes of patients <sup>53, 64</sup>. Some studies have placed a focus on the quality of nutritional care in long-term care

institutions<sup>52-54</sup>, others have described the current practices of nutritional care in an observational manner but have not shown associations between the different levels of quality of care<sup>64, 65</sup>. In the Austrian hospital setting, only marginal information about the quality of nutritional care is available<sup>5, 64</sup>.

To identify patients at risk of malnutrition, risk screening is the first and crucial step that must be taken in nutritional care according to the nutrition care process<sup>9</sup>. Several valid and reliable screening tools are available, and their uses have been summarised in systematic reviews<sup>66-68</sup>. However, staff at many European hospitals do not use these malnutrition screening tools in clinical practice<sup>65</sup>. To convince healthcare staff, stakeholders and hospital managers of the need to use a nutritional screening tool as part of their daily routines, studies must be carried out to investigate the impacts of these tools<sup>69</sup>.

One Cochrane systematic review was carried out to determine the effectiveness of nutritional screening on process indicators (e.g. referral to a dietitian) and patient outcomes (e.g. mortality)<sup>69</sup>. Only three studies could be included that addressed the research aim in this systematic review. The authors concluded that further research is needed, in the form of high-quality studies with good methodology, to gain more insight into the complex process of malnutrition risk screening<sup>69</sup>. This paper highlights the need for data on how malnutrition risk screening relates to the different levels of quality of care in hospitals<sup>69</sup>. Furthermore, there is a need for studies that are carried out to gain an understanding of the perceptions of healthcare staff regarding these screening tools<sup>45</sup>. Once if researchers, clinical practitioners and stakeholders understand how malnutrition screening tools influence the quality of nutritional care in clinical practice and how healthcare professionals perceive the use of these tools, this knowledge may help to accelerate and promote the use of screening tools in hospitals.

## **AIMS AND OUTLINE OF THE DOCTORAL THESIS**

The overall aim of the work described in this doctoral thesis was to gain insight into the quality of nutritional care in hospitals regarding malnutrition, and especially into education of healthcare staff and screening on malnutrition.

The detailed aims of the five papers included in this doctoral thesis are given below.

*Study 1*

The main objective of the first study was to determine the provisions and content of nutrition education and, in particular, education on malnutrition in older adults in formal nursing and medical educational programs throughout Europe (Chapter 3 and Chapter 4).

Research question, part A

- What do European nurses learn about malnutrition and malnutrition screening in older adults during their basic education?

Research question, part B

- What do European medical doctors learn about malnutrition and malnutrition screening in older adults during their basic education?

*Study 2*

The overall aim of the second study was to evaluate the association between quality indicators on several levels (structure, process, outcome) with regard to nutritional care and screening in hospitals (Chapter 5).

Research questions

- Is there an association between the use of clinical guidelines and the use of validated screening tools?
- What is the nutritional screening policy in hospitals like (validated screening tools and other indicators used for nutritional screening)?
- Is there an association between the use of validated screening tools with the prevalence of malnutrition and dietitian referral and other nutritional interventions?

### *Study 3*

The third study was conducted to determine the effect of the use of a valid and reliable malnutrition screening tool as part of an existing electronic documentation system in a hospital to assess the knowledge, attitudes and perceived practices of nurses, nurses' aides and physicians regarding malnutrition (Chapter 6).

#### Research question

- How do the knowledge, attitudes and practices of healthcare professionals with regard to malnutrition change after implementing a malnutrition screening tool in a hospital setting?

### *Study 4*

The fourth study had two aims; to examine the effect of the use of a malnutrition screening tool on process indicators of nutritional care and to explore healthcare professionals' perceptions and opinions regarding the use of a malnutrition screening tool (Chapter 7).

#### Research questions

- How does the use of a malnutrition screening tool effects process indicators of nutritional care?
- Which perceptions and opinions do healthcare professionals have with regard to the use of a malnutrition screening tool?

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## METHODS

This chapter presents an overview of the methodologic aspects of the studies conducted as part of the work described in this doctoral thesis. Tables 2.1 and 2.2 provides a summary of the aims, designs, settings and samples, data collection and processes of data analysis in the individual studies. For more details, please refer to Chapters 3 through 7.

**Table 2.1** Methodological aspects of study one – part A, study one – part B and study two

	<b>Study 1 – part A</b>	<b>Study 1 – part B</b>	<b>Study 2</b>
<b>Aim</b>	To provide an insight into what formal nursing degree programs in Europe teach on the topic of malnutrition and malnutrition screening	To gather information about the curricular content on malnutrition and malnutrition screening in older adults in basic study programs for medical doctors across Europe	To evaluate the association between the presence of a guideline and a validated screening tool (structure) and nutritional care (processes) and outcomes in hospitals
<b>Design</b>	Cross-sectional study using an online-survey		Secondary data analysis of data collected in a cross-sectional multi-center study
<b>Setting &amp; sample</b>	131 nursing education institutions in Europe in 26 European countries	26 medical schools in 12 European countries	53 Austrian hospitals with 5255 patients
<b>Data collection</b>	An online questionnaire was developed and e-mailed to the responsible persons for curriculum development in nursing and medical education institutions		A standardized questionnaire was used. On an institutional level, data was collected by nurse directors and, on a patient level, by two nurses at each patient's bedside or/and with patient records
<b>Data analysis</b>	Descriptive statistics and statistical tests		Descriptive statistics and statistical tests

**Table 2.2** Methodological aspects of study three and study four

	<b>Study 3</b>	<b>Study 4</b>
<b>Aim</b>	To determine the effect of the use of a valid and reliable malnutrition screening tool (process) on the knowledge, attitudes and practices of nurses, nurses' aides and physicians (structure)	To evaluate the impact of the use of a malnutrition screening tool (structure) on process indicators of nutritional care and explore healthcare professionals' perceptions and opinions with regard to the use of a malnutrition screening tool
<b>Design</b>	Controlled pretest-posttest study	Mixed methods design (convergent parallel design) Quantitative part: controlled pretest-posttest study Qualitative part: semi-structured interviews
<b>Setting &amp; sample</b>	269 nurses, nurses' aides and physicians working at internal wards in hospitals at T0 (pretest) and 190 at T1 (after 1 month)	Quantitative part: 1171 patients participated at T0 (pretest), 1186 at T1 (after 1 month) and 1253 at T2 (after 3 months) Qualitative part: 11 healthcare professionals (nurses, physicians, dietitians, managers)
<b>Data collection</b>	A standardized self-reported questionnaire to assess the knowledge, attitudes and perceived practices (KAP) of healthcare staff was used	Quantitative part: patient records were used to collect data about process indicators of nutritional care Qualitative part: semi-structured interviews were conducted to collect data about perceptions and opinions of healthcare staff
<b>Data analysis</b>	Descriptive statistics and statistical tests	Quantitative part: descriptive statistics and statistical tests Qualitative part: Content analysis



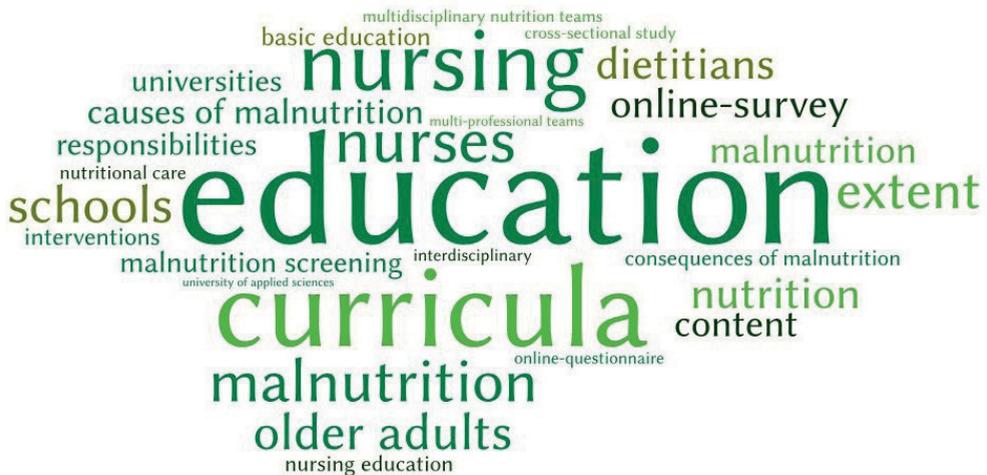


## Chapter 3

# Is the topic of malnutrition in older adults addressed in the European nursing curricula? A MaNuEL study

Doris Eglseer, Ruud J.G. Halfens, Sandra Schüssler, Marjolein Visser, Dorothee Volkert, Christa Lohrmann

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## ABSTRACT

**Background:** The lack of sufficient knowledge of healthcare professionals is one main reason given for adequate nutritional interventions not always being implemented. Until now, it is not known to which extent European nurses are exposed to the topic of malnutrition in older adults during their education.

**Objective:** To determine whether formal nursing degree programs in Europe address the topic of nutrition and, specifically, malnutrition in older adults.

**Design:** A cross-sectional study was conducted using an online-survey.

**Participants:** The online-survey link was e-mailed to 926 nursing education institutions in 31 European countries.

**Methods:** This study was conducted as part of the *Healthy Diet for Healthy Life Joint Programming Initiative, Malnutrition in the Elderly Knowledge Hub (MaNuEL)* project. Descriptive analyses were performed using SPSS. Associations were calculated using the chi-square tests and Fisher's exact test.

**Results:** 131 institutions responded to the survey (14.2 %). 113 (86.3 %) of the institutions addressed the topic of nutrition in their educational programs, and 73.7 % addressed the topic of malnutrition in older adults. Malnutrition screening (70.8 %), causes (67.2 %) and consequences (68.7 %) of malnutrition were frequently-addressed topics of content. Topics that were rarely addressed included nutritional support in intensive care units (ICU) (23.7 %), cooperation in multidisciplinary nutrition teams (28.2 %), dietary counselling (32.1 %) and the responsibilities of various professions in nutritional support (35.1 %). The topic of malnutrition in older adults is taught by nurses in 52.7 %, by dietitians in 23.7 %, by nutritional scientists in 18.3 %, and physicians in 19.8 % of the institutions.

**Conclusions:** The topics of malnutrition and malnutrition screening are currently not included in the content of nutrition courses taught at nearly 30 % of the European educational institutions for nurses. Nursing educators urgently need to improve curriculum content with respect to the topic of malnutrition in older adults to enable nurses to provide high-quality nutritional care of older persons.

**KEYWORDS:** nursing education, nutrition, malnutrition, older adults



## INTRODUCTION

The prevalence of malnutrition ranges from 20 to 50 % in hospitalized patients and can reach up to 71 % in nursing home residents <sup>1-3</sup>. The consequences of malnutrition are manifold and include negative health-related outcomes, such as poor wound-healing, infections, complications and hospital readmissions <sup>4, 5</sup>. In addition, malnutrition places a considerable cost burden on the health care systems <sup>6, 7</sup>.

Nevertheless, malnutrition is often poorly recognized and undertreated <sup>8</sup>. There are many explanations as to why nutritional interventions are not implemented and conducted. The *Council of Europe* identified the lack of sufficient education with regard to nutrition among all staff groups as one major barrier <sup>9</sup>. In a recently published study, nurses were interviewed and asked their opinions about barriers that prevented them from providing good nutritional care <sup>10</sup>. The authors of this study found that the lack of sufficient knowledge and skills was the main reason given that adequate interventions were not implemented. In other studies, negative attitudes towards nutrition were reported to play an important role <sup>11</sup>. Nurses are often not familiar with the current guidelines and are unsure which methods they should use to conduct nutritional screening of clients <sup>10</sup>. On the other hand, the results of other studies have shown that nurses working in the clinical practice want to receive education on (mal)nutrition, but often do not have access to appropriate educational programs <sup>12</sup>.

For nurses to be able to provide optimal nutritional care for older adults, they must be educated about (mal)nutrition while receiving their basic formal education and training <sup>13</sup>. Based on international guidelines on the management of malnutrition, the inclusion of the following content in the nursing curricula is crucial: malnutrition screening, nutritional interventions that can be supported by nurses (e.g., provision of oral nutritional supplements or energy-protein enriched food), monitoring of nutritional intake and multidisciplinary cooperation.

In a comprehensive literature review of publications indexed in the medical databases MEDLINE (PubMed), CINAHL and EMBASE, which was conducted by the authors in September and October 2016, not a single study was found that dealt with (mal)nutrition in the context of the education of European nurses. One survey carried out in the U.S. in nursing schools was identified <sup>14</sup>, but this survey was conducted more than 30 years ago and only surveyed the

level of general nutrition education rather than education on malnutrition in older adults.

At present, the extent to which European nurses are exposed to the topic of malnutrition in older adults during their basic education is not known. Therefore, the aim of this study was to determine the provisions and content of nutrition education and, particularly, education about malnutrition in older adults in formal nursing educational programs throughout Europe.

## **METHODS**

### **Design**

This study was conducted as part of the *Healthy Diet for Healthy Life Joint Programming Initiative, Malnutrition in the Elderly Knowledge Hub (MaNuEL)* project, which aims to build research capacity on malnutrition in older persons in Europe <sup>15</sup>. We selected a cross-sectional study design and used a web-based online survey to gather extensive information about curricula content on (mal)nutrition in basic educational programs for nurses.

### **Questionnaire**

An online questionnaire was developed based on a questionnaire used by Adams et al. in a prior study, which was conducted to gather information about nutrition education from medical schools in Europe <sup>16</sup>. Questions were added to collect more detailed information, such as about the content development for the respective nutrition courses. Furthermore, questions about malnutrition in older adults were added. Once the questionnaire had been developed, it was e-mailed to members of the MaNuEL project team who are experts in the field of malnutrition in six European countries (Austria, Germany, Netherlands, Spain, France and Ireland), and feedback was requested. The questionnaire was subjected to minor revision based on the feedback and propositions, such as new answer categories, were added to some questions.

The final, revised questionnaire contained 15 questions. All questions except the last one were close-ended with pre-formulated answers. All institutions were asked to send the curriculum of the nutrition courses to the authors. The questionnaire was prepared in the English language and is shown in a supplemental file.

## **Sampling**

All European countries that are members of the European Union (n = 28) were included in this study. In addition, the countries of Switzerland, Norway and Iceland were included because they were perceived as countries comparable to EU members states. A list of nursing universities, universities of applied sciences and nursing schools in all the countries (n = 31) was generated.

National nursing associations in each of the countries were contacted and asked to provide a list of all educational institutions for nurses, including the e-mail addresses of contact persons. These were provided by 11 countries. If countries did not send a complete list, a supplementary internet search was conducted to identify nursing universities, universities of applied sciences and nursing schools in the respective countries.

The institutions were invited to participate in the study via e-mail and received an informative letter about the study; participation in the study was thereby voluntary. The online survey was anonymous and was carried out using a secure website. The software tool "Survey Monkey" was used to create the online-survey. In January 2017, the online-survey link was emailed to 926 nursing education institutions in 31 European countries.

## **Interventions to increase response**

To increase the response rate of the survey, the following interventions were implemented <sup>17, 18</sup>:

- A non-monetary incentive was offered (study results provided after completion of the study)
- The questionnaire was kept as short as possible (requiring about 10 minutes to complete)
- Personalized cover letters were sent via e-mail (mainly to the person responsible for education and curriculum development or the head of the institution, if it was possible to identify contact persons)
- A special Medical University e-mail address was created and used to send out the e-mails
- Two reminders were sent (after two weeks and after five weeks)
- The survey delivery was accomplished with the help of local nursing associations (cover letters were written in the target language of each country)

### **Data analysis**

The statistical software SPSS version 23<sup>19</sup> was used for purposes of data analysis, and the questionnaire answers were analysed using descriptive statistics. Questionnaires with missing data were excluded from the analysis (n = 60). The reason for this was that, in most incomplete questionnaires, only the first few questions were answered, and the questions about malnutrition in older adults were not answered. Associations between the types of institution and the contents of malnutrition education were calculated using the chi-square tests and Fisher's exact test.

## **RESULTS**

A total of 191 (20.6 %) out of 926 institutions filled out the online questionnaire. Of those 191 questionnaires, 131 (68.6 %) were completely filled out and included in the data analysis. The response rate of universities was 10.1 % (n = 44), the response rate of universities of applied sciences was 75.5 % (n = 37) and the response rate of nursing schools was 11.2 % (n = 49). One institution listed its institution type as "other". No responses at all were received from institutions located in France, Greece, Iceland, Latvia, or Sweden. Table 3.1 shows the number of completed questionnaires and response rate by country and institution type.

45 % of the respondents were persons responsible for the curriculum development, 44 % were members of the faculty of education, 18.3 % were lecturers in the field of nutrition/malnutrition, 17.6 % were lecturers in the field of malnutrition in older adults and 4.6 % were experts (e.g., researchers) in the field of malnutrition. 22 % answered the question with "others" and were mostly teachers in other subjects than malnutrition or dean/heads of the institutions.

**Table 3.1** Number of completed questionnaires and response rate by country and type of nursing institution

	Questionnaires sent out n = 926	Completed questionnaires n = 131				Total response %
		Completed University n = 44	Completed University of Applied Sciences n = 37	Completed School of Nursing n = 49	Completed Other n = 1	
Austria	64	1	3	6	0	15.6
Belgium	26	0	1	4	0	19.2
Bulgaria	11	6	0	1	0	63.6
Croatia	6	2	0	2	0	66.7
Cyprus	5	3	0	0	0	60.0
Czech Republic	16	5	1	0	0	37.5
Denmark	25	0	0	2	0	8.0
Estonia	3	1	2	0	0	100.0
Finland	24	0	7	0	0	29.2
Germany	171	0	1	17	0	10.5
Hungary	6	1	2	0	0	50.0
Ireland	14	7	0	2	0	64.3
Italy	34	2	0	0	0	5.9
Lithuania	9	1	4	1	0	66.7
Luxemburg	1	0	0	1	0	100.0
Malta	1	1	0	0	0	100.0
Netherlands	40	0	1	1	0	5.0
Norway	12	1	1	0	0	16.7
Poland	37	1	1	0	0	5.4
Portugal	41	3	3	7	0	31.7
Romania	9	1	0	1	0	22.2
Slovakia	19	1	1	0	0	10.5
Slovenia	19	1	2	1	0	21.1
Spain	58	6	1	2	0	15.5
Switzerland	19	0	5	1	0	31.6
United Kingdom	45	0	1	0	1	4.4

### Nutrition education in general

A total of 113 (86.3 %) of the institutions stated that they offered nutrition education. In 96 (73.3 %) of all institutions, nutrition education is a mandatory part of the nursing curricula, and in 17 (13 %), it is only optional. 97 (74.0 %) of the institutions that offer nutrition education provide lectures during the first year. 83 (63.4 %) provide nutrition education during the second year; 76 (58.0 %), during the third year; 51 (38.9 %), during the fourth year; and 34 (26.0 %), during the fifth year of the respective education programs (see Table 3.2). 23 (17.6 %) institutions provide lectures during only one year of education; 21 (16.0 %), during two years; 31 (23.7 %), during three years; 31 (23.7 %), during four years; and 12 (9.2 %), during five years of the respective education program. The amount of time allocated to nutrition education was mostly less than five hours per year, but 26 institutions (19.8 %) provided more than 25 hours of education during the first year of nutrition education (see Table 3.2).

**Table 3.2** Extent of nutrition education per year of education of the respective institutions (in % of all institutions) (n = 131)

	0 hrs	< 5hrs	6-15hrs	16-25hrs	> 25hrs
<b>1<sup>st</sup> year</b>	26.0	24.4	19.1	10.7	19.8
<b>2<sup>nd</sup> year</b>	36.6	30.5	17.6	6.1	9.2
<b>3<sup>rd</sup> year</b>	42.0	31.3	16.8	4.6	5.3
<b>4<sup>th</sup> year</b>	61.1	21.4	14.5	1.5	1.5
<b>5<sup>th</sup> year</b>	74.0	13.0	7.6	1.5	3.8

The survey results indicated that teachers/educators (81, 61.8 %), responsible persons from the nursing faculty (84, 61.1 %), or interdisciplinary faculties (22, 16.8 %), students (36, 27.5 %), experts, for instance on nutrition (33, 25.2 %), external experts (25, 19.1 %) and administrators (12, 9.2 %) developed the curricula of the nutrition courses (multiple answers were possible).

The contents of the (mal)nutrition courses were developed, for the most part, based on nutritional guidelines (62.6 %), the expertise of specialists (46.6 %) and recommendations from professional nutrition associations (35.9 %) (multiple answers were possible). If the contents of the courses were developed based on guidelines or professional nutritional associations, the institutions used local or national, country-specific recommendations (n = 31). Nine respondents indicated that they use European recommendations, such as the

guideline of the *European Society for Clinical Nutrition and Metabolism* (ESPEN), and very few ( $n = 5$ ) used recommendations from other non-European countries (e.g., USA) or the *World Health Organization* (WHO).

### **Nutrition education with respect to malnutrition in older adults**

The topic of malnutrition education in older adults was included as part of the nurses' curricula in 73.3 % ( $n = 96$ ) of the institutions surveyed. Regarding the content of the malnutrition education, the most commonly mentioned topic was malnutrition screening (68, 70.8 %). If the institutions indicated that malnutrition screening was taught as part of the educational program, they were asked to state which screening tools they recommend in their courses. The most frequently ticked screening tool was the *Mini Nutritional Assessment* (MNA), followed by the *Malnutrition Universal Screening Tool* (MUST) and the *Nutritional Risk Screening* (NRS). The topics of the causes (88, 67.2 %) and consequences (90, 68.7 %) of malnutrition were also frequently covered in the lectures. Content that was rarely reported included nutrition support in intensive care units (ICU) (31, 23.7 %), cooperation in multidisciplinary nutrition support teams (37, 28.2 %), dietary counselling (42, 32.1 %) and the responsibilities of various professionals in nutritional support (46, 35.1 %). No significant differences were detected between the institution types. However, teachers at universities of applied sciences tended to present more lectures about methods for food fortification, and teachers at schools of nursing tended to present lectures on nutrition support in the ICU less frequently than teachers in other institutions (see Table 3.3).

**Table 3.3** Content of the education with respect to malnutrition in older adults in the total sample and by type of institution, sorted by frequency of response

Topic	Total (%) n = 131	University (%) n = 44	University of Applied Sciences (%) n = 37	School of Nursing (%) n = 49	p-value for differences between type of nursing institutions
Malnutrition screening	70.8	65.5	71.0	74.3	0.71
Consequences of malnutrition	68.7	61.4	78.4	67.3	0.36
Causes of malnutrition	67.2	63.6	75.7	63.3	0.57
Indications for parenteral nutrition	67.0	52.3	56.8	46.9	0.65
Assessment	59.5	50.0	67.6	61.2	0.30
Indications for enteral nutrition	57.3	59.1	64.9	51.0	0.40
Oral nutritional supplements	53.4	56.8	59.5	44.9	0.37
Application of enteral nutrition	53.4	50.0	64.9	49.0	0.28
Application of parenteral nutrition	51.1	47.7	59.5	49.0	0.52
Monitoring/evaluation	46.6	47.7	51.4	40.8	0.55
Calculation of nutritional requirements	43.6	43.2	54.1	36.7	0.33
Methods for food fortification	38.9	31.8	54.1	32.7	0.07
Perioperative nutrition	36.6	36.4	45.9	30.6	0.46
Responsibilities of various professions	35.1	31.8	40.5	32.7	0.45
Dietary counselling	32.1	31.8	43.2	24.5	0.26
Multidisciplinary nutrition support teams	28.2	25.0	35.1	24.5	0.29
Nutrition support in ICU	23.7	27.3	35.1	12.2	0.06
Other	6.9	4.5	8.1	8.2	0.77

In 52.7 % (n = 69) of the institutions, the survey results indicated that the topic of malnutrition in older adults is taught by nurses. Dietitians hold lectures on this topic in 23.7 % (n = 31), nutritional scientists in 18.3 % (n = 24), and physicians, in 19.9 % (n = 26) of the institutions. 6.1 % (n = 8) of the respondents stated that other experts, such as pharmacologists or nurses with spe-

cial education on nutrition, hold the lectures on malnutrition (multiple answers were possible). An internal board of experts provided quality insurance for the respective curriculum in 58.8 % (n = 77). 88.5 % of the respondents stated that they perceived malnutrition as either a very important (88, 67.2 %) or important (27, 20.6 %) topic in nursing education.

It was not possible to conduct a content analysis of the curricula of the nutrition courses because the study team did not receive any curricula from the education institutions.

## **DISCUSSION**

To our best knowledge, this study is the first to evaluate the provision and content of nutrition education in the formal education of nurses in European countries. The results of this study provide insights into how the topic of nutrition, and specifically malnutrition in older adults, is currently addressed in formal nursing education programs. Our results show that 13.7 % of the participating educational institutions do not include courses on nutrition in their curricula of the nurse education programs. 26.7 % of the institutions do not address the topic of malnutrition in older adults and nearly 30 % of the institutions do not address the topic of malnutrition screening as part of the curriculum. Some topics, such as multi-professional nutrition support and certain interventions (e.g., methods for food fortification), as well as their monitoring and evaluation, are only rarely included in the curricula.

### **Provision of (mal)nutrition education**

26.7 % of nurses that graduate from educational institutions have no exposure to the topic of malnutrition in older people during their formal education and before beginning their professional career. The lack of knowledge and skills, in turn, represent major barriers to providing adequate nutritional care for malnourished people<sup>10</sup>. These results are of particular concern, since older people are (already) the main population group in need of nursing care, and the demographic changes in Europe will lead to an increasing number of older people who are dependent on care<sup>20</sup>. Therefore, content on malnutrition needs to be included as part of the curriculum for nurses.

Lectures on malnutrition are mostly held by nurses. Based on our data, dietitians teach only 23.7 % of the nutrition courses. Because they have expertise

in nutrition education, dietitians play an important role in teaching and provide crucial training for other health care professionals<sup>21</sup>. Teachers with expertise and specialized knowledge, such as dietitians, should preferably be involved in the education of other health professionals, if possible. The efforts of other health professionals, such as nurses and physicians, to provide additional contributions should be supported to strengthen networks of multidisciplinary cooperation and enable nurses to gain different perspectives during their educational period. In a best-case scenario, the formal education is connected to placements, and the knowledge is directly applied in practice. However, as far as we know, no general recommendations currently exist on how much nutrition education should be included in the basic formal education of nurses in Europe.

### **Malnutrition screening**

Since nurses are in close contact with the clients, they are in a very good position to recognize problems with eating and drinking and, consequently, the (risk of) malnutrition early on<sup>22</sup>. Identifying malnourished clients by conducting malnutrition screening via validated screening tools is one of the nurses' main responsibilities and represents part of the multi-professional approach to provide good nutritional care<sup>23</sup>. The results of the current study, however, show that malnutrition screening is not addressed in nutrition courses offered at about 30 % of the institutions that provide formal nursing education.

The results of recent studies have shown that the nutritional status of hospitalized patients and nursing home residents are, in some European countries, rarely screened using validated screening tools<sup>24</sup>, even though this has been recommended by experts and international, evidence-based practice guidelines<sup>25, 26</sup>. Screening rates differ significantly between European countries and, for example, are higher in Nordic European countries than in South Eastern or Southern European countries<sup>27</sup>. In countries with low screening rates, nurses often rely on unreliable parameters to evaluate their clients' nutritional status, such as clinical judgement or current weight<sup>24, 28</sup>. These parameters are not suitable for the identification of malnourished persons; studies have found that nurses underestimate the prevalence of malnutrition when they use clinical judgement<sup>28, 29</sup>. Using the current weight as a parameter is also problematic, because malnutrition in older adults is not necessarily associated with low BMI. Weight and weight-related parameters such as BMI are often

misleading and difficult to interpret <sup>30</sup>. Furthermore, older persons frequently undergo therapies or have diseases that influence the fluid balance and, subsequently, make it difficult to interpret weight changes <sup>31</sup>. Therefore, the nurses must receive good training that enables them to screen older persons properly for malnutrition and, namely, in an evidence-based manner.

### **Malnutrition interventions**

The results of the current study indicate that several evidence-based interventions are not frequently taught during the nurses' basic educational period (see Table 3.3). Representatives from about half of the institutions stated that they include the topic of oral nutritional supplements in their curriculum. Other topics were less frequently included, such as methods of food fortification (38.9 %), perioperative nutrition (36.6 %), dietary counselling (32.1 %), or nutrition support in intensive care units (ICU) (23.7 %). Nutrition support for older patients in ICU may not necessarily need to be part of curriculum because it is an extremely specific topic. Dietary counselling also does not necessarily need to be part of the nurses' curricula. In most European countries, dietitians are accredited experts in nutrition and, therefore, are responsible for providing dietary counselling in (clinical) practice <sup>32, 33</sup>. However, while dietitians have the responsibility to develop nutritional care plans and conduct dietary counselling, the implementation of the interventions related to these care plans requires the involvement and, therefore, the knowledge of nurses <sup>34</sup>. For that reason, information about interventions for malnourished older adults or older adults at risk of malnutrition and the specific role of nurses in those interventions must be included in the nutrition courses offered as part of the curriculum.

### **Multidisciplinary nutritional support**

Our results show that only 28 % of the participating institutions address multidisciplinary nutrition teams in their curricula, and only 35 % address the responsibilities of different staff groups with respect to nutritional care. Already in 2002, the European Council of Europe had identified major barriers to the provision of adequate nutritional care in hospitals. Two of these were the lack of cooperation between staff groups and the lack of clearly assigned responsibilities in planning and managing nutritional care <sup>9</sup>. Since then, many studies have identified poor communication and the lack of cooperation between different professionals and in different settings as significant problems <sup>10, 35</sup>.

Health professionals from various disciplines seem to lack an understanding of their own and other professionals' roles in nutritional care <sup>35</sup>.

### **Limitations**

Even though the authors made great efforts to strengthen the quality of this study, some limitations exist. It is known that the quality of findings from online surveys can be threatened by low response rates <sup>18</sup>. In the current study, an overall response rate of 14.2 % could be achieved. Therefore, it is not possible to draw general conclusions about all European institutions based on these results. Furthermore, the persons who filled out the online survey may have not known specific details about the content of the nutrition education courses offered by the institutions, and this may have influenced their answers. In addition, it is not possible to rule out the possibility of a response bias. The fact that the survey was presented in the English language might have represented a barrier for participation. Although we carefully conducted an internet search and cooperated with national nursing associations to identify all nursing education institutions, it is also possible that we did not find all of them.

### **CONCLUSIONS**

Our survey results revealed that the topic of malnutrition in older adults and malnutrition screening is not taught in nearly 30 % of the participating institutions that offer basic nursing education.

In the future, the existing curricula should be analysed in detail. One priority of future studies should be to conduct an analysis of the effectiveness of educational interventions in nursing education and nursing practices regarding malnutrition in older adults. Because a lack of malnutrition education on some topics was identified, especially multidisciplinary nutrition support, different nutritional interventions and the evaluation of these interventions, existing courses on malnutrition should be adapted and/or new high-quality courses should be developed. In educational practice, the content on the topic of nutrition should be taught by nutrition professionals, such as dietitians in close cooperation with members of multi-professional teams to provide different perspectives on the problem <sup>21</sup>.

In conclusion, the results of this survey suggest that the way (mal)nutrition is taught as part of the nursing curricula in European institutions should be

improved to enable nurses as part of the multidisciplinary team to provide high-quality nutritional care of older persons.

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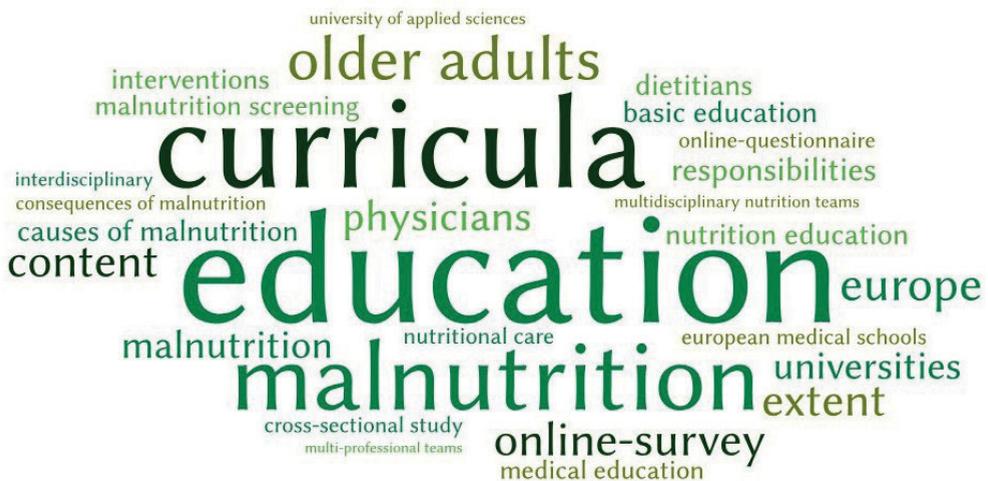


## Chapter 4

# Nutrition education on malnutrition in older adults in European medical schools: Need for improvement?

Doris Eglseer, Marjolein Visser, Dorothee Volkert, Christa Lohrmann

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## **ABSTRACT**

**Purpose:** Malnutrition is a condition which is highly prevalent, especially in older persons. Physicians play an important role in multidisciplinary nutritional management but often feel inadequately prepared to provide nutritional information/therapy to their patients. The aim of this study was to gather information on curricular content on malnutrition in older persons within basic study programs for medical doctors.

**Methods:** We selected a cross-sectional study design and used a web-based online survey. We emailed the web-link to those persons responsible for curriculum development at 310 medical schools in 31 European countries.

**Results:** A total of 26 (8.4 %) medical schools in twelve European countries completed the questionnaire. The topic of malnutrition in older adults was included as part of the medical students' curricula at 50.0 % (13 out of 26) of the participating institutions. Most commonly topics taught in the institutions were causes of malnutrition (13, 50 %), assessment of malnutrition (13, 50 %) and consequences of malnutrition (12, 46.2 %). The topic of malnutrition screening was addressed in 9 (35 %) of the institutions.

**Conclusions:** Based on our results, we strongly recommend including the topic of malnutrition in older adults in the undergraduate curricula of medical students in Europe. A special focus should be placed on multidisciplinary cooperation. Integrative teaching that targets all professional groups could be one option. Initiatives need to be carried out to create a higher level of awareness and promote improvements in nutrition education for medical doctors.

**KEYWORDS:** nutrition, malnutrition, education, medical students, Europe, older adults



## **INTRODUCTION**

Malnutrition represents a highly relevant geriatric syndrome in older people, along with frailty, immobility, falls, incontinence or cognitive impairment <sup>1, 2</sup>. Age-related changes, such as impaired senses of taste and smell, an increase in the number of satiety signals, or numerous chronic diseases and, thus, multiple drug-use, may lead to reduced food intake. In addition, social factors such as loneliness or life-changing experiences like the loss of a partner may decrease nutritional intake and lead to malnutrition <sup>2, 3</sup>. The prevalence of malnutrition in older adults, which ranges between 5 and 50 %, depends on the setting as well as the instrument used to assess malnutrition <sup>4-6</sup>. Negative consequences of malnutrition are well-documented in the literature, including a higher risk of infections, poor rates of wound healing, increased lengths of hospital stays, diminished quality of life and even increased mortality <sup>7-9</sup>.

Healthcare staff must strive to achieve good health outcomes for older people and prevent and treat malnutrition by providing adequate nutrition <sup>10</sup>. Malnutrition can successfully be prevented and treated if evidence-based interventions are conducted, as, for example, summarized in the ESPEN (European Society for Clinical Nutrition and Metabolism) guidelines on clinical nutrition and hydration in geriatrics <sup>10</sup>. Nutritional awareness and knowledge are prerequisites, however, for the implementation of these recommendations <sup>11-13</sup>.

Dietitians/nutritionists are well-trained experts in nutrition and are uniquely qualified to coordinate nutritional therapy based on the Nutrition Care Process in all healthcare settings <sup>10, 13</sup>. However, other healthcare professionals, including physicians, nurses and therapists, should also be involved in nutritional care, made aware of nutritional problems and know the (basic) principles of nutritional therapy. This allows them to address nutritional challenges in older people, take adequate prevention steps and provide treatment for older persons with (a risk of) malnutrition within the multidisciplinary team <sup>14, 15</sup>.

Physicians play a special role in multidisciplinary nutritional management. In most European countries, physicians are responsible for prescribing nutritional therapy and referring patients to dietitians. In addition, they are responsible for providing their patients with correct and evidence-based nutritional information <sup>16</sup>. If physicians have a firm foundation of knowledge in the field of nutrition and display a positive attitude toward the topic, it can be assumed

that they are more likely to initiate nutritional therapy and refer to or consult a dietitian and at an earlier stage<sup>13</sup>.

Physicians in the clinical practice often feel incompetent and inadequately prepared to provide nutritional information/therapy to their patients<sup>17</sup>. This may be due to the fact that they receive little education about nutrition during their undergraduate education. If medical doctors do not feel comfortable discussing nutritional topics, they are unlikely to recognize patients who are at risk of malnutrition, provide nutritional information to their patients, or refer them to a nutritional expert. This is regrettable, since patients rely on medical doctors and view them as trustworthy sources of reliable health information.

The undergraduate education is the basis of the daily working life for many physicians<sup>16</sup>. Unfortunately, the integration of nutrition topics into the curricula of medical students is poor, and there are many barriers to including nutrition training in these curricula. These barriers include negative attitudes towards the role of nutrition as compared to medical interventions, the unrecognized importance of nutrition in medicine, or already overfilled curricula<sup>11, 18</sup>.

In recent years, some surveys were carried out to elucidate the extent of nutrition education in medical schools. A survey conducted in U.S. medical schools in 2006 and updated in 2010 was identified<sup>19, 20</sup>. In 2010, nearly all educational institutions that completed the survey (103 out of 109) stated that they provided some form of nutrition education. Of these medical schools, 25 % stated that they provided a course dedicated to the topic of nutrition for their students. The average amount of time spent on nutrition content was 22.3 hours over the complete educational period<sup>19</sup>.

In a European survey about nutrition education carried out in 32 European medical schools in 14 European countries<sup>21</sup>, 68.8 % of the respondents stated that nutrition education is required in some form in their curriculum. The average amount of time spent on nutrition content was 23.7 hours over the complete educational period<sup>21</sup>. ESPEN recently conducted a worldwide survey in 29 countries (Europe, Asia, South America, Australia) to determine the extent and content of clinical nutrition education offered to medical students<sup>22</sup>. Of the 56 participating institutions, 73.3 % of the respondents reported that they provided obligatory education on clinical nutrition; however, in only 55 % of the institutions, education on clinical nutrition was mandatory. The extent of

clinical nutrition was more than 8 hours in 72 % of the medical schools, while it was less in 28.0 %<sup>22</sup>.

Taken together, these results show that not all medical schools provide nutrition education, and if education on nutrition is provided, it is taught as an aside and is not specifically identified in the curricula. Concurrently, most of the educators and students surveyed indicated that the amount of nutrition education offered was inadequate<sup>19, 21, 22</sup>.

However, as stated above, (the risk of developing) malnutrition is especially relevant in older adults. The above-mentioned surveys placed a general focus on education in nutrition but not specifically on nutrition education in older persons. Up until now, there has been no indication in the literature if and to which extent the topic of malnutrition, and specifically malnutrition in older adults (where its prevalence is highest), is addressed in medical curricula.

For this reason, we aimed at gathering information on curricular content on malnutrition in older persons that are present in basic study programs for medical doctors.

## **METHODS**

We selected a cross-sectional study design and used a web-based online survey that consisted of fifteen questions. We then sent the web-link by e-mail to those persons responsible for curriculum development at 310 medical schools in 31 European countries. These persons at all institutions were asked to complete the questionnaire (in the English language) and send the curriculum of their nutrition courses to the authors. To increase the response rate, we kept the questionnaire as short as possible (five to ten minutes to complete), used a special university e-mail address, distributed the online-survey link with the help of local medical associations (cover letters were written in the target language of the country) and sent our study results to the participating universities after the study was completed. Data analysis was carried out by using SPSS. The details of the methods have been published elsewhere<sup>14</sup>.

## RESULTS

A total of 26 (8.4 %) out of the 310 identified medical schools in twelve European countries completed the questionnaire: Italy (1), Belgium (1), Poland (1), Portugal (1), Switzerland (1), Finland (2), Germany (2), Sweden (2), Hungary (3), Ireland (3), the Netherlands (3) and Lithuania (6). Although we sent out reminders, no responses were received from institutions located in Austria, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, United Kingdom, Estonia, France, Greece, Iceland, Latvia, Luxemburg, Malta, Norway, Romania, Slovakia, Slovenia, or Spain. No educational institution sent us their curriculum (i.e., non-compliance with second request); therefore, it was not possible to conduct a content analysis of the curricula.

Of the 26 responding institutions, respondents from twenty (76.9 %) institutions stated that they offered nutrition education. In twelve (60.0 %) institutions, nutrition education was listed as a mandatory part of the medical curricula, whereas in eight (40.0 %) institutions presented is as optional. Fourteen (53.9 %) institutions provided lectures during the first year. Twelve (46.2 %) provided nutrition education during the second year; sixteen (61.5 %), during the third year; thirteen (50.0 %), during the fourth year; and thirteen (50.0 %), during the fifth year of the respective education programs (see Table 4.1). The amount of time allocated to nutrition education was usually less than five hours per year, but three institutions (11.5 %, in Finland, Poland and Ireland) provided more than 25 hours of education during the first year of nutrition education (see Table 4.1).

**Table 4.1** Extent of nutrition education per year of education of the respective institutions (in % of all institutions) ( $n = 26$ )

	0 hrs	< 5hrs	6-15hrs	16-25hrs	> 25hrs
<b>1<sup>st</sup> year</b>	46.2	30.8	7.7	3.9	11.5
<b>2<sup>nd</sup> year</b>	53.9	30.8	7.7	0.0	7.7
<b>3<sup>rd</sup> year</b>	38.8	38.5	11.5	3.9	7.7
<b>4<sup>th</sup> year</b>	50.0	15.4	26.9	0.0	7.7
<b>5<sup>th</sup> year</b>	50.0	26.9	15.4	0.0	7.7

In 42.3 % of all participating institutions (11 out of 26), the survey results indicated that the topic of malnutrition in older adults was taught by physicians. Dietitians held lectures on this topic in 19.2 % (5 out of 26), nurses in 7.7 % (2 out of 26) and nutritional scientists in 7.7 % (2 out of 20) of the institutions.

The topic of malnutrition *in older adults* was included as part of the medical students' curricula at 50.0 % (13 out of 26) of the participating institutions.

Regarding the content of malnutrition education, the most commonly mentioned topics regarding malnutrition in older persons were: causes of malnutrition (13, 50.0 %), assessment of malnutrition (13, 50.0 %) and consequences of malnutrition (12, 46.2 %). The topic of malnutrition screening was addressed in 9 (35.0 %) of the institutions. Nutrition support in older patients admitted to intensive care units (ICU) was rarely reported (4, 15.4 %). Perioperative nutrition (7, 29.6 %) or cooperation in multidisciplinary nutrition support teams (8, 34.6 %) and the responsibilities of various professionals in nutritional support (8, 34.6 %) were also infrequently included topics (Table 4.2).

**Table 4.2** Course content with respect to malnutrition in older adults in thirteen medical institutions that included the topic of malnutrition in older adults in their curricula

Topic	Addressed in nutrition course of medical education institutions (n = 26) (%)
Causes of malnutrition	50.0 (13/26)
Assessment of malnutrition	50.0 (13/26)
Consequences of malnutrition	46.2 (12/26)
Indications for enteral nutrition	42.3 (11/26)
Calculation of nutritional requirements	42.3 (11/26)
Indications for parenteral nutrition	42.3 (11/26)
Oral nutritional supplements	38.5 (10/26)
Monitoring/evaluation	38.5 (10/26)
Malnutrition screening	35.0 (9/26)
Application of enteral nutrition	34.6 (8/26)
Responsibilities of various professions	34.6 (8/26)
Dietary counselling	34.6 (8/26)
Multidisciplinary nutrition support teams	34.6 (8/26)
Application of parenteral nutrition	34.6 (8/26)
Perioperative nutrition	26.9 (7/26)
Methods for food fortification	26.9 (7/26)
Nutrition support in ICU	15.4 (4/26)
Other	7.7 (2/26)

## DISCUSSION

The results of this online-survey show that it is challenging to collect conclusive data about the curricular content from European medical universities. Representatives from only 26 out of 310 universities that were contacted completed the questionnaire, and we did not receive any curricula, although we made great efforts to increase the response rate <sup>14</sup>. For example, we asked representatives of medical associations in the respective European countries to deliver the survey-link to the institutions. In some countries, the associations supported us by writing a short cover letter in the respective language of the countries. We also sent reminders by e-mail and used an official e-mail address that had been specially created for the study, since this has been shown in other studies to improve the response rate <sup>14</sup>.

It is necessary to reflect on strategies to increase response when planning similar surveys in the future. Using existing contacts to other universities may prove to be advantageous. One possibility could be directly contacting the responsible persons in advance and explaining the aim of the survey <sup>23</sup>. In general, online-surveys achieve about 10 % lower response rates than telephone surveys <sup>24</sup>. Therefore, using the method of a telephone survey may result in a higher rate of completed questionnaires.

In light of the low response and feedback rate we achieved with our online survey, we could presume that the representatives contacted at the medical universities have limited or no interest in nutrition education, but this may not necessarily be the case. The low response rate also created a bias in our results. For this reason, the results could not be generalized to other populations, but still have the potential to provide important insights. Because we did not receive any curricula from the educational institutions, we could not objectively assess the content of the curricular courses on nutrition. This would have allowed us to collect important and valid data. We presume that representatives of institutions that have a vested interest in nutrition were more likely to respond, potentially creating a bias in our results. According to the data that could be collected, we assume that the proportion of nutrition education in the medical curricula is still limited.

In the U.S., the National Academy of Sciences recommends 25 minimum contact hours for nutrition education for medical students <sup>25,26</sup>. The American Society for Nutrition even recommends 44 minimum contact hours <sup>27</sup>. To our

knowledge, such recommendations do not exist for Europe <sup>22</sup>. Although our survey sample did not allow us to identify the exact number of teaching hours devoted to nutrition education, we revealed that most of the universities provided either no or fewer than five hours of nutrition education per year (see Table 4.1). These results lead us to conclude that nutrition education – if it exists at particular institutions at all – still makes up a minor part of the physicians' curricula.

Malnutrition is a condition, which is highly prevalent, especially in older persons, and is therefore recognized as a geriatric syndrome <sup>28</sup>. Due to the high heterogeneity of the answers about both amount and content of (mal)nutrition education in the current survey it is of high importance to develop European standards in the field of nutrition education. There are ongoing efforts to standardise education and training in geriatric medicine <sup>29</sup>. To include education about malnutrition in older adults as part of geriatric education can be one possibility to increase the quality of nutrition education. The extent and content of education of geriatricians differ from country to country, but in most European countries there is a need for improvement <sup>30</sup>. The European Union of Medical Specialists (UEMS) published a consensus paper among geriatricians on a geriatric curriculum with the minimal requirements for medical students. It was concluded that the topic of malnutrition is one important geriatric syndrome in older people and should be included in the geriatricians' curricula <sup>31</sup>.

Sooner or later, nearly every physician will come into contact with malnourished patients <sup>22</sup>, regardless of the setting. According to the results of our survey, physicians are not adequately prepared to correctly identify these persons and refer them or treat them in an evidence-based way. Nutritional medicine is a multidisciplinary topic, and dietitians/nutritionists are considered to be experts in the field of clinical nutrition <sup>13</sup>. However, physicians have to be able to identify when an older person is in need of a referral to a dietitian and dietetic treatment. If physicians have not received basic knowledge about malnutrition in older adults, it is highly unlikely that they will consult dietitians for further treatment, working together in a multidisciplinary team to develop nutrition care plans for the patients.

In recent years, researchers have demonstrated that nutritional therapy is effective and can increase body weight, body composition and improve physical

functions<sup>32, 33</sup>. It can reduce complication rates and has the potential to reduce the length of hospital stays and readmission rates to hospital<sup>33-35</sup>. Some studies could even demonstrate reduced mortality and healthcare costs<sup>34-36</sup>. However, nutritional therapy in malnourished persons or persons at risk of developing malnutrition can only be successful if these persons are detected at an early stage and if all healthcare professionals work together<sup>15</sup>.

Some countries, such as the U.S., U.K. and Australia, have invested efforts in recent years to improve nutrition education in medical programs. Some online curricula and web-based nutrition education resources have been developed to help medical doctors improve their nutritional skills<sup>11, 37</sup>. However, these resources are not available or used in all countries, and physicians must have enough interest in the topic of nutrition and motivation to educate themselves independently.

## **CONCLUSION**

Based on our results, we strongly recommend including the topic of malnutrition in older adults in the undergraduate curricula of medical students in Europe. Specific topics such as perioperative nutrition or nutrition in ICUs should be included in the courses. A special focus should be placed on multidisciplinary cooperation. Integrative teaching that targets all professional groups could be one option. Furthermore, teachers with expertise in nutrition education should preferably be involved in the educational process. Initiatives need to be carried out to create awareness needed and promote improvements in nutrition education for medical doctors. If nutrition continues to be treated as secondary subject matter of lesser importance by the educational institutions training healthcare professionals, the potential of nutrition therapy will not be expanded in clinical practice, which may result in poorer outcomes for malnourished older persons.

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## **CONFLICT OF INTEREST**

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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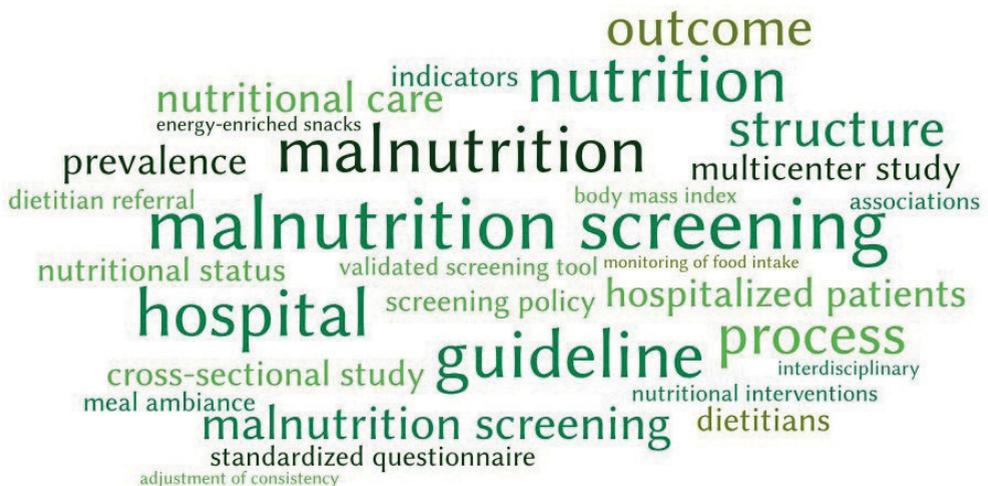


## Chapter 5

# Is the presence of a validated malnutrition screening tool associated with better nutritional care in hospitalized patients?

Doris Egelseer, Ruud Halfens, Christa Lohrmann

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## **ABSTRACT**

**Objective:** To (1) evaluate the association between the use of clinical guidelines and the use of validated screening tools, to (2) evaluate the nutritional screening policy in hospitals, and to (3) examine the association between the use of validated screening tools and a) the prevalence of malnutrition and b) nutritional interventions in hospitalized patients.

**Methods:** This study was a cross-sectional multi-center survey. Data were collected using a standardized questionnaire on three levels: institution (presence of a guideline for malnutrition), department (use of a validated screening tool), and patient level (e.g., malnutrition prevalence).

**Results:** 53 hospitals with 5255 patients participated. About 45.0 % of the hospitals indicated that they have guidelines for malnutrition. 38.6 % of the departments used validated screening tools as part of a standard procedure. The nutritional status of 74.5 % of the patients was screened during admission, mostly on the basis of clinical observation and the patients' weights. In 21.2 % of the patients, a validated screening tool was used. Significant differences between wards with and without validated screening tools were found with regard to malnutrition prevalence ( $p = 0.002$ ) and the following interventions: referral to a dietitian ( $p < 0.001$ ), provision of energy-enriched snacks ( $p = 0.038$ ), adjustment of consistency (food/drinks) ( $p = 0.004$ ), monitoring of the nutritional intake ( $p = 0.001$ ), and adjustment of the meal ambience ( $p < 0.001$ ).

**Conclusion:** Nutritional screening with validated tools in hospitalized patients remains poor. Generally, the nutritional status of patients is screened with unreliable parameters such as clinical observation and BMI. The results of the present study suggest that the use of validated malnutrition screening tools is associated with better nutritional care and lower malnutrition prevalence rates in hospitalized patients.

**KEYWORDS:** malnutrition, hospital, screening, guideline, dietitian, interventions



## **INTRODUCTION**

Malnutrition remains a serious problem in hospitals. It is defined as an acute or chronic condition whereby an energetic imbalance, lack of energy, protein or other nutrients causes measurable and adverse effects on body composition, function, and clinical outcomes <sup>1</sup>. Prevalence rates for hospitalized patients are up to 60 % <sup>2-5</sup>. Numerous studies have demonstrated adverse outcomes for malnourished patients such as prolonged length of stay, greater risk of complications such as delayed wound healing, increased chance of infection, diminished quality of life, and increased mortality <sup>6-10</sup>. During the past decade, political interest in hospital malnutrition has grown <sup>11</sup>. A key meeting was the Council of Europe in 2003, at which malnutrition was described to constitute a central social, health policy, and economic challenge for the individual member states <sup>12</sup>.

Since then, a number of international, European, and national guidelines, as well as standards and protocols for adequate nutritional care in hospitals have been published <sup>13-17</sup>. In addition to publishing guidelines for the prevention and treatment of malnutrition, some countries launched initiatives with the aim to provide best-practice nutritional care for malnourished patients. Examples include the Malnutrition Quality Improvement Initiative <sup>18</sup> in the USA, the Malnutrition Task Force <sup>19</sup> in the UK and Fight Malnutrition in the Netherlands <sup>13</sup>.

Experts agree that patients in need of nutritional support should receive treatment at the earliest possible opportunity during their hospital stay <sup>12</sup>. Early interventions ensure the effectiveness of nutritional therapy and prevent a further decline in nutritional status. Clinical dietitians play a major role in the interdisciplinary team for the management of malnourished patients, as they are accredited experts in human nutrition <sup>17, 20</sup>. They have the responsibility for planning, supervising, and evaluating nutritional therapy in hospitals and are often the leaders in multidisciplinary nutritional care. Therefore, patients should be referred to a dietitian as soon as possible after a positive screening result is obtained <sup>20, 21</sup>. To find out which patients need a dietitian and further nutritional interventions, the nutritional status of each patient must be routinely screened when they are admitted to the hospital and each week if they stay in hospital for a longer time period <sup>22</sup>. Screening, therefore, is the starting point of high quality nutritional care <sup>23</sup>. Both experts in the field of nutrition and nutritional guidelines recommend risk screening with validated screening

tools<sup>13-16</sup>. These are defined as psychometrically tested tools, ensuring that they measure what is needed (validity), that the measurements are reproducible (reliability), and that they are user-friendly (practicability). Validated screening tools must be developed by a multidisciplinary group, and the tool must be suitable for use with the target population (e.g., hospitalized people)<sup>15, 23</sup>. However, in the daily clinical practice, screening tools are often not used in hospitals and malnourished patients often go both unrecognized and, consequently, untreated<sup>24</sup>.

We hypothesized that hospitals with approved guidelines with regard to clinical malnutrition would use validated screening tools more frequently and, subsequently, would provide better nutritional care. The aims of this study were

1. to evaluate the association between the use of clinical guidelines and the use of validated screening tools,
2. to evaluate the nutritional screening policy in hospitals (validated nutritional screening tools and other indicators used for nutritional screening), and
3. to examine the association between the use of validated screening tools with
  - a) the prevalence of malnutrition and
  - b) dietitian referral and other nutritional interventions.

## MATERIALS AND METHODS

### Design

The “*International Prevalence Measurement of Care Problems*” is a cross-sectional multi-center survey that is conducted annually on one specific day in several European countries in different healthcare settings such as hospitals, nursing homes, and assisted living homes<sup>25</sup>. The assessment includes nursing care problems like pressure ulcers, incontinence, malnutrition, falls, and restraints. The current study relies upon data in the “*International Prevalence Measurement of Care Problems*” that deals with malnutrition.

### **Ethical considerations**

The ethical approval of the responsible medical ethical committee was obtained (20-192 ex 08/09). Patients were informed in detail about the study both in writing and verbally, and a written informed consent was obtained either from the patient or their legal representative.

### **Sample and setting**

All hospitals in Austria with more than 50 beds ( $n = 268$ ) were invited to participate in the study via e-mail and leaflets. To gather representative results, the hospitals were recommended to conduct the measurements in all integrated departments. Subjects with implausible BMIs ( $< 10 \text{ kg/m}^2$  and  $> 60 \text{ kg/m}^2$ ), patients who were 18 years and younger, and patients who were dehydrated or had other fluid imbalances were excluded.

### **Data collection**

Prior to the survey, each institution nominated an institutional coordinator (mostly the head nurse) who was responsible for collecting the data within the institution and who received the study protocol and training package with the corresponding manuals. The data collection procedures on institutional and departmental levels were conducted by these institutional coordinators. The data collection on the patient level was conducted by two trained nurses directly at each patient's bedside, excepting demographic data, which were extracted from the patient records. One nurse was part of the departmental team, while the other nurse was from a different department to ensure objectivity and reliability of the data. If a disagreement occurred, the data collected by the external nurse was used. Data were collected either in the form of printed questionnaires, whereby the data was subsequently entered into an online form, or solely via an online form. All persons involved in the data collection process were trained by the study team. The data collection for the present study took place on April 14<sup>th</sup>, 2015.

### **Instruments**

The original Dutch version of the questionnaire used for data collection was developed by experts in the field of nursing and nutrition and is based on a comprehensive literature review. The validity and reliability of the questionnaire has been tested in different health care settings and been assessed

positively <sup>25</sup>. For the present study, an Austrian German version of the questionnaire was used, which was translated by professional translators from Dutch into Austrian German, back-translated and double-checked for appropriate wording. To ensure its applicability, a pilot measurement was conducted in November 2008 in 11 Austrian hospitals <sup>26</sup>. Since then, the instrument has been used annually for data collection. The questionnaire records data on three levels: the institutional, departmental and patient levels.

The institutional coordinators were asked whether approved guidelines for the prevention and treatment of malnutrition exist within the institution. Approved guidelines were defined as statements or recommendations, which have been systematically developed with reference to the current scientific literature with the aim of supporting practitioners and patients in decision making. Approved guidelines must be the form of written documents, generally accepted, mandatory for the whole institution, and accessible to all health personnel. Examples of approved guidelines were the ESPEN guidelines and the German DGEM guidelines on clinical nutrition <sup>16, 27</sup>.

On department level, the institutional coordinators were asked whether they had a standard nutritional screening policy that including validated screening tools, which was used during admission. This was defined as a psychometrically tested (valid and reliable) screening tool, which is applied to every hospitalized patient within 24 hours after admission, for example the Malnutrition Universal Screening Tool (MUST) <sup>28</sup> or the Mini Nutritional Assessment (MNA) <sup>29</sup>.

On the patient level, demographic data was collected to assess the degree of care dependency according to the *Care Dependency Scale* (CDS) <sup>30</sup>. Summed scores can range from 15 to 75. The lower the score, the higher the level of care dependency <sup>30</sup>. Medical diagnoses were assessed according to the main categories of the *International Classification of Disease* (ICD 10) <sup>31</sup>. Patients had to be weighed on the day of data collection with light clothes and without shoes. If weighing was not possible, for example, due to a very poor overall condition of the patient, the patients or their relatives were asked for their current weight. Patient height was measured either with a measuring tape or, if this was not possible, calculated based on the knee height and the length of the forearm or demi-span. Malnutrition was defined as the unintentional weight loss of more than 6 kg over the last 6 months, or more than

3 kg during the last month and/or a Body Mass Index (BMI) < 18.5 kg/m<sup>2</sup> in patients younger than 65 and < 20 kg/m<sup>2</sup> for patients 65 years of age and older<sup>32</sup>. Furthermore, participants were asked if a screening for nutritional status was conducted during patient admission. If patients were screened, they were asked with how many indicators they were screened (e.g., current weight of the patients, clinical observation by the nurses, a validated nutritional screening tool like MUST, MNA or, laboratory parameters). In addition, nutritional interventions were assessed for all patients by allowing them to choose from among 15 potential answers (e.g., energy and protein enriched diet, oral nutritional supplements) including the answer option of “other interventions”, which allowed for multiple answers.

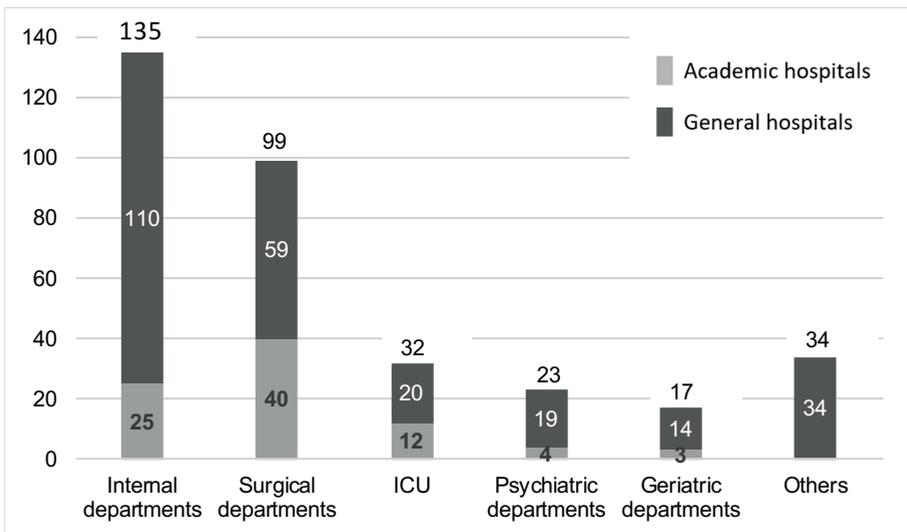
### **Data analysis**

All data were processed using SPSS 23.0 statistical software (Statistical Package for the Social Sciences Chicago, Illinois) IBM Corp.<sup>33</sup>. Discordant values and contradictions within the data file were checked, and data cleaning was performed. Patients younger than 18 years were excluded from the data analysis because the applied definition of malnutrition was developed for adults. Categorical data are presented as absolute and relative frequencies, while continuous data are presented as means with standard deviations (SD), or as medians with ranges. Differences among the malnourished and non-malnourished patients were assessed by applying the  $\chi^2$ -test, the independent sample T test, or the Mann-Whitney U test. To calculate the association between the use of a guideline and the use of validated screening tools on the department level, the data were aggregated on the institutional and departmental levels and analyzed by applying contingency tables and the  $\chi^2$ -test. The  $\chi^2$ -test was also used to calculate the association between the use of validated screening tools and the prevalence of malnutrition, as well as dietitian referral and other nutritional interventions on the patient level. The statistical significance was set to  $\alpha = 0.05$ .

## RESULTS

### Sample characteristics

53 hospitals took part in this study. The mean number of departments in these hospitals was 6, whereas 3 hospitals with more than 20 departments participated. Most of the 340 departments of the participating hospitals were internal or surgical departments (see Figure 5.1). Altogether, 7286 potential study participants were admitted to the departments on the day of the measurement. The patients' response rate was 73.7 %, 112 patients had to be excluded due to implausible BMI ( $n = 3$ ), ages of 18 years or younger ( $n = 15$ ), and problems with hydration ( $n = 94$ ). BMI and weight loss measurements would not be conclusive in these patients and the prevalence of malnutrition would be distorted. For results that adhere to the definition of malnutrition (research question 3a), data from 3579 patients could be analyzed because no information was available for the current weight of 1788 patients.



**Figure 5.1** Participating departments by specialization  
ICU = Intensive care unit

The median age of the patients included was 65.6 years (SD 17.2), 56.4 % were 65 years or older. 53.3 % of the participants were female. The mean number of medical diagnoses was 2.3 ( $\pm 1.6$ ). The three most prevalent diagnoses were cardiovascular diseases (39.7 %), motor neuron diseases (24.7 %), and

respiratory diseases (20.0 %). 9.9 % of the patients were completely or highly dependent on care, whereas 63.8 % were completely independent. The patient characteristics are presented in Table 5.1.

**Table 5.1** Patient characteristics and differences among malnourished and non-malnourished patients

Characteristics	Total n = 5255	Malnourished n = 664	Non- malnourished n = 2915	p-value
<b>Sex</b>				
<b>Female</b>	2800 (53.3 %)	364 (54.8 %)	1498 (51.4 %)	0.1
<b>Male</b>	2455 (46.7 %)	300 (45.2 %)	1417 (48.6 %)	
<b>Age</b>	69 [19-99]	70 [19-96]	67 [19-96]	0.001
<b>High Care Dependency (CDS 15-44)</b>	522 (9.9 %)	47 (7.1 %)	151 (5.2 %)	0.05
<b>CDS</b>	66.3 (± 14.4)	67.2 (± 12.6)	69.3 (± 11.2)	< 0.001
<b>BMI</b>	26.3 (± 5.2)	22.5 (± 4.7)	27.2 (± 4.9)	< 0.001
<b>Number of medical diagnoses</b>	2.3 (± 1.6)	2.3 (±1.5)	2.1 (± 1.4)	0.001
<b>Cardiovascular disease</b>	2088 (39.7 %)	229 (34.5 %)	1086 (37.3 %)	0.182
<b>Motor neuron disease</b>	1299 (24.7 %)	117 (17.6 %)	738 (25.3 %)	< 0.001
<b>Respiratory disease</b>	1049 (20.0 %)	155 (23.3 %)	483 (16.6 %)	< 0.001
<b>Disease of the digestive tract</b>	1021 (19.4 %)	173 (26.1 %)	514 (17.6 %)	< 0.001
<b>Disease of the kidneys</b>	830 (15.8 %)	99 (14.9 %)	396 (13.6 %)	0.372

BMI = Body Mass Index, CDS = Care Dependency Scale

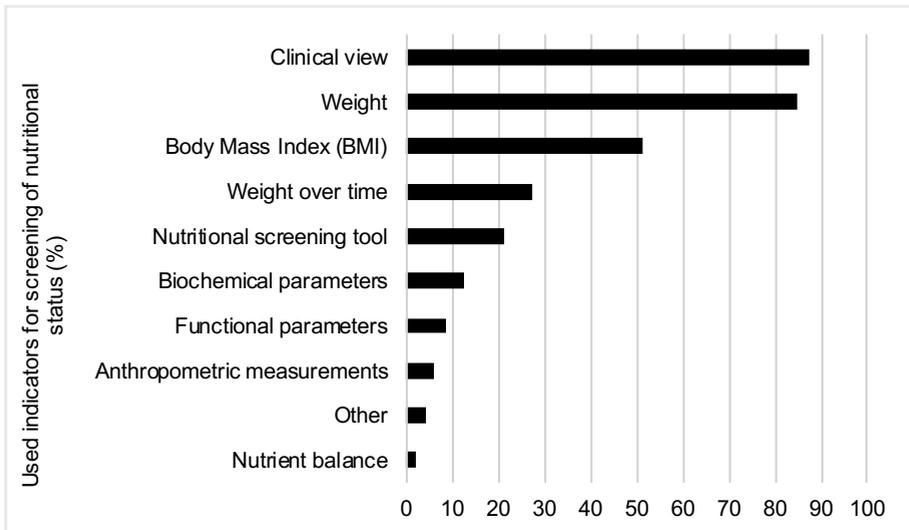
Values presented are n (%) for categorical data and mean (±SD) or median [range] for metric data, according to the distribution.

### Association between malnutrition guidelines and validated screening tools

On an institutional level, 23 out of 53 (43.4 %) institutional coordinators from the participating hospitals indicated that approved guidelines for the prevention and treatment of malnutrition existed within the institution. The institutional coordinators of the departments in hospitals with guidelines stated more often (47.8 % vs. 33.8 %,  $p < 0.012$ ) that they use a validated screening tool as part of a standard procedure during admission.

### Nutritional Screening Policy

The nutritional status of 74.5 % of the patients ( $n = 3914$ ) was screened during admission to the hospital. The indicators most commonly used were the clinical observations of the nurses, the current weight, and the BMI. 21.2 % ( $n = 829$ ) patients were assessed with a validated screening tool such as the MNA, MUST, or others. The frequencies of the indicators used for screening of nutritional status are shown in Figure 5.2, and multiple answers were possible.



**Figure 5.2** Indicators used for screening of nutritional status during admission to hospital (%), with multiple answers possible

On a departmental level, the institutional coordinators from 131 out of 340 (38.5 %) participating departments stated that a validated screening tool is

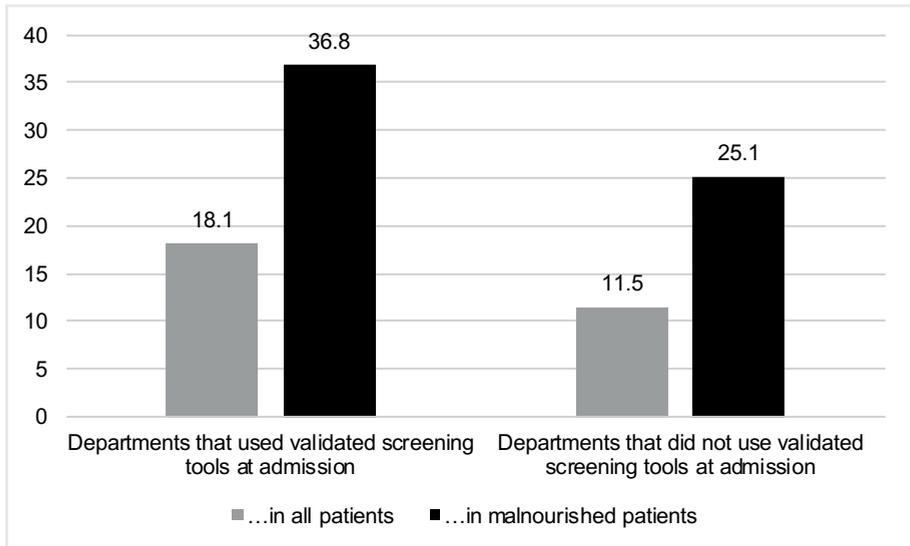
used as part of a standard procedure at the department. However, only 808 out of 1838 (44 %) of the patients admitted to these 131 wards were effectively screened with a nutritional screening instrument.

### Association between validated screening tool and prevalence of malnutrition

The prevalence of malnutrition was 18.6 %. Malnourished patients were significantly older, had a higher number of diseases, and were more dependent on care than non-malnourished patients. The prevalence of malnutrition in departments measured using validated screening tools was significantly lower than in departments that did not use screening tools (16.1 % vs. 20.2 %,  $p = 0.002$ ).

### Association between validated screening tool and dietitian consultation

731 out of 5255 (13.9 %) of the hospitalized patients received consultation from a dietitian. The number of patients referred to a dietitian differed significantly between departments that used a validated screening tool upon patient admission and departments that do not have such a nutritional screening policy ( $p < 0.001$ ) (see Figure 5.3).



**Figure 5.3** Referral to a dietitian in departments with and without a validated screening tool as part of a standard procedure; \* significant differences  $p < 0.001$

### Association between validated screening tool and other nutritional interventions

The number of nutritional interventions differed significantly for patients of departments that used a validated screening tool as part of a standard procedure and patients of departments that did not use one (see Table 5.2). Patients of departments that using a validated screening tool received more interventions than patients of departments that did not use a screening tool.

**Table 5.2** Nutritional interventions of patients in departments with and without a validated screening tool as part of a standard procedure during patient admission

Intervention	Validated screening tool used		p-value
	Yes (n = 1938)	No (n = 3317)	
Energy (protein) enriched diet	165 (8.5 %)	248 (7.5 %)	0.178
Energy-enriched snacks provided between meals	175 (9.0 %)	246 (7.4 %)	0.038
Oral nutritional supplementation	79 (4.1 %)	113 (3.4 %)	0.212
Enteral tube feeding	21 (1.1 %)	85 (2.6 %)	< 0.001
Intravenous feeding	54 (2.8 %)	115 (3.5 %)	0.177
Adjusted consistency/ substance (food/ drinks)	74 (3.8 %)	185 (5.6 %)	0.004
Client receiving the daily required fluid intake	233 (12.0 %)	399 (12.0 %)	0.995
Information for patient or family	270 (13.9 %)	434 (13.1 %)	0.384
Adjusting meal ambience	397 (20.5 %)	493 (14.9 %)	< 0.001
Fluid list	234 (6.9 %)	211 (6.4 %)	0.435
Food list	132 (6.8 %)	152 (4.6 %)	0.001
No measures taken due to palliative policy	8 (0.4 %)	14 (0.4 %)	0.960
<b>No actions</b>	<b>1084 (55.9 %)</b>	<b>2090 (63.0 %)</b>	<b>&lt; 0.001</b>

## **DISCUSSION**

This study is one of few studies that has investigated the association between the use of clinical guidelines and nutritional screening and nutritional care<sup>34, 35</sup>. The main result of this study was that departments in which validated screening tools are used as part of a standard procedure based on guidelines have higher referral rates to dietitians, provide more nutritional interventions, and show lower prevalence rates of malnutrition. Furthermore, the results of our data analysis demonstrated that the presence of clinical guidelines for malnutrition is associated with a better nutritional screening policy, which means that more patients are screened using a validated screening tool.

### **Malnutrition guidelines**

As mentioned in the introduction, several clinical guidelines for the detection and management of hospital malnutrition exist<sup>13-17, 36</sup>. Fewer than half of the hospitals in our study sample used such a guideline. This result is similar to that of a previous study, which was published in 2012, in which the authors reported that about 60 % of the hospitals used malnutrition guidelines<sup>26</sup>. In our study, hospitals with such guidelines had a better nutritional screening policy, and patients in those institutions were screened more often using a validated screening tool. Data from the literature have shown that the implementation of clinical practice guidelines has positive effects on the quality of care in general<sup>37</sup>. However, no previous study has examined the effectiveness of the implementation of malnutrition guidelines. The magnitude of the effectiveness of such guidelines is influenced by many factors such as the strength of the evidence in the guidelines, the method of their development, the complexity of the recommendations, and the implementation strategy<sup>37</sup>. In our study, we asked whether malnutrition guidelines existed. Our results, therefore, indicate that the presence of these guidelines can have an impact on nutritional care in hospitals. The knowledge and presence of such guidelines may contribute to a higher degree of attention paid or better understanding of the problem of malnutrition among health personnel, better malnutrition screening policies and, therefore, an overall higher quality of nutritional care.

### **Nutritional screening policy in hospitals**

Standardized nutritional screening is a prerequisite for the early identification of malnourished patients and is recommended to be performed using validated screening tools<sup>15, 17, 23</sup>. Despite this recommendation, the results of the present study show that the most commonly used indicators for nutritional screening are the clinical observations of nurses, current weight, and BMI. These parameters are widely accepted as effective because screening and assessment tools are still not very commonly used in Austria. Our data revealed that the nutritional status was screened using a screening tool in only 21.2 % of the patients. Furthermore, even in departments in which the institutional coordinators stated that a validated screening tool was used as part of a standard procedure, only 44 % of the patients were effectively screened using the stated tools.

The reliance upon the ability of nurses to clinically judge patient nutritional status has been discussed in the literature as one of the major barriers to the introduction of standardized nutritional screening via screening tools. Studies have demonstrated that nurses usually trust their own clinical observations and, therefore, do not feel the need to use screening tools<sup>38</sup>. Porter, Raja, Cant, Aroni<sup>39</sup> described that nurses in Australian hospitals were exercising their clinical judgement rather than using validated screening tools, deciding on the basis of their clinical observations who should be referred to a dietitian. Data from the literature show that relying entirely on clinical observations to classify patients with mental illnesses with regard to their nutritional risk is not reliable<sup>38</sup>. A large percentage of malnourished patients are overlooked when using clinical judgement to screen for malnutrition<sup>38</sup>. The second method most commonly used to determine the nutritional risk in this study was to measure the current weight and BMI. These anthropometric parameters alone cannot be used to effectively determine nutritional status<sup>22, 23</sup>. The prognostic value of the BMI is difficult to interpret and/or can be misleading, particularly in older people who are the patients most frequently affected by malnutrition<sup>40</sup>. In our study, nearly 90 % of the nurses relied upon clinical observations to screen patients for their nutritional status, more than 80 % of the nurses relied upon the weight measurements, and more than 50 % relied upon the BMI. Therefore, according to the current literature, most nurses in Austria currently do not use valid or reliable tools in clinical practice.

With reference to the recent literature, some additional barriers exist in clinical practice for conducting screening. On one hand, these barriers arise due to a lack of awareness and the low priority given to nutrition in the daily clinical routine. On the other hand, an insufficient level of knowledge seems to exist among health care professionals with regard to malnutrition<sup>41</sup>. Results of a cross-sectional, Europe-wide study, which was conducted in 2007, showed that only half of the hospitals admitted to the application of routine nutritional screening, irrespective of whether the nutritional screening tool had been psychometrically tested or not. Most of the hospitals, however, conducted screening with tools that had been developed in-house and had not been psychometrically tested<sup>24,42</sup>. This could be due to the fact that a large variety of screening tools are described in the literature and available on the Internet. The diversity of options could be rather confusing for clinicians and, therefore, lead to variable decision-making<sup>24</sup>.

Specific departmental habits and/or embedded practices may be possible reasons for not using a tool that has been widely accepted in other locations<sup>43</sup>. Some studies have suggested that nutritional screening should be embedded in policy as well as in patient documentation to overcome this barrier. Furthermore, nutritional screening must be mandatory, or it will not be performed by staff<sup>39,43,44</sup>. Until now, screening has not been mandatory in Austria. In the Netherlands, for example, malnutrition screening was introduced as a performance indicator for hospitals, which means that hospitals are obligated to conduct nutritional screening using validated screening tools. Furthermore, the hospitals must report both the number of patients screened during admission and the number of malnourished patients to the Dutch Health Care Inspectorate (HCI). It could be shown that the percentage of screened patients significantly improved from 51 to 72 % after the implementation of malnutrition screening as a performance indicator<sup>45</sup>. These results show that political support from the national healthcare system plays a major role in the realization of adequate nutritional care in hospitals. However, the simple obligation to conduct malnutrition screening alone cannot offer a complete solution for the improvement of malnutrition screening. Other interventions must be made, such as the reduction of barriers in daily clinical practice<sup>39,43</sup>. The malnutrition screening tools used must be as simple as possible (e.g., the BMI should be automatically calculated by the computer) and high-quality educational programs need to be offered. When nursing staff rotate to a new department, they face the difficulties inherent in learning how to use new screening tools

and, therefore, continuing education is one of the most important factors that contributes to improving malnutrition screening <sup>43</sup>.

### **Nutritional screening tools and its association with prevalence of malnutrition, dietitian referral and nutritional interventions**

The present prevalence data are somehow lower than results reported in the current literature but, once more, underline the serious problem of hospital malnutrition <sup>10, 46</sup>. In our study sample, which consisted of 5255 patients, the current weight of 1788 patients was unknown. This meant that the malnutrition prevalence could not be calculated for these patients. When examining the characteristics of these 1788 patients, it could be seen that they were more dependent on care, have a higher care dependency in the CDS item “eating and drinking”, and were more multimorbid than the sample average. Malnutrition has been shown to be strongly associated with high levels of care dependency <sup>7</sup>. Therefore, it seems obvious that the prevalence of malnutrition measured in our sample (18.6 %) would have been higher if we had had the weight from the omitted patients. Furthermore, the definition of malnutrition applied may contribute to the relatively low prevalence of malnutrition. This definition was developed by experts in the field of malnutrition and is based on evidence-based guidelines <sup>32</sup>. However, according to this definition, the amount of weight loss should be recorded in whole numbers (e.g., 3 kg or 6 kg). The potential error, therefore, is higher for a patient with a lower weight as opposed to a patient with a higher weight. Whole numbers were initially used to make the data collection process as simple as possible for the nurses performing the assessment. If a definition were used that stipulated that weight loss should be recorded using rational numbers, the measured prevalence of malnutrition would have been higher.

We expected that especially the patients admitted to institutions and wards that used fewer guidelines and validated screening tools would have higher prevalence rates than seen in this study. We observed that the 1788 patients with unknown weights were admitted to institutions and wards that used fewer guidelines and validated screening tools. These results also showed that the use of guidelines and/or validated screening tools influence whether the patients are weighed or not.

An explanation for the lower prevalence of malnutrition reported by institutional coordinators in departments with standardized nutritional screening poli-

cies could be that, in general, nurses that screen in a standardized manner pay greater attention to malnourished patients or patients assessed as being at-risk. Perhaps these nurses had more educational training than nurses in other departments. As a consequence, they intervened more frequently and, consequently, provided more preventive interventions so that the prevalence of malnutrition remained lower than in other departments that did not use validated screening tools in a standardized manner.

This hypothesis is consistent with our results concerning the referral to dietitians. At departments in which the institutional coordinator reported that a validated screening tool was used as part of a standard procedure, a significantly higher frequency of dietitian consultations was observed. This could have potentially influenced malnutrition prevalence in these departments. Similar findings have been reported by Dutch authors<sup>45,47</sup>. In a controlled intervention trial they showed that patients who received malnutrition screening and subsequent nutritional therapy received a significantly higher number of referrals to a dietitian as compared to the control group. Patients in the control group were not routinely screened for malnutrition<sup>47</sup>.

The referral to a dietitian, which followed nutritional screening by nurses, is a prerequisite to begin an evidence-based nutritional therapy, which includes comprehensive nutritional assessment and provides individualized nutrition care plans<sup>48,49</sup>. Dietitians not only contribute to adequate nutritional therapy, but also to adequate nutritional screening, which is mostly conducted by nurses. A recently published study that evaluated the malnutrition screening policy in Dutch hospitals found that dietitians contributed to successful screening even if they did not conduct it themselves. Dietitians who are often present in the departments and provide continuous education for nurses and physicians function as motivators and enablers for successful malnutrition screening<sup>45</sup>. Therefore, the presence of dietitians in the departments as well as the integration of dietitians in the daily clinical routine in Austria could improve nutritional care and may influence malnutrition prevalence.

Nevertheless, the correlation between the malnutrition screening tool used and malnutrition prevalence must be carefully scrutinized. We cannot know whether the patients were malnourished prior to their admission to hospital or if the departments without screening tools had a high number of high-risk patients (e.g., cancer patients, geriatric patients). If this were the case, this

could be an additional explanation for the higher prevalence of malnutrition in departments that lacked screening tools. This correlation was identified in the current study, but data to explain this correlation is lacking.

Another important finding of the present study was the significant difference between departments with and without validated screening tools, with regard to the number of nutritional interventions performed at the department. These results again highlight the importance of nutritional screening tools as starting points for evidence-based nutrition care. The application of screening tools can lead to greater awareness for malnutrition in general and may enhance the use of nutritional interventions. Thus, it is of the utmost importance to implement validated screening tools as a state-of-the-art in every hospital, and particularly hospitals in Austria. To achieve routine malnutrition screening in hospitals, it seems beneficial to involve national agencies as well as political leaders <sup>24</sup>.

### **Further advantages of early nutritional screening**

As mentioned in the introduction, malnutrition is a challenge for both health professionals as well as the health care systems <sup>12</sup>. Conducting malnutrition screening during the admission to hospital is an effective strategy to initiate early nutritional interventions <sup>23</sup>. Findings in the literature show that targeted nutritional interventions are effective and can lead to improved health-related outcomes <sup>50-53</sup>. A recently-published systematic review that addresses the effectiveness of oral nutritional supplements showed improved outcomes for patients such as an improvement in the quality of life, reduction in infections, reduction in minor post-operative infections, reduction in falls, and reduction in functional limitations <sup>50</sup>. Furthermore, the authors found that the use of oral nutritional supplements helped institutions save money, or at least not spend more <sup>50</sup>. Considering the positive patient-related outcomes of nutritional interventions, these are convincing arguments that support routine nutritional screening, including re-screening within pre-defined periods and good nutritional care in daily clinical practice.

### **Limitations of the study**

The results of the present study have added to the knowledge about the nutritional screening policies and their associations with nutritional care present in some Austrian hospitals. Nevertheless, there are some limitations to this

study. A selection bias is possible, because participation in the survey was voluntary and only 20 % of Austrian hospitals accepted the invitation to participate. Furthermore, the hospitals were invited to encourage every integrated department to participate, but this was not always the case. It is possible that hospitals forwarded the invitation to participate in the study on to the departments with the best nutritional care practices. The need to receive the written informed consent of all patients could lead to the refusal of patients with a very poor state of health to participate, although exactly these patients would be at a high risk of malnutrition and, therefore, potentially the most interesting for the study. Unfortunately, some values were omitted from the questionnaires with reference to the extent of weight loss of the patients. Subsequently, not all of the patients included could be categorized as malnourished or not; data from these patients had to be excluded from some parts of the statistical analysis. Another limitation is that the cross-sectional design of the present study does not allow conclusions to be made with regard to causalities.

### **Recommendations for research and practice**

However, based on the results, we recommend that further clinical trials be conducted to investigate the impact of nutritional screening tools on nutritional care and malnutrition prevalence in a prospective, controlled manner to derive causalities. For the clinical practice, we strongly recommend the use of validated screening tools at admission as well as re-screening in defined time intervals unless the present data show the benefits of good nutritional care.

### **CONCLUSIONS**

Nutritional screening with validated tools remains poor in Austrian hospitals. Mostly, nutritional status of the patients is screened by not reliable parameters (e.g. clinical judgement, current weight). Our results show that the presence of a clinical guideline is associated with better nutritional screening policy. Furthermore, the quality of nutritional care improves with implementing a validated screening tool as a matter of standard procedure at the department. To prove this hypothesis and to gain comprehensive conclusion about the impact of nutritional screening tools, high quality intervention studies have to be conducted in the future.

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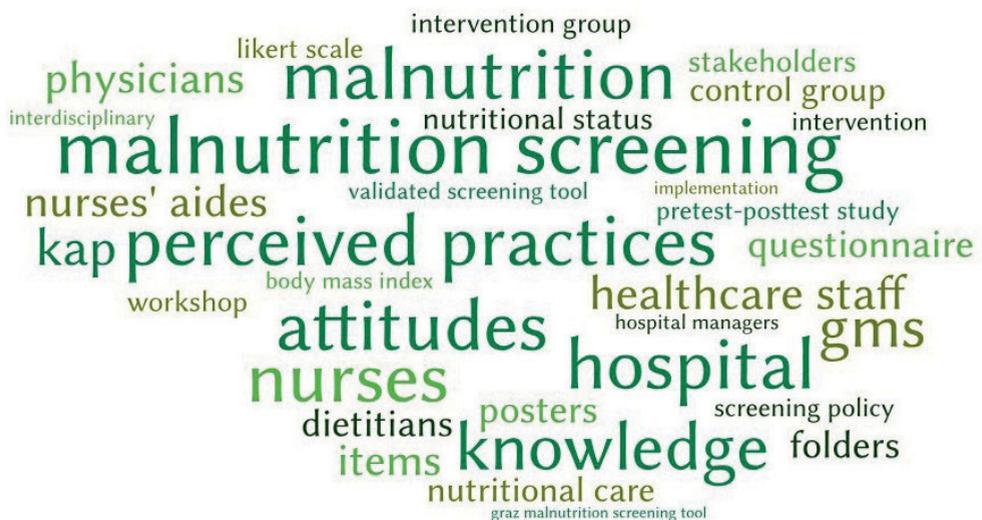


## Chapter 6

# Use of an electronic malnutrition screening tool in a hospital setting: Effects on knowledge, attitudes and practices of healthcare staff

Doris Eglseer, Ruud Halfens, Christa Lohrmann

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## **ABSTRACT**

Malnutrition risk screening is essential for the adequate identification and treatment of malnourished hospitalized patients. The aim of this study was to determine the effect of the use of an electronic malnutrition screening tool on the knowledge, attitudes and practices of a pool of nurses, nurses' aides and physicians. A controlled study using a pretest-posttest design was conducted in two Austrian hospitals. The hospital that was assigned to the intervention group used the Graz Malnutrition Screening Tool (GMS). The hospital that was assigned to the control group received no intervention. To collect data, a questionnaire was filled out by the study participants at baseline (T0) and one month after the implementation (T1) to assess knowledge, attitudes and practices (KAP). All data were analysed using descriptive statistics, chi-squared tests, Wilcoxon signed-rank tests and Student's t-tests. 269 nurses, nurses' aides and physicians participated in the study and completed the questionnaires at T0; 190 people at T1. The sum score for the KAP questionnaire changed significantly after the implementation of the malnutrition screening tool in the intervention group ( $p < 0.001$ ), but not in the control group. The use of a valid and reliable malnutrition screening tool effectively improved the knowledge, attitudes and practices of healthcare staff. This knowledge, attitudes and practices are essential to providing successful nutritional care in malnourished patients, and improving these factors may result in improved patient outcomes. To attain these outcomes, stakeholders as well as members of all professions involved in multidisciplinary nutritional care must invest significant efforts.

**KEYWORDS:** malnutrition screening, hospital, knowledge, practices



## INTRODUCTION

Malnutrition is a serious and common condition in hospitalized patients, affecting up to 60 % of these patients, depending on the hospital setting and the population <sup>1</sup>. Internal wards with a high percentage of older adults have the highest prevalence rates <sup>1</sup>. Malnutrition is defined as a condition in which a lack of energy, protein and/or other nutrients causes measurable and adverse effects on the body composition, function and clinical outcomes. It encompasses both under- and overnutrition <sup>2</sup>. For the purpose of this paper, malnutrition refers to undernutrition. The adverse effects include prolonged wound healing, higher risks of complications, longer hospital stays, higher levels of care dependency and higher rates of mortality, all of which place a high cost burden on the healthcare systems <sup>3,4</sup>.

To adequately prevent and treat malnutrition in hospitalized patients, guidelines recommend conducting nutritional risk screening with a valid and reliable screening tool within 24 hours of the patient's hospital admission <sup>5-13</sup>. Malnutrition screening can be rapidly carried out to identify subjects at nutritional risk <sup>13</sup>. Studies show that more than half of patients with (or at risk of) malnutrition are not identified unless malnutrition screening is conducted <sup>14,15</sup>. Furthermore, patients staying in wards that do not use a malnutrition screening tool receive fewer nutritional interventions than patients in wards that use a malnutrition screening tool <sup>16</sup>.

However, many hospitals have not integrated the routine use of a validated screening tool in the standard procedure in their wards, although this varies greatly among different countries <sup>16,17</sup>. If the healthcare staff do not use a valid and reliable screening tool, other indicators are usually used to determine the nutritional status of the hospitalized patients. Commonly used indicators are weight or the Body Mass Index (BMI) <sup>16</sup>. Another commonly used indicator is the clinical view of healthcare professionals, which is a subjective indicator. Weight, BMI and also the clinical view of staff are of low validity and reliability and their use may lead to a lack of recognition of malnourished patients, which emphasizes the need for systematic screening with validated tools <sup>16</sup>. Data collected as part of the "*International Prevalence Measurement of Care Problems*", a large, cross-sectional, annual survey <sup>16</sup>, show that about 38.5 % of Austrian hospital wards use a screening-tool but that the screening is not conducted with more than half of the patients on these wards.

The reasons that healthcare staff do not use a malnutrition screening tool are manifold and include the lack of time and knowledge, a low priority of nutritional issues in general, absence of a supportive organizational culture and negative attitudes of healthcare staff (e.g., nurses) toward malnutrition screening<sup>18, 19</sup>. Malnutrition is a multidisciplinary topic, and successful nutritional care is only possible if professionals such as dietitians, physicians, nurses and nurses' aides work together<sup>20</sup>. For this reason, specific roles and responsibilities for patient nutritional care are often not clearly assigned to members of these different professions<sup>18</sup>.

To convince healthcare staff, stakeholders and hospital managers of the need to use a nutritional screening tool as part of their daily routines, studies must be carried out to investigate the effectiveness of these tools<sup>21</sup>. However, up until now, few studies have been conducted to evaluate the effectiveness of the use of a malnutrition screening tool with regard to the knowledge, attitudes and practices of healthcare staff in hospitals, although these are key components for the successful nutritional care of malnourished patients<sup>21</sup>.

Therefore, the aim of this study was to determine the effect of the use of a valid and reliable malnutrition screening tool as part of an existing electronic documentation system in a hospital to assess the knowledge, attitudes and practices of nurses, nurses' aides and physicians regarding malnutrition.

## **METHODS**

### **Design**

A controlled study with a pretest-posttest study design was conducted to determine the knowledge, attitudes and perceived practices of healthcare staff (nurses, nurses' aides and physicians) on malnutrition at the baseline (T0) and one month after the implementation of a malnutrition screening tool (T1).

### **Participants**

We chose a convenience sample of two Austrian hospitals, which represented the intervention and control groups, respectively. The inclusion criteria were that the hospitals had not used a malnutrition screening tool prior to the study and both concurrently agreed that they were willing to use a malnutrition screening tool. Furthermore, the two hospitals were chosen due to their

similarities in terms of the patient characteristics (e.g., age, diseases) and organizational structures (e.g., sizes of the hospital, sizes of the wards, number of beds, specialisations).

This study was carried out in the internal wards of the respective hospitals. The internal wards were chosen because of the high prevalence of malnutrition in patients in these wards <sup>1, 22</sup>. The participating hospitals decided to participate in this study and use it as a pilot-project to determine whether the tool could be used in all hospital wards in the future. Figure 6.1 shows the timeframe of the study procedure.

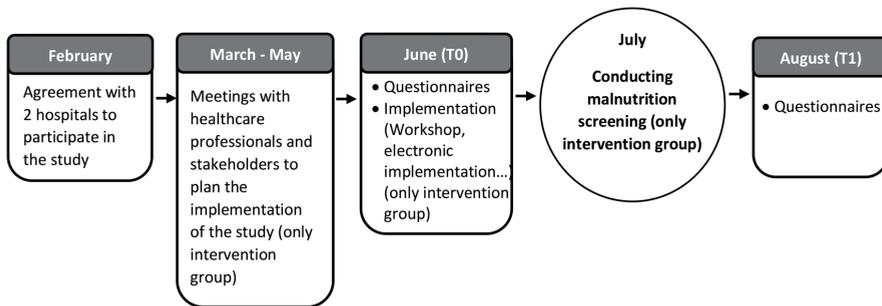


Figure 6.1 Time frame of the study procedure, year 2017

### Intervention

The intervention was the implementation of the Graz Malnutrition Screening Tool (GMS) <sup>22</sup>. This tool was chosen, among other reasons, because it has been developed by local experts. This increased the acceptability of the screening tool to the users. Furthermore, the GMS was chosen because it has been explicitly developed for hospitalized patients, based on the ESPEN guidelines for nutrition screening <sup>7</sup>. Furthermore, it shows good psychometric properties <sup>22</sup>, and it was possible to use this screening tool in conjunction with the existing electronic documentation system used in the hospital. The GMS consists of four items: BMI, weight loss, nutritional intake and diseases related to nutrition.

The implementation process consisted of several actions. First, the screening tool needed to be integrated into the existing electronic documentation system of the hospital. We decided to include the screening in the process of electronically documenting of patient records for practical reasons. We assumed

that it make the application of the screening as easy as possible, allowing staff to screen the patients' nutritional status while performing the standardized nursing/medical assessment and entering this information into the electronic documentation system during the admission of the patients.

From March until May 2017, we held several meetings in the intervention hospital with the ward nurses and stakeholders to plan the timeframe and implementation of the study (see Figure 6.1). In June, the research dietitian conducted two workshops, each with a duration of about 45 minutes. In these workshops, the dietitian described the background of the screening tool, provided instructions on how to fill out the screening forms. All the nurses, nurses' aides and physicians in the respective wards were invited to take part in these workshops (i.e., participation was voluntary). At the workshops, two innovators (one nurse and one physician) were chosen who would control the application of the screening and remind colleagues to conduct the screening during the admission of each patient. The workshop explained how to use the screening tool and did not aim to educate the participants about malnutrition. Printed folders and posters, including the most important information about the project and the contact details from the project leader were handed out to each ward nurse to be distributed in the participating departments.

The control group did not receive any intervention.

### **Questionnaire**

To collect data, a questionnaire was used to assess the knowledge, attitudes and perceived practices (KAP) of the study participants<sup>23</sup>. Data were collected at two time points: at the baseline (T0, June 2017) and one month after the implementation of the malnutrition screening tool (T1, August 2017). The questionnaire was handed out to all nurses, nurses' aides and physicians who were working in the participating wards by the research team in printed form (see Figure 6.1).

### **Knowledge, attitudes and perceived practices (KAP)**

The first part of the questionnaire consisted of demographic questions, while the second part of the questionnaire was the instrument used to assess the knowledge, attitudes and perceived practices (KAP) of the healthcare staff, which was previously published by Laur et al.<sup>23</sup>. We obtained the written per-

mission to use this questionnaire before starting the study. The questionnaire includes <sup>27</sup> questions which are divided in two subscales. The first subscale (20 questions) includes questions that allowed us to assess the knowledge and attitudes (KA) of the health professionals, and the second subscale (7 questions) includes practice questions (P) that allowed us to assess the perceived nutritional practices regarding malnourished patients in the respective wards. The participants answered the questions using a 5-point Likert scale (KA subscale) or 4-point Likert scale (P subscale). The possible answers to the KA questions ranged from strongly disagree (1 point) to strongly agree (5 points). The answer categories for the P questions were: never (1 point), sometimes (2 points), often (3 points), always (4 points), or not applicable (1 point). The maximum score that could be achieved on the whole questionnaire was 128, which consisted of 100 points for the KA subscale and 28 for the P subscale <sup>23</sup>.

The questionnaire was designed to reflect high-quality nutrition care practices and was designed for use in hospitals <sup>23</sup>. It has an acceptable length and generally takes about 10 minutes to complete. The questionnaire was tested in terms of its face validity and test-retest reliability and satisfactory results were reached. The intraclass correlation coefficient (ICC) for the subscale knowledge and attitudes was 0.69, and the ICC for the subscale practice was 0.84 <sup>23</sup>.

In the current study, the original English questionnaire was translated into the German language by a dietitian who is familiar with the terminology used in the area of malnutrition. Afterwards, an independent professional translator (native speaker) translated the questionnaire back to English. After a discussion was held with dietitians, nurses and nurse researchers, certain formulations were adapted after the back-translation, and a pre-test of the questionnaire was conducted with 15 healthcare professionals. Subsequent feedback received from these professionals led to the final adaptations of the questionnaire, which ensured the simplicity and efficiency of its use.

Furthermore, three subjective statements were added that allowed us to collect data on the personal opinions of the participants and investigate the concurrent validity of the German version of the KAP questionnaire. These were:

- My knowledge regarding malnutrition improved since the last measurement.

- My attitudes regarding malnutrition improved since the last measurement.
- The nutritional management of malnourished patients at my ward improved since the last measurement.

These statements needed to be rated by the participants with a 5-point Likert scale (answers ranging from strongly disagree to strongly agree).

### **Data analysis**

All data were entered into the SPSS statistical software (Statistical Package for the Social Sciences Chicago, Illinois) version 23 and analysed using descriptive statistics, chi-squared tests, Wilcoxon signed-rank tests and Student's t-tests. The confidence intervals for the t-tests were set at 95 %. The effect sizes were calculated and interpreted as suggested by Cohen <sup>24</sup>. The small effect size was set at 0.10, the medium effect size at 0.3 and the large effect size at 0.5 <sup>24</sup>. Questionnaires with missing data were excluded from the analysis to obtain the KAP total score, KA subscore and P subscore.

To analyse the three, additional, subjective questions (if the participant believed that their knowledge, attitudes and perceived practices had changed), a new variable was created. With respect to this variable, the answers in the 5-point Likert scale that were treated as "yes, knowledge/attitudes/perceived practices changed" were "strongly agree" and "somewhat agree". Answers that were treated as "no, knowledge/attitudes/perceived practices did not change" were "strongly disagree" and "disagree". "Neutral" answers were not taken into account during the analysis of these items. The associations between the improvements in knowledge, attitudes, or perceived practices and the intervention vs. control group were analysed using the chi-squared test.

### **Justification of sample size**

A calculation of minimally detectable effect sizes of changes in the KAP sum score between T0 and T1 was conducted. A sample size of 150 would have 80 % power to detect an effect size of at least 0.230 using a paired t-test with a two-sided significance level of 0.05.

### **Ethical considerations**

The local ethics committee approved the study (29-270 ex 16/17). Participation in the study was voluntary for the hospitals. The nurse hospital managers as well as the medical hospital managers had to provide their written informed consent. All ward nurses and medical heads in the participating departments had to provide their agreement to participate in writing.

## **RESULTS**

### **Demographic data**

269 nurses, nurses' aides and physicians participated in the study and filled out the questionnaire at the baseline. Of these 269 participants at the baseline, 190 persons completed the questionnaire at T1. No significant differences in the demographic data among the participants in the intervention group and control group at baseline were observed (see Table 6.1).

## Tables

**Table 6.1** Baseline demographic data of the participants in the intervention and control groups

	Intervention group (n = 164)	Control group (n = 105)	p-value
	n (%)	n (%)	
Female	138 (84.7)	86 (81.9)	0.613
Profession			0.459
Physicians %	33 (20.3)	27 (25.7)	
Nurses %	84 (51.5)	54 (51.4)	
Nurses' Aides %	46 (28.2)	24 (22.9)	
Age			0.06
<30	24 (14.7)	26 (24.8)	
30-39	47 (28.8)	48 (36.2)	
40-49	56 (34.4)	23 (21.9)	
50-60	35 (21.5)	18 (17.1)	
> 60	1 (0.6)	0 (0)	
Work experience			0.13
< 2 years	8 (4.9)	14 (13.3)	
2-5 years	21 (12.9)	16 (15.2)	
6-10 years	32 (19.5)	24 (22.9)	
11-20 years	50 (30.7)	23 (21.9)	
21-30 years	40 (24.5)	21 (20.0)	
> 31 years	12 (7.4)	7 (6.7)	
Working full-time	83 (51.2)	65 (61.9)	0.09

Note: 1 person in the intervention group did not answer all of the demographic questions.

### Changes in scores of the KAP questionnaire

Of the 190 questionnaires that were filled out at the baseline (T0) and one month after the implementation of the malnutrition screening tool (T1), seven had missing data. Subsequently, 183 of the 269 participants' questionnaires (68 %) could be included to calculate the sum score for the whole KAP questionnaire and scores for the KA and P subscales. The baseline scores for the intervention and control groups were very similar in terms of these three scales (see Table 6.2).

**Table 6.2** Changes in sumscore and subscores of the KAP questionnaire before and after the implementation of the malnutrition screening tool, with effect size

	<b>Sum score, KAP (max. score = 128)</b>			
	T0 mean (SD)	T1 mean (SD)	<i>p</i> -value	<i>Effect size</i>
IG (n = 120)	95.8 (8.0)	98.3 (8.6)	0.000	0.3
CG (n = 63)	95.9 (9.8)	97.4 (9.4)	0.081	-
<b>Subscore, KA (max. score = 100)</b>				
IG (n = 120)	75.9 (6.4)	77.3 (7.1)	0.009	0.2
CG (n = 63)	76.1 (8.3)	77.6 (6.5)	0.113	-
<b>Subscore, P (max. score = 28)</b>				
IG (n = 120)	19.9 (5.0)	21.0 (4.8)	0.007	0.2
CG (n = 63)	19.8 (4.4)	19.9 (4.4)	0.968	-

IG = intervention group, CG = control group, KAP = knowledge, attitudes and perceived practices, KA = knowledge, attitudes, P = perceived practices, SD = standard deviation

The sum score for the KAP questionnaire changed significantly after the implementation of the malnutrition screening tool in the intervention group ( $p < 0.001$ ), but not in the control group ( $p = 0.081$ ). Similar results were observed when the data was analysed separately for each subscale. The KA score changed significantly in the intervention group ( $p = 0.009$ ) but not in the control group ( $p = 0.113$ ) and a significant improvement in the P subscale was observed in the intervention group ( $p = 0.007$ ), but not in the control group ( $p = 0.968$ ) (see Table 6.2).

### Changes in single items on the KAP questionnaire

Overall, we observed significant, positive changes between T0 and T1 in eight items for the intervention group (see Table 6.3); specifically, these included four items in the KA subscale and four items in the P subscale. The highest effect size was reached regarding the change in agreement to the statement “All patients should be screened for malnutrition at admission to hospital”.

In the control group, data related to two items on the KA questionnaire improved significantly after the implementation of the screening tool (see Table 6.4).

**Table 6.3** Items on the KAP questionnaire that changed significantly in the intervention group between T0 and T1, with effect size

Items	Pretest (T0)		Posttest (T1)		Pretest/posttest		Effect size		
	M	SD	M	SD	Z	P			
<b>Knowledge and attitudes</b>									
Nutrition is not important to every patient's recovery in hospital	1.9	1.1	1.5	0.9	2.1	0.036	0.2	S-M	
All patients should be screened for malnutrition at admission to hospital	3.1	1.0	3.4	1.0	3.4	0.001	0.3	M	
I know how to refer to a dietitian	4.1	0.9	4.2	0.8	2.0	0.044	0.2	S-M	
I need more training to better support the nutrition needs of my patients	3.4	1.1	3.6	0.9	2.2	0.030	0.2	S-M	
<b>Perceived practices</b>									
Assist a patient to eat if they need help	3.4	1.0	3.6	0.9	2.1	0.034	0.2	S-M	
If permitted, encourage a patient's family to bring food from home for the patient	2.5	1.0	2.7	1.0	2.5	0.012	0.2	S-M	
Visit and check a patient during their meal time to see how well they are eating	2.9	0.9	3.1	1.0	2.7	0.006	0.2	S-M	
Realign my tasks so I do not interrupt a patient during their mealtime	2.4	1.0	2.6	1.0	2.3	0.024	0.2	S-M	

M = Mean, SD = Standard deviation, S = small, M = medium

**Table 6.4** Changes in the knowledge and attitudes (KA) items of the KAP questionnaire between T0 and T1

	Intervention group (n = 122)			Control group (n = 68)		
	T0 M (SD)	T1 M (SD)	p-value	T0 M (SD)	T1 M (SD)	p-value
<b>Knowledge and attitudes (KA), 5-point Likert scale</b>						
1. Nutrition is not important to every patient's recovery in hospital *	1.9 (1.1)	1.7 (0.9)	0.036	1.5 (0.9)	1.4 (0.7)	0.286
2. All patients should be screened for malnutrition at admission to hospital	3.1 (1.0)	3.4 (1.0)	0.001	3.1 (1.2)	3.1 (1.1)	0.801

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3. A patient's weight should be taken at admission	4.3 (0.7)	4.3 (0.8)	0.817	4.4 (0.8)	4.4 (0.7)	0.442
4. All staff involved in patient care can help set up the tray, open packages, etc.	4.2 (0.9)	4.3 (0.8)	0.316	4.0 (1.3)	4 (21.1)	0.394
5. All staff involved in patient care can provide hands-on assistance to eat when necessary	4.5 (0.7)	4.4 (0.9)	0.264	4.3 (1.0)	4.3 (0.9)	0.933
6. Malnutrition is a high priority at this hospital	3.5 (0.9)	3.6 (1.0)	0.923	3.1 (1.0)	3.2 (0.9)	0.152
7. Giving malnourished patients an adequate amount of food will enhance their recovery	4.0 (0.8)	4.1 (0.7)	0.239	4.1 (0.9)	4.2 (0.6)	0.227
8. All malnourished patients require individualized treatment by a dietitian *	4.3 (0.7)	4.2 (0.9)	0.205	4.0 (1.1)	4.2 (0.8)	0.172
9. I have an important role in promoting a patient's food intake	3.9 (0.9)	4.0 (0.9)	0.265	4.0 (0.9)	4.0 (0.8)	0.718
10. Monitoring food intake is a good way to determine a patient's nutritional status	4.0 (0.6)	4.1 (0.8)	0.664	3.8 (0.9)	4.0 (0.8)	0.192
11. Interruptions during the meal can negatively affect patient food intake	3.8 (0.9)	3.9 (0.8)	0.074	3.7 (1.0)	4.0 (0.8)	0.013
12. Promoting food intake to a patient is every staff member's job	4.3 (0.6)	4.3 (0.7)	0.965	4.3 (0.9)	4.3 (0.7)	0.848
13. Nutritional care of a patient is only the role of the dietitian *	2.6 (1.0)	2.8 (1.1)	0.053	2.3 (1.0)	2.1 (0.8)	0.053
14. Malnourished patients who are discharged need follow up in the community	3.9 (0.8)	3.8 (0.7)	0.512	3.9 (0.8)	3.9 (0.8)	0.807
15. A patient's weight is not necessary at discharge *	2.5 (1.1)	2.5 (1.0)	0.342	2.4 (0.9)	2.5 (1.1)	0.344
16. I always know when to refer to a dietitian	3.3 (0.9)	3.4 (0.9)	0.657	3.4 (0.9)	3.6 (0.8)	0.023
17. I know how to refer to a dietitian	4.1 (0.9)	4.2 (0.8)	0.044	4.1 (0.9)	4.1 (0.8)	0.768
18. I know when a patient is at risk of malnutrition or is malnourished	3.6 (0.9)	3.7 (0.8)	0.373	3.6 (1.0)	3.7 (0.8)	0.389
19. I know some strategies to support food intake at meals	4.0 (0.7)	4.1 (0.7)	0.130	4.1 (0.7)	4.3 (0.5)	0.131
20. I need more training to better support the nutrition needs of my patients	3.4 (1.1)	3.6 (3.6)	0.030	3.3 (0.9)	3.2 (0.9)	0.184

\* Reverse coded questions; Note: For some items, the n is slightly smaller than 122 or 68, because not everyone completed all questions

**Table 6.5** Changes in practice (P) items of the KAP questionnaire between T0 and T1

	Intervention group (n = 122)			Control group (n = 68)		
	T0 M (SD)	T1 M (SD)	p-value	T0 M (SD)	T1 M (SD)	p-value
<b>Perceived practices (P), 4-point Likert scale</b>						
21. Check the patient has all that they need to eat (e.g., dentures, glasses)	3.4 (0.9)	3.5 (0.9)	0.092	3.4 (0.9)	3.4 (1.0)	0.704
22. Help a patient with opening food packages	3.4 (1.0)	3.5 (0.9)	0.108	3.3 (1.0)	3.3 (1.0)	0.825
23. Assist a patient to eat if they need help	3.4 (1.0)	3.6 (0.9)	0.034	3.3 (1.1)	3.2 (1.2)	0.475
24. If permitted, encourage a patient's family to bring food from home for the patient	2.5 (1.0)	2.7 (1.0)	0.012	2.7 (1.1)	2.5 (1.1)	0.280
25. Visit and check a patient during their meal time to see how well they are eating	2.9 (0.9)	3.1 (1.0)	0.006	2.9 (0.9)	2.9 (1.0)	0.719
26. Realign my tasks so I do not interrupt a patient during their meal time	2.4 (1.0)	2.6 (1.0)	0.024	2.7 (0.9)	2.8 (1.0)	0.157
27. At discharge of a malnourished patient, provide the patient or family with nutrition education material	2.1 (1.1)	2.1 (1.1)	0.738	1.7 (1.0)	1.8 (1.0)	0.403

Note: For some items, the n is slightly smaller than 122 or 68, because not everyone completed all questions

### **Subjective questions regarding the change in knowledge, attitudes and perceived practices – concurrent validity**

54.2 % of the participants in the intervention group stated that their knowledge of malnutrition improved, while this was indicated by only 20.7 % of the participants in the control group. This difference between the intervention group and control group is statistically significant ( $p = 0.003$ ). However, 79.2 % of the participants in the intervention group said that their attitudes had improved as opposed to 65.5 % of the participants in the control group (no significant difference between the groups). Meanwhile, 77.8 % of the participants in the intervention group stated that their perceived nutritional practices regarding malnourished patients improved, while only 34.8 % of those in the control group issued this statement (significant difference between the intervention and control group was observed,  $p < 0.001$ ).

## DISCUSSION

This study shows that the implementation of a malnutrition screening tool leads to an improvement in knowledge, attitudes and perceived practices (KAP) of the healthcare staff (nurses, nurses' aides and physicians) in hospitals. When comparing the results of the KAP questionnaire before the implementation (T0) and after the implementation (T1), we observed that the KA and P scores improved significantly in the intervention group but not in the control group. Participants in the intervention group indicated that their attitudes and knowledge (subscore KA) had improved as well as their nutritional practices (P).

### **Improvements in single items of the knowledge and attitudes subscore**

A significant improvement in the intervention group between T0 and T1 was observed for four items. The effect size for the change in pretest and posttest results was the highest for the item "All patients should be screened for malnutrition at admission to hospital". This means that the attitudes of the healthcare staff improved with regard to the application of a screening tool. This is an important finding since – before the project – nurses, nurses' aides and doctors indicated that they were afraid that the application of the screening tool would be time-consuming and would not be beneficial. Some of the staff were uncertain whether the use of a screening tool would be beneficial, because they assumed that they would recognize malnourished patients during their clinical examination. These types of expressions of attitudes displayed by staff toward validated screening tools were not only observed during the current project but have also been described in the literature<sup>25-27</sup>. Authors of recent studies have interviewed nurses and asked questions regarding the application of validated screening tools. The results of these interviews revealed that nurses often believe that they know when a patient requires further nutritional intervention and, therefore, assume that standardized screening is not necessary<sup>25, 26</sup>.

Another significant improvement in KA was noted in the responses to the general statement "Nutrition is not important to every patient's recovery in hospital" (reverse coded). The data showed that the attitudes toward and knowledge about the importance of nutrition has generally improved. Some studies have shown that positive attitudes correlate with higher knowledge, and can also lead to better nutritional practices<sup>28</sup>. On the other hand, there are studies that were not able to show that an improvement in knowledge automatically

improved behaviour and practices <sup>29</sup>, since sustained changes in nutritional practices are longer, complex and continuous processes <sup>23, 29</sup>.

Another positive change was observed in the positive responses to the statement “I know how to refer to a dietitian”. These responses show that the knowledge towards multidisciplinary cooperation has improved. This is an extremely important point since experts all agree that working together in multidisciplinary teams, which include dietitians, nurses, physicians and/or other healthcare professionals, is the most effective way to tackle the serious problem of malnutrition in hospital <sup>30-32</sup>. Nurses and physicians must realize that malnutrition is not only a topic that is assigned to dietitians but to the whole team that cares for the patients. Members of every profession have important roles in the provision of adequate nutritional care regarding malnutrition <sup>18, 19</sup>.

After implementing the malnutrition screening tool, the participants of the current study indicated more frequently that they would need more training to provide better support for the patients' nutrition needs. This suggests that the healthcare staff were not aware before the study that they might have gaps in nutritional knowledge and that the awareness of a need for further training was aroused by increased contact with the topic of malnutrition. The literature shows that nutritional topics are rarely included as part of the education of healthcare professionals such as nurses and physicians <sup>33-35</sup>. This indicates that they must pursue further education on their own to gain knowledge that enables them to detect, diagnose and treat malnutrition <sup>33</sup>.

Surprisingly, we observed improvements in the intervention group as well as the control group, namely, for two items on the KA questionnaire (see Table 6.4). This could be partly explained by the impossibility of blinding in the study. The healthcare staff who participated in the study control group knew that they were part of a study on malnutrition since they had to fill out the questionnaires. They did not receive detailed information and received no intervention, however, the knowledge about the study alone may have led to a slight improvement in the knowledge and attitudes for these two items. However, the data for the items in the practice questionnaire as well as the sum scores did not change significantly between T0 and T1 in the control group. To actually change nutritional practices, this shows that more interventions are necessary than simply knowing that a malnutrition study is being carried out.

### **Improvements in single items of the practice questionnaire subscore**

The P subscore reflects what is actually being done to treat malnourished patients or patients at risk. A significant improvement in four out of seven items was observed in the intervention group. The results show that, after the implementation of the screening tool, the healthcare staff encouraged the patients to eat more frequently and assisted them if they needed help. Furthermore, they encouraged the families to bring food from home more often, checked the patients more often during the meals to see how well they were eating and altered their scheduled tasks more often to avoid interrupting the patients during their meals. Interventions in malnourished patients were not addressed at all in the 45-minute workshops before the implementation process. This means that the improvement in nutritional practices was solely achieved by the implementation of the screening tool. It can be assumed that the awareness level of the healthcare staff increased, resulting in better nutritional practices and more frequently conducted interventions, by the process of implementing the screening tool alone.

### **Implementation process**

Even though the results show positive improvement trends for most of the items on the questionnaire, not all items improved significantly in the intervention group. One possible explanation for these results, therefore, could be the low participation in the workshops that were held before the screening tool was implemented. As mentioned in the introduction, the study team recommended that all healthcare personnel involved in the study attend this workshop, but participation was voluntary. Therefore, not even 10 % of these personnel participated. The knowledge, attitudes and practices may have improved even more significantly if all personnel had attended the workshop.

The study revealed that the number of dieticians was limited. Many at-risk patients were identified using the standardized, validated screening tool. These at-risk patients needed to receive a nutritional assessment from the dietitian who was in charge of the patients in the respective wards. If necessary, an individual nutrition plan had to be created by the dietitians. Because so many patients were identified as being at risk of malnutrition, the dietitians were not able to visit all of them due to limitations in time and human resources. Of course, this had a negative impact on the entire nutrition care process, as some nurses legitimately raised the question of how meaningful it is to screen

the patients if the number of dieticians is too limited to treat patients in need of nutritional care. However, these are structural problems and challenges that were revealed during the study, which subsequently led to discussions among healthcare professionals and stakeholders, and these findings are perceived as a positive outcome of the project. These types of organizational challenges have been described in other studies, which reported similar difficulties in clinical practice<sup>18, 19, 27, 36</sup>. Limited time and limited resources as well as a lack of support from the organization and stakeholders have frequently been mentioned as the most important barriers to adequate malnutrition screening<sup>18</sup>. In order to convince stakeholders to support the implementation of malnutrition screening, it is important to present convincing data and figures, all of which this study aimed to support. Furthermore, it is important to make stakeholders aware of the problem of malnutrition and enable them to realize the importance of nutrition in the health and wellbeing of patients<sup>31</sup>.

The implementation of a malnutrition screening tool is the first step that can be taken toward offering successful nutritional care in hospitals. However, interventions must be carried out after the screening. The roles and responsibilities of members from all professions involved in nutritional care must be clearly assigned, and a structured approach should be adopted in the respective wards. This means that offering successful nutritional care in hospitals involves more than merely implementing a valid and reliable screening tool. The organizational culture towards nutrition needs to change, and nurses/medical managers and health care staff must invest significant efforts to achieve long-term changes.

### **Strengths and Limitations**

The major strength of this study is its inclusion of the non-equivalent control group and use of the pretest-posttest design. This can be considered a strong design, because it allowed us to assess whether patients in the two hospitals had similar scores at baseline (T0). Because the intervention and control group had similar scores at the baseline, we can conclude that the pretest-posttest differences were the result of the implementation of the malnutrition screening tool<sup>37</sup>. Furthermore, a high percentage (70.6 %) of the healthcare staff who participated in the study filled out the questionnaire at both measurement time points (T0 and T1). This made it possible to analyse paired responses, strengthening the results of the study.

The study had certain limitations. It was not possible to randomize the participants either to the control or the intervention group, because the malnutrition screening tool was implemented in entire wards. We also decided not to randomize the wards to the control or intervention group, because this could have influenced the validity of the results. In addition, the two participating hospitals could choose whether they wanted to represent the intervention or the control group.

The KAP questionnaire is a subjective measurement method. The questions were answered by the participants themselves and, therefore, self-perceived. This is especially relevant with reference to the nutritional practices, since these are self-perceived nutritional practices and not objectively-observed practices. Furthermore, we did not assess whether the positive changes in knowledge, attitudes and practices led to improved patient outcomes.

## **CONCLUSIONS**

The results of this study show that the implementation of a validated malnutrition screening tool helps improve the knowledge, attitudes and practices of healthcare staff (nurses, nurses' aides, physicians). Knowledge, attitudes and practices are key components for successful nutritional care in malnourished patients, and an improvement in these factors may result in improved patient outcomes. It is of the utmost importance that the healthcare professionals involved in nutritional care are aware of their responsibilities, work together and communicate with all members of the multidisciplinary team. A sufficient number of dietitians should be employed in the hospitals to adequately meet the nutritional needs of patients at risk of malnutrition. The healthcare staff must be provided with enough human and time resources to manage malnourished patients in a successful and multidisciplinary manner. In the future, the KAP questionnaire can and should be used to recognize alterations in the knowledge, attitudes and practices of healthcare staff in further studies as well as in clinical practice projects. Future studies should be conducted not only to measure the outcomes in terms of the KAP of the healthcare staff or processes, but also to measure patient outcomes.

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## Chapter 7

# The impact of using a malnutrition screening tool in a hospital setting: A mixed methods study

Doris Eglseer, Daniela Schoberer, Ruud Halfens, Christa Lohrmann

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## **ABSTRACT**

**Background/Objectives:** Malnutrition risk screening represents a crucial starting point for the successful management of malnourished patients. This study was conducted to 1) examine the effect of the use of a malnutrition screening tool on process indicators of nutritional care and 2) explore health-care professionals' perceptions and opinions regarding this tool.

**Methods:** A mixed methods design was used. A controlled pretest-posttest study was conducted to carry out quantitative analyses, and semi-structured, qualitative interviews were held. Quantitative data were analysed with descriptive statistics, chi-squared tests, Student's t-tests and Kruskal-Wallis H tests, using SPSS 23. Qualitative data were analysed by performing a qualitative content analysis using MAXQDA 12. Two comparable hospitals participated in the study, representing one intervention group (IG) and one control group (CG). The Graz Malnutrition Screening Tool (GMS) was implemented and used in the IG for at least one month, while the CG received no intervention.

**Results:** The use of the screening tool positively correlated with significant improvements in the process indicators of nutritional care after one month, in terms of the number of nutritional interventions and the frequency of documentation of the diagnosis and the patient's weight and height. The content of the interviews revealed that nearly all professionals involved perceived the overall screening process positively. Few barriers were identified.

**Conclusions:** The results of this study show that the use of a screening tool has a positive, short-term impact on the hospital's process quality of nutritional care. Ongoing efforts are required to sustainably maintain these positive changes. During this process, positive attitudes, nomination of motivated 'opinion-leaders' and concerted management support are helpful facilitators.



## **INTRODUCTION**

Malnutrition in hospitalized patients leads to serious, negative patient outcomes, such as increased morbidity and mortality, increased complication rates, greater lengths of hospital stays, higher readmission rates and lower quality of life <sup>1-3</sup>. Additionally, malnutrition has a strong negative impact on healthcare costs <sup>4</sup> and leads to the accumulation of additional expenses of up to 30 % per affected patient <sup>5</sup>. The adequate management of malnutrition, which has been described in numerous evidence-based guidelines and expert papers, could counterbalance these negative outcomes <sup>6-9</sup>.

Nutritional care for patients (at risk of) malnutrition in clinical practice should be standardized and structured, guided by the nutrition care process, which includes malnutrition risk screening, nutritional assessment, diagnostic procedures, nutritional care plans, nutritional care, monitoring and evaluating and documentation <sup>10, 11</sup>. In particular, evidence-based guidelines recommend the implementation of a malnutrition risk screening process as a crucial starting point for the successful nutritional management of malnourished patients <sup>7-9, 12</sup>. The European Society for Clinical Nutrition and Metabolism (ESPEN) defines malnutrition risk screening as a “rapid process performed to identify subjects at nutritional risk” that should be carried out by trained health professionals using a valid and reliable screening tool for all patients admitted to the hospital <sup>10</sup>.

A positive malnutrition screening should result in a referral to a dietitian. The dietitian is responsible for a nutritional assessment and a positive nutritional assessment should lead to malnutrition diagnoses by members of several professions (dietitian, physician, nurse) <sup>11, 13</sup>. However, studies have shown that not all malnourished patients are referred to a dietitian <sup>14</sup> and that the documentation of the malnutrition diagnosis is rare in clinical practice <sup>15</sup>. This is troubling, as it is necessary to document the diagnosis and collect relevant information about the patient’s nutritional status and care to guarantee their safety <sup>16, 17</sup>. Incomplete documentation can reduce the quality of care and the ability of health professionals to provide nutritional care in alternative settings <sup>16</sup>.

To improve nutritional practices, including the screening practice, it is necessary to conduct studies in which the effect of nutritional risk screening on structures, processes and patient outcomes is examined <sup>18, 19</sup>. These data

could be used to increase the awareness of the problem and initiate interventions. In particular, more information about process indicators, which are based on nursing, medical, therapeutic, or administrative actions that correlate with health outcomes, needs to be gathered. These process indicators are used to measure the activities performed by different health professionals who provide care, such as making a diagnosis, recommendations, or implementing treatment, or during their interactions with the patient<sup>20</sup>. Studies that address the impact of validated risk screening on process and outcome indicators are still rare<sup>21</sup>. A Cochrane systematic review conducted in 2013 revealed that evidence for the effect of nutritional screening on process and outcome indicators is currently lacking, and more studies with good methodology need to be carried out to draw clear conclusions<sup>21</sup>.

In some countries, including Austria, only a few hospitals have implemented validated nutritional risk screening although it is recommended in guidelines, and valid and reliable instruments are available<sup>14</sup>. Therefore, it is necessary to gain a deeper understanding of the perceptions and opinions of all persons involved in the use of this screening tool<sup>22</sup>. By collecting the opinions of healthcare professionals and stakeholders as well as data about process changes in clinical practice, the use of malnutrition screening tools can be promoted.

Two aims are described in this study:

1. to examine the effect of the use of a malnutrition screening tool on process indicators of nutritional care and
2. to explore healthcare professionals' perceptions and opinions regarding the use of a malnutrition screening tool.

## **METHODS**

### **Research Design**

A study with a mixed methods research design and a convergent parallel design was conducted<sup>23, 24</sup>. Quantitative and qualitative data were collected simultaneously and assigned equal priority. In this design, quantitative and qualitative data are handled separately during the data collection and analyses processes. It is important to combine the quantitative and qualitative data and integrate them to interpret the results properly<sup>23-25</sup>.

### **Implementation of the malnutrition screening tool - quantitative part of the study**

To collect quantitative data, a controlled pretest-posttest study was conducted. The criteria for inclusion were that none of the hospitals used a malnutrition screening tool at the time of their enrollment in the study. Furthermore, the hospitals participating in the study had to have similar sizes and characteristics (e.g., patients' ages and diseases, ward specialisations). During the study, the Graz Malnutrition Screening Tool (GMS) <sup>26</sup> was implemented in the internal wards of one hospital (intervention group = IG), and no screening tool was implemented in the internal wards of the other hospital (control group = CG). The hospital directors chose whether they would be allocated to the IC or CG themselves because only one hospital agreed to implement the GMS. After one month of screening (July, T1) had been conducted, the intervention group chose whether it would continue screening or not.

The healthcare staff in the IG agreed to screen all patients admitted to the wards from 1 July 2017 and on for the whole month. Data on the following process indicators were extracted from the electronic documentation system (patient records) after the patient's discharge:

- Nutritional intervention initiated by a dietitian
- Diagnosis of malnutrition by a physician
- Documentation of weight and height (BMI) by a nurse

The demographic data were analysed using descriptive statistics, and the associations between the groups were analysed by applying chi-squared tests, Student's t-tests and Kruskal-Wallis H tests. Associations between the outcome parameters and the timepoints as well as the groups were calculated by applying chi-squared-tests. SPSS version 23 for Windows was used for the data analysis <sup>27</sup>.

### **Qualitative part of the study**

To collect qualitative data, eleven semi-structured interviews were held in the IG by a research dietitian with healthcare professionals as well as decision-makers (hospital directors), and the screening tool was used in parallel. The researcher took a convenience sample; participation was on a voluntary basis. Individual interviews were conducted at the respective wards in a quiet room to avoid interruptions, in the German language and audio-recorded. The recordings were transcribed literally to ensure that no data were lost.

To describe and interpret the qualitative results of this study, we used the method of qualitative content analysis<sup>28,29</sup>. A coding frame was developed in a concept-driven (deductive) way. Three important topics that were derived from the interview guide were used as the main categories, and five subcategories were developed inductively<sup>29</sup>. Two authors (DE, DS) discussed the final coding frame and adapted it (e.g., overlapping categories were specified). Subsequently, the interview material was divided into thematic coding units so that each unit fit into one category of the coding frame. The first author (DE) conducted the final coding, and half of the material was coded by two authors (DE, DS) independently to check for agreement<sup>29</sup>. The percentage of coding units that were assigned to the same category by both authors was calculated. The agreement between the two researchers was 81 %, which was interpreted as satisfactory<sup>29</sup>.

Data were organised and analysed using MAXQDA 12<sup>30</sup> and presented in the form of personal quotes from the interviewees.

### **Graz malnutrition screening tool (GMS)**

Together with the hospital management, the researchers decided to implement the Graz Malnutrition Screening Tool (GMS), which is a valid and reliable instrument<sup>26</sup>. The GMS was tested for its reliability and validity. The Pearson correlation coefficient for the correlation with the Nutritional Risk Screening (NRS) was 0.78 and for the Mini Nutritional Assessment-short form (MNA-SF), 0.84. Furthermore, the sensitivity (0.87) and specificity (0.90) were high according to the NRS<sup>26</sup>. These values underline the high concurrent validity of the tool. Cohen's kappa coefficient for the inter-rater reliability was 0.82, which indicates that nearly perfect agreement existed between the raters<sup>26</sup>. The practicability of the screening tool is high because it can be incorporated into the electronic patient record system, is user-friendly and is easy to handle<sup>26</sup>.

The GMS consisted of two parts: the first part contained three questions and was filled out by a nurse (BMI, weight loss and nutritional intake). A physician completed the second part, assessing whether the patient had an underlying disease that increased the malnutrition risk<sup>26</sup>. Both the nurse and the physician answered the questions to complete the screening process, enabling a score to be calculated. If a score of three or more was obtained, this was an indication that the patient was at risk of malnutrition and in need of further nutritional assessment<sup>26</sup>.

### **Timeline of the study**

The implementation of the malnutrition screening tool was planned from March to May 2017. Meetings with the medical and nurse hospital directors, leading department physicians and nurses took place, during which the implementation of the GMS was discussed. Furthermore, 45-minute training sessions on the screening tool were provided for all nurses, nurse aides and physicians. Participation was voluntary. If healthcare professionals did not participate in the training sessions, the colleagues informed them about the correct use of the malnutrition screening tool. To provide support, ensuring the correct use of the malnutrition screening tool, the study team distributed leaflets and posters with information on the study in the participating wards. Opinion leaders were also identified, represented by one nurse and one physician at each ward. These leaders were responsible for checking the screening process at regular intervals and reminding the nurses and physicians to complete screenings, if incomplete screenings were noted. The dietitians were involved during the whole process.

During T0 (June), neither hospitals included in the study (IG and CG) used any malnutrition screening tool. At T0, baseline data were collected on every patient admitted to the hospitals (IG and CG) during June. This baseline data included demographic information about the patients as well as data about the three outcome variables: if a dietitian initiated a nutritional intervention, if there was a diagnosis of malnutrition by a physician and if nurses documented weight and height (BMI).

During T1 (July), the intervention group used the malnutrition screening tool. From 1 July and on, the GMS was available in the electronic documentation tool, and healthcare professionals (nurses and physicians) were encouraged to use the malnutrition screening tool with every newly admitted patient during the month of July. At T1, demographic data as well as data about the three outcome variables (nutritional intervention initiated by a dietitian, diagnosis of malnutrition by a physician, documentation of weight and height (BMI) by a nurse) were collected again for every patient admitted to the hospitals (IG and CG) during July. From August and on, the stakeholders and healthcare professionals at the intervention hospital decided whether they would continue screening or not.

During T2 (October), all quantitative measurements (demographic data and data about the three outcome variables) from T0 and T1 were repeated to investigate long-term effects. The qualitative interviews were conducted over two days at the end of July.

### Ethics

Ethical approval was obtained from the responsible ethics committee (29-270 ex 16/17). The hospitals participated on a voluntary basis, and all responsible persons (medical and nursing hospital directors) gave their written informed consent. The persons interviewed agreed orally to participate in the interviews. Following the recommendations of the ethics committee, it was not necessary to obtain the informed consent from the patients because we only collected routine data.

## RESULTS

### Quantitative results

Data from all patients that were admitted to the participating internal wards in June, July and October 2017 were included in the analysis. Table 7.1 shows the demographic data of the patients included at each timepoint.

**Table 7.1** Demographic data of the included patients per timepoint and group

Timepoint		Intervention group (n = 673)	Control group (n = 498)	p-value
T0	Female gender, %	50.4 %	56.0 %	0.055
	Age in years, mean	68.9	68.6	0.232
	Median number of medical diagnoses	4	5	0.000
Timepoint		Intervention group (n = 691)	Control group (n = 495)	p-value
T1	Female gender, %	50.2 %	55.5 %	0.093
	Age in years, mean	68.9	67.8	0.292
	Median number of medical diagnoses	4	6	0.000

Timepoint		Intervention group (n = 698)	Control group (n = 555)	p-value
T2	Female gender, %	51.6 %	51.7 %	0.962
	Age in years, mean	70.1	68.2	0.032
	Median number of medical diagnoses	5	5	0.142

In July (T1), 83.5 % of all patients admitted to the IG were screened for risk of malnutrition. According to the results of the GMS, 27.4 % of these were at risk of malnutrition. In October (T2), healthcare staff completed malnutrition screening for 4.6 % of the admitted patients.

### Associations of interventions over time

At T1, the frequency of patients receiving a nutritional intervention initiated by a dietitian was significantly higher compared to the frequency at T0 (13.4 % vs. 22.0 %,  $p < 0.001$ ). At T2, the percentage of patients receiving a nutritional intervention declined nearly to the initial value measured at T0.

Physicians documented a malnutrition diagnosis in the patient records significantly more often at T1 than at T0 (0.9 % vs. 4.1 %,  $p = 0.001$ ), and the rate of documentation of the patients' BMIs by nurses increased significantly from 59.4 % before the intervention to 86.4 % after the intervention ( $p < 0.001$ ). No significant differences between T0 and T1 were observed for the CG. At T2, the percentages of patients who received a nutritional intervention and were diagnosed as malnourished, as well as whose weight and height were documented by nurses, decreased nearly to the initial values that had been measured at the baseline (see Table 7.2).

### Associations of interventions between the groups

At T0 (before the intervention), no associations were detected between the IG and CG with respect to nutritional interventions and malnutrition diagnosis, but associations related to the documentation of weight and height were observed. Nurses in the CG documented weight and height (71.1 %) significantly more often than nurses in the IG (59.4 %). One month after the implementation of the malnutrition screening tool, significant differences could be observed between the groups with respect to the outcome parameters (frequency of nutritional interventions initiated by a dietitian, frequency of diagnosis of malnutrition by a physician and frequency of documentation of weight and height (BMI) by a nurse, in favour of the IG (see Table 7.3).

**Table 7.2** Associations between the timepoints and the outcome indicators nutritional intervention, malnutrition diagnosis and documentation of BMI

Group	Timepoints	Nutritional intervention	p-value	Diagnosis malnutrition	p-value	Documentation of BMI	p-value
IG	T0 vs. T1	13.4 % vs. 22.0 %	0.000	0.9 % vs. 4.1 %	0.000	59.4 % vs. 86.4 %	0.000
	T1 vs. T2	22.0 % vs. 12.9 %	0.000	4.1 % vs. 1.1 %	0.001	86.4 % vs. 44.0 %	0.000
	T0 vs. T2	13.4 % vs. 12.9 %	0.793	0.9 % vs. 1.1 %	0.639	59.4 % vs. 44.0 %	0.000
CG	T0 vs. T1	10.0 % vs. 8.3 %	0.379	0.4 % vs. 0.4 %	0.995	71.1 % vs. 74.5 %	0.220
	T1 vs. T2	8.3 % vs. 7.6 %	0.668	0.4 % vs. 1.1 %	0.208	74.5 % vs. 55.0 %	0.000
	T0 vs. T2	10.0 % vs. 7.6 %	0.156	0.4 % vs. 1.1 %	0.293	71.1 % vs. 55.0 %	0.000

IG = intervention group, CG = control group, BMI = Body Mass Index

**Table 7.3** Associations between the groups and the outcome indicators nutritional intervention, malnutrition diagnosis and documentation of BMI

Timepoints	Nutritional intervention	p-value	Diagnosis malnutrition	p-value	Documentation of BMI	p-value
T0 (IG VS. CG)	13.4 % vs. 10.0 %	0.08	0.9 % vs. 0.4 %	0.314	59.4 % vs. 71.1 %	0.000
T1 (IG VS. CG)	22.0 % vs. 8.3 %	0.000	4.1 % vs. 0.4 %	0.000	86.4 % vs. 74.5 %	0.000
T2 (IG VS. CG)	12.9 % vs. 7.6 %	0.002	1.1 % vs. 1.1 %	0.913	44.0 % vs. 55.0 %	0.000

IG = intervention group, CG = control group, BMI = Body Mass Index

## **Qualitative results**

Two nurses, two nursing ward managers, two dietitians, two physicians and three decision-makers (two nurse directors and one medical director) in the IG participated in the interviews. The interviews lasted 20 to 45 minutes. Three main categories were developed deductively, based on the interview guide for the semi-structured interviews, and five subcategories were developed inductively from the interview material.

### **1. Implementation and use of the malnutrition screening tool**

#### **Organizational topics and efforts**

Members of all professions interviewed, including the decision-makers, stated that the additional workload associated with the use of the screening tool was low. They held the opinion that integrating the screening into the electronic documentation system was helpful. Nurses mostly included the malnutrition screening in their nursing assessment at the time of the patient's admission, which made it easier to use.

*What I have noticed is that it [screening] didn't require much extra effort for us [nurses]. Well, we should have a weight for every patient anyway, and we write it down on the [nursing] assessment form. So it didn't really require more effort... (nurse)*

Nevertheless, some interviewees indicated that nurses had to remind the physicians to fill out the malnutrition screening form, which impeded its use.

A topic that was repeatedly mentioned and was related to the organisation of the screening was the limited number of dietitians. If a positive screening result was obtained, a nutritional assessment needed to be conducted by a dietitian. However, during this study, it was observed that this was not always possible.

#### **Facilitators**

The interviewed nurses indicated that they felt as though their patient care improved through the implementation of the screening. This supported the acceptance and use of the malnutrition screening tool on the wards.

Furthermore, interviewed persons from all professions said that the level of awareness about the number of malnourished patients increased.

The fact that members of all healthcare professionals that are part of nutritional care had access to the malnutrition screening tool emerged as another facilitator. This meant that they could see whether at-risk patients had been admitted to the wards, and this led to numerous 'automatic' dietitian visits. Nurses and physicians perceived this as a highly beneficial aspect.

*It gave us a certain sense of relief...that the dietitian visited the patients automatically and took measures independently. You didn't need to worry about the dietitian referral. (physician)*

The nurses and physicians expressed the impression that nutritional interventions were carried out following the screening process. Some physicians and nurses (opinion leaders) also supported the use of the screening tool and checked to see if it had been filled out for every newly admitted patient. This greatly facilitated the use of the tool.

### **Barriers**

The barrier to the use of the malnutrition screening tool that was most frequently mentioned by nurses was the absence of current weight and weight loss data. The weight, height and weight loss data should be collected as part of the GMS, and these data need to be filled in to obtain a final risk score. Some patients could not be weighed due to the lack of specific resources (e.g., wheelchair scale) or did not know what their weight had been three months prior to hospital admission. This was usually the case in patients who were highly dependent on care. However, nurses often solved this problem by calling the caregivers (e.g., in the nursing home where the patients had lived) and requesting the information.

Another barrier mentioned by the interviewed physicians was that they did not agree with all diagnoses listed in the screening tool as a risk diagnosis for malnutrition.

Some nurses and physicians mentioned that they felt they received a low level of support from the management and considered this to be a barrier to the use of the malnutrition screening tool. One decision-maker pointed out the low at-

tendance at the training sessions about the malnutrition screening tool (participation was voluntary) and indicated that this could have been another barrier.

## **2. Impact of the use of the malnutrition screening tool on clinical practice**

### **Impact on healthcare professionals**

All interviewed professionals stated that the implementation of the malnutrition screening tool raised their awareness of malnutrition. The dietitians' daily work changed most radically after the implementation of the screening tool, since they had to treat more patients who were at risk of malnutrition. The dietitians working at the participating wards mentioned that they thought the nurses and physicians realized there was a need for nutritional therapy, not only for patients with diabetes or other diseases related to nutrition but also for malnourished patients. The visibility of the need for dietitians in the hospital settings increased. This had an impact on the dietitians' daily work, and they said that they felt more integrated in the daily procedures at the respective wards.

*I noticed that the dietitian was on the ward a lot more often during the last few weeks. And it all happened so automatically. The dietitian came and told us that she had seen that the patient was at risk of malnutrition. And it was easier for us then. (nurse)*

### **Impact on patient care**

Most of the interviewed persons indicated that they believed that the use of the malnutrition screening tool had a positive impact on patient care.

Few healthcare professionals stated that they were unsure whether the use of the screening tool influenced patient care. Most of the nurses and physicians interviewed stated that there were more nutritional interventions initiated by the dietitians after the implementation of the tool, and more counselling sessions were conducted by the dietitians. Some nurses reported that patients received more nutritional supplements and were given energy and protein-enriched foods more frequently. One nurse said that she felt that the dietitian would now be involved earlier if there were a need for nutritional therapy.

### 3. Future considerations regarding the malnutrition screening tool

Most of the persons interviewed stated that they wanted to continue the screening process. One dietitian expressed the fear that she could not visit all patients who were at risk of malnutrition due to her limited time resources.

In the interviews, the decision-makers stated that they considered the GMS to be an important tool, but wanted to wait and see the results of the evaluation before deciding whether to integrate it into the daily routine.

## DISCUSSION

The results of the quantitative part of this study show that the use of a malnutrition screening tool improved the process quality of nutritional care, in terms of the number of nutritional interventions, malnutrition diagnosis frequencies and weight and height (BMI) documentation frequencies for the patients involved in the study. The results also show that, if the rate of use of the malnutrition screening tool decreased, the process quality indicators simultaneously deteriorated. Within about 4 weeks of the implementation of the malnutrition screening tool, the results reveal that nearly all involved professionals perceived the overall process positively. The interviewees highlighted numerous advantages of the use of the screening tool and generally perceived the screening as an intervention that required little effort. Few barriers were identified regarding the use of the screening tool.

Against this background, a legitimate question to ask is why the rate of screening was high one month after the implementation but fell to nearly zero three months after the implementation of the screening tool. This observation has also been cited in similar projects conducted in other countries. Leistra et al. reported that the Dutch Ministry of Health introduced malnutrition screening as a performance indicator in 2007 and, since that timepoint, screening rates have increased continuously<sup>31</sup>. One possible reason for the success noted in this case may be that the implementation and use of a screening tool was mandatory. In our study, a screening period of at least one month was agreed upon with the decision-makers. Afterwards, the health professionals were free to decide whether to continue or discontinue screening. The results of our study indicate that, given the option, health professionals may not voluntarily choose to screen patients for malnutrition. The results of the study by Leistra et al.<sup>31</sup> support this assumption, in that a main enabler for completion of the

screening in that study was that the screening was a required item in the electronic documentation system<sup>31</sup>. Other qualitative studies have yielded similar results. Healthcare professionals mostly agree that, if malnutrition screening were a required item, screening rates and, accordingly, the quality of nutritional care would improve<sup>22, 32</sup>.

We can also offer an explanation for the decline of the screening rate and accompanied interventions three months after the implementation of the tool by examining other organizational factors, such as the low attendance at the training sessions or the low levels of support professionals received from the decision-makers. The screening process may not have been assigned the highest priority at the time, and not all healthcare professionals may have felt that they needed to attend the training sessions. They also indicated that they felt that they needed support from the management to fully integrate the screening into their daily routines. These results are in accordance with those of other studies, in which barriers to the use of malnutrition screening tools were examined<sup>22, 31, 33, 34</sup>. Sufficient coordination efforts by the hospital management and managerial support are extremely important factors that influence the success of malnutrition screening<sup>22, 32, 34, 35</sup>.

The results of our study show that the engagement of individual nurses, physicians and dietitians is at least as important as the managerial engagement, which has also been shown in other studies<sup>31, 32</sup>. During the interviews, the presence of active and engaged healthcare professionals was identified as an important facilitator. In this context, these persons could be nominated as 'local opinion leaders', who would provide reminders and facilitate nutritional screening<sup>36, 37</sup>. In studies that have dealt with effective implementation strategies, the nomination of opinion leaders was found to be an effective strategy to promote evidence-based practice and improve the performance of healthcare professionals<sup>37</sup>. This potential should be exploited to guarantee a high screening rate and adequate nutritional care based on the nutrition care process over the longer term.

Successful multidisciplinary cooperation has also been cited as a facilitator for nutrition screening in the literature<sup>22, 31, 32</sup>. The quantitative results of our study show that the implementation of the malnutrition screening tool led to positive improvements in multidisciplinary cooperation. These findings underline the improved integration of dietitians on the wards, which had an impact on the

daily patient care, as was stated by the healthcare professionals during the interviews. This conclusion is also supported by the quantitative data collected during this study, which show that more patients received a nutritional intervention by a dietitian. Collaboration and communication among members of different professions, such as dietitians, nurses and physicians, is essential to ensure successful nutritional care in hospitals<sup>17</sup>. This statement is supported by several guidelines and published calls to action for the management of malnutrition in hospitals<sup>7, 8, 17</sup>.

One additional possibility for improving and optimising nutritional care as well as multidisciplinary cooperation in hospitals would be to launch a qualified multidisciplinary nutrition support team. These teams may help improve the process of malnutrition screening of hospitalized patients<sup>38</sup>. The members of a nutrition support team have special training and should at least include a clinical dietitian and a physician, and ideally, a nurse and a pharmacist<sup>38</sup>. Nutrition support teams are recommended by expert associations and, like the use of artificial nutrition and implementation of patient safety measures, have been shown to improve patient outcomes<sup>39, 40</sup>.

All aspects of nutritional care need to be documented and communicated to all members of the multidisciplinary team<sup>41</sup>. Our quantitative data show that the implementation of the malnutrition screening tool improved the chances that malnutrition is properly diagnosed and patient weight and height (BMI) are documented. These are important process indicators that allow healthcare professionals to provide high-quality care to patients. Accurate documentation and communication is important to code diseases properly and facilitates the work in multidisciplinary teams<sup>41</sup>. By completely and correctly documenting the patient's weight and height and conducting a malnutrition diagnosis, the management of malnutrition might be simplified to a considerable extent. During the interviews in this study, dietitians stated that the proper documentation of the patients' BMIs helped them calculate the patients' nutritional requirements and create adequate nutritional care plans more easily; it simplified their work.

One strength of this study was the mixed methods research design used, which allowed us to gain a more complete understanding of the process of implementing and using a validated malnutrition screening tool in a hospital setting. The use of this design allowed us to obtain quantitative data on chang-

es in the process quality of nutritional care as well as qualitative perceptions and opinions with regard to the use of a malnutrition screening tool. All professions involved in the nutritional management were also interviewed, which allowed us to gain comprehensive insights into the perceptions of members of each profession. The results obtained have significant value, despite the fact that the wards that participated in the study were only from two different hospitals, and the intervention phase was relatively short. Future studies on malnutrition screening should, therefore, place a focus on long-term measurements. It would be of special interest to investigate the implementation of a malnutrition screening tool not only on process indicators but also on outcome indicators of nutritional care (e.g., on nutritional intake, weight and length of stay). Furthermore, it would be interesting to determine whether mandatory screening is more successful than voluntary screening by using creative and motivational methods.

## **CONCLUSION**

The results of this study show that the implementation of a valid and reliable malnutrition screening tool can improve the process quality of nutritional care in a hospital setting. Most interviewed healthcare professionals perceived the use of the screening tool as beneficial for the patients, the daily clinical practice and the quality of care. The malnutrition screening was experienced as an intervention that required a low investment of effort. However, all positive changes observed in this study are short-term changes. It is of the utmost importance that efforts are made to maintain these positive changes sustainably. The establishment of positive attitudes, nomination of motivated 'opinion-leaders' and improved support provided by the management are helpful facilitators in this process which have the potential to support positive, long-term changes in nutritional care.

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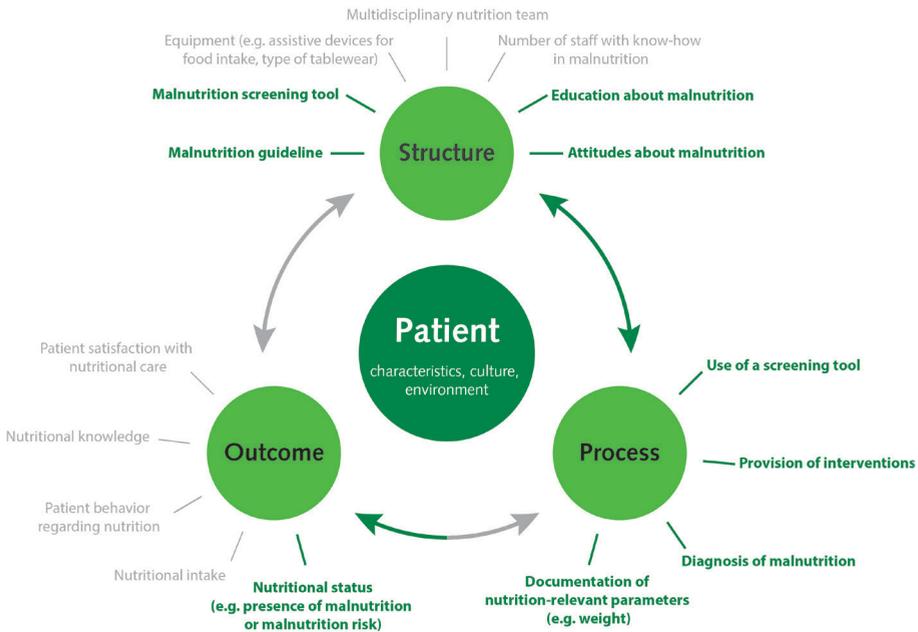


## GENERAL DISCUSSION

This chapter summarises and addresses the most important results of the work described in this doctoral thesis. Furthermore, it introduces the applied methods used in the individual studies and gives recommendations for clinical practice and future research.

The overall aim of the work described in this doctoral thesis was to gain insight into the quality of nutritional care in hospitals regarding malnutrition, and especially into the education of healthcare staff and screening on malnutrition. For this reason, the model of the quality of care established by Donabedian was adapted, resulting in the creation of the Quality of Nutritional Care (QoNC) model (Chapter 1). The studies described in this thesis are embedded in the QoNC model, and each study refers to one or more factors in this model.

Figure 8.1 shows which factors of nutritional care were addressed in the individual studies and the associations investigated.



**Figure 8.1** The Quality of Nutritional Care (QoNC) model with regard to malnutrition, based on Donabedian's model of quality of care. This figure depicts specific examples. (Green = Indicators and associations that were addressed in the studies described in this doctoral thesis)

In study one, the education of healthcare staff about malnutrition, which is a structural quality indicator, was assessed. In study two, an association between the availability of guidelines (structure) and the use of a malnutrition screening tool (process) could be shown. Furthermore, an association between different process quality indicators was demonstrated (use of a screening tool and use of interventions) as well as the association of the use of a screening tool (process) and the prevalence of malnutrition (outcome).

The findings of study three revealed the positive effect of the use of a malnutrition screening tool (process) on knowledge, attitudes (structure) and perceived practices (process). In study four, the impact of using a malnutrition screening tool (process) on different process indicators, such as the diagnosis of malnutrition, documentation of weight and height and an intervention by a dietitian, was shown. Moreover, the study revealed a positive impact of the use of a screening tool (process) on attitudes of the staff (structure).

### **Summary of the main results**

#### *Study 1, part A*

The aim of the first study, part A, was to determine the provisions and content of nutrition education and, particularly, education about malnutrition in older adults in the basic education of nurses throughout Europe. Representatives from 131 out of 926 (14.2 %) educational institutions in 26 European countries completed the online-questionnaire, and this data could, therefore, be included in the analysis. The results show that 86.3 % of the participating educational institutions included courses on nutrition in their curricula of the nurse education programs. 73.7 % of the institutions addressed the topic of malnutrition in older adults as part of the curriculum. Frequently included topics were causes (67.2 %) or consequences (68.7 %) of malnutrition. Some contents, such as multi-professional nutrition support (28.2 %), responsibilities of various professions within nutritional care (35.1 %) and certain interventions (e.g. methods for food fortification, 38.9 %), as well as their monitoring and evaluation (46.6 %), were not frequently taught.

#### *Study 1, part B*

In the first study, part B, the provisions and content of nutrition education and education about malnutrition in older adults in formal medical educational pro-

grams in Europe were assessed. Data extracted from completed questionnaires received from 26 out of 310 institutions from twelve European countries could be included in the final analysis. 79.9 % of the medical education institutions integrated nutrition education in their curricula. The courses were not mandatory in 40.0 % of the institutions that provided nutrition education. In 50.0 % of the institutions, education on malnutrition in older adults was provided. The topics taught most frequently in the institutions were similar to those included in the nurses' curricula and, in particular, basic knowledge such as the causes (50.0 %) and consequences (46.2 %) of malnutrition. Specific interventions and multidisciplinary cooperation were rarely included.

### *Study 2*

Study two was carried out to evaluate the association between quality indicators on several levels (structure, process, outcome) with regard to nutritional care and screening in hospitals. In this cross-sectional, multicentre study, 53 hospitals with 340 wards and a total of 5255 patients participated. 38.6 % of the wards surveyed used validated screening tools as part of a standard procedure during admission. The nutritional status of 74.5 % of the patients was screened during admission, but a validated screening tool was used in only 21.2 % of the patients. More commonly used parameters were the clinical view of the nurses and the patients' weight. The findings showed that hospitals that used malnutrition guidelines also used significantly more often a validated screening tool. Wards that embedded a validated malnutrition screening tool in their daily work provided significantly more interventions to their patients. They referred the patients to a dietitian, provided energy-enriched snacks or consistency-adjusted food/drinks, monitored the nutritional intake and adjusted the meal ambiance more frequently. Significant differences were also found between wards with and without validated screening tools with regard to malnutrition prevalence, which means that wards with a malnutrition screening tool had lower numbers of patients with malnutrition.

### *Study 3*

Study three placed a focus on the evaluation of the effect of the use of a valid and reliable malnutrition screening tool on the knowledge, attitudes and self-perceived practices of nurses, nurses' aides and physicians. Two hospitals were included in the study. One hospital implemented the validated Graz Malnutrition Screening Tool (GMS) on the internal wards (intervention group).

The other hospital was assigned to the control group and received no interventions. The results of this study showed that the use of a malnutrition screening tool led to a significant improvement in knowledge, attitudes and perceived practices of the healthcare staff (nurses, nurses' aides and physicians) in the intervention group, but not in the control group, after one month of screening using the GMS. The greatest improvements were achieved with regard to perceived practices of the healthcare staff. In the subscale for perceived practices, four out of seven items improved significantly.

#### *Study 4*

The fourth study was a mixed methods study and was conducted to assess 1) the impact of the use of a valid and reliable malnutrition screening tool on process indicators and 2) the healthcare professionals' perceptions and opinions with regard to the use of the screening tool. A pretest-posttest study was conducted for the quantitative part of the study, and semi-structured interviews using content analysis were conducted for the qualitative part. The results of the quantitative part showed that the use of a malnutrition screening tool significantly improved process quality indicators of nutritional care, namely, the number of nutritional interventions initiated by a dietitian, the frequency of malnutrition diagnosis by physicians and the frequency of documentation of weight and height (BMI) by nurses. The results also showed that if the screening rate decreased, the process quality indicators simultaneously decreased. The results of the qualitative part of this study revealed that nearly all involved professionals perceived the overall process positively within four weeks of the use of the screening tool. The interviewees highlighted that the study increased their awareness of the problem of malnutrition, improved the multidisciplinary cooperation and positively affected the quality of patient care. Few barriers, e.g., difficulties measuring the weight and height of the patients, which is a mandatory item in the screening tool, were identified with regard to the use of the tool.

### **Discussion of the main results**

#### *Education of European nurses and medical doctors on the topic of nutrition and malnutrition in older adults*

Several studies have showed that a lack of education and knowledge represents a major barrier to providing adequate nutritional care for malnourished

people<sup>1-3</sup>. In study 1, about 30 % of the nursing education programs and about 50 % of the medical education programs in Europe did not address the topic of malnutrition in older adults in their curricula. These results are similar to those of a recent ESPEN survey in which 30 % of the participating medical education centres did not include the content of clinical nutrition (including malnutrition) in their curricula<sup>4</sup>. This means that a high percentage of nurses and physicians are not prepared for treating malnourished patients when they start their clinical work.

In particular, the results of **study one (part A and part B)** showed that the topic of multidisciplinary cooperation with regard to malnutrition is a neglected topic in the education of nurses and physicians. Only a low number of the institutions included multidisciplinary cooperation or the responsibilities of various professions regarding malnutrition management in their curricula. However, cooperation between different healthcare professionals is an important factor for the success of nutritional care for malnourished patients<sup>5</sup>. Therefore, the assignment of responsibilities to the different professions is important<sup>5</sup>. It is known that healthcare staff lacks an awareness of both the roles and activities of other professions and their own responsibilities<sup>2, 5, 6</sup>. Experts recommend that the roles of each profession involved in nutritional care, and especially of the core team of dietitians, nurses and physicians, be determined, described and communicated throughout the hospitals<sup>6</sup>, e.g., in institution-specific guidelines or process descriptions that are available to all staff members. This may enhance interdisciplinary communication and cooperation<sup>5, 6</sup>.

Regarding the topics taught at European nursing and medical institutions, the results of **study one** show that several evidence-based interventions are infrequently included. While dietitians have the responsibility to develop nutritional care plans, including evidence-based interventions, the implementation of these interventions requires the involvement and, therefore, the knowledge of nurses<sup>7</sup>. Physicians, on the other hand, are responsible for providing leadership in terms of increasing the acceptance of nutrition care as an essential part of patient care<sup>5</sup>. They may empower dietitians to lead nutritional care in the multi-professional team and, therefore, have to be aware of the evidence regarding the impact of malnutrition and the effectiveness of nutrition interventions. Furthermore, if nurses and physicians do not have knowledge about the impacts of nutritional interventions, they may not refer patients to a dietitian<sup>5</sup>.

*Current state of the quality of nutritional care in Austrian hospitals*

The results of **study two** demonstrated that there is a considerable potential for improving the quality of nutritional care in Austrian hospitals. 45 % of the participating hospitals had an evidence-based guideline for malnutrition. Only one-fifth of the patients admitted to the hospital were screened for malnutrition with a valid and reliable screening tool. Instead of a validated screening tool, nurses mostly used indicators such as the nurses' clinical view, patient's current weight and patient's BMI, which are not valid and reliable indicators<sup>8-10</sup>. The findings of our study also showed that the use of a validated screening tool, as part of a standard procedure during patient admission, is associated with an increased rate of dietitian referrals and the use of nutritional interventions. Similar findings have been reported by other studies<sup>11,12</sup>. In a controlled intervention trial, the authors showed that healthcare staff referred patients who received malnutrition screening significantly more often to a dietitian for further assessment and treatment than patients in the control group, who were not routinely screened for malnutrition<sup>12</sup>. These results strongly suggest that routinely performed malnutrition screening is a crucial starting point for providing adequate nutritional care.

Another reason for the low screening rate observed is that screening is not mandatory in Austria. In other countries, such as The Netherlands, United Kingdom and the United States, hospitals are obligated to conduct nutritional screening using validated screening tools<sup>11, 13, 14</sup>. For example, staff in hospitals in the United States must complete malnutrition screening within 24 hours of patient admission to receive accreditation by the Joint Accreditation of Health Organisations<sup>14,15</sup>. These best-practice examples in other countries demonstrate that political support from representatives of the national health care system as well as support from stakeholders play major roles in the realisation of adequate nutritional care in hospitals.

*Effect of malnutrition screening on knowledge, attitudes and perceived practices*

The **third study** described in this thesis showed that the implementation of a malnutrition screening tool leads to an improvement in knowledge, attitudes and perceived practices (KAP) of nurses and physicians working in hospitals after one month in a prospective manner. For this study, a questionnaire, which was specifically developed to assess the KAP with regard to hospital

malnutrition of different healthcare staff was used and translated into the German language <sup>16</sup>. The results of another study using this questionnaire are in line with the results of **study three**. Laur et al. showed that the implementation of an integrated nutrition pathway for acute care – including malnutrition screening, assessment and interventions – led to a significant improvement in the KAP score after one year <sup>17</sup>. Furthermore, the findings show that healthcare staff, who felt involved in the implementation process, had even higher KAP scores than those who did not feel involved <sup>17</sup>.

The attitudes of the healthcare staff improved the most with regard to the application of a screening tool. This is an important finding, as studies have shown that nurses often have negative attitudes about the use of the screening tool and think its use would not be beneficial. These studies have also shown that nurses assume they know when a patient requires further nutritional interventions, on the basis of their clinical expertise and, therefore, assume that standardised screening is not necessary <sup>2,3</sup>. Our findings indicate that coming in contact with malnutrition screening increases the nurses' awareness regarding the topic and helps them develop a more positive attitude towards the topic of malnutrition screening.

The results of **study three** indicate that the perceived practices of the healthcare staff also improved. The study of Laur et al. demonstrated similar results after implementing an integrated nutrition pathway <sup>17</sup>. Our results pointed out that, after the implementation of the malnutrition screening tool, the healthcare staff encouraged the patients to eat more frequently and assisted them if they needed help. They also frequently encouraged the families to bring food from home, checked the patients during the meals to see how well they were eating and altered their scheduled tasks to avoid interrupting the patients during their meals. These results indicate that the awareness level of the healthcare staff increased, resulting in better nutritional practices and more frequently conducted interventions, by following the process of implementing a malnutrition screening tool.

#### *Impact of malnutrition screening on quality of care*

In **study four**, the practices of healthcare staff were measured objectively by collecting data from existing patient records. The results of this study confirmed that the use of a malnutrition screening tool improved the process quality of nutritional care, with respect to the number of nutritional interventions, malnu-

trition diagnosis frequencies of and weight and height (BMI) documentation frequencies for the patients involved in the study. However, the improvements in the quality of nutritional care through the use of a malnutrition screening tool were only observed in the time period during which the screening tool was used regularly. If the screening rate decreased, the process quality indicators simultaneously decreased. This highlights the fact that the sustainable use of a malnutrition screening is a decisive factor in the provision of good quality nutritional care.

The benefits of malnutrition screening on the quality of care have also been cited in similar projects conducted in other countries<sup>11, 18, 19</sup>. Leistra et al. reported that the Dutch Ministry of Health already introduced malnutrition screening as a performance indicator in 2007. Since that timepoint, screening rates have increased continuously<sup>11</sup>. One possible reason for the long-term success noted in this case may be that the implementation and use of a screening tool was made mandatory. In our study, a screening period of at least one month was agreed upon with the decision-makers. Afterwards, the health professionals were free to decide whether to continue or discontinue screening.

The results of **study four** indicate that, given the option, health professionals may not voluntarily choose to screen patients for malnutrition. Study findings by Leistra et al.<sup>11</sup> confirm this in that a main enabler for completing screening was the fact that the screening was a required item in the electronic documentation system<sup>11</sup>. Other qualitative studies have yielded similar results. Healthcare professionals mostly agree that, if malnutrition screening were a required item, screening rates and, accordingly, the quality of nutritional care would improve<sup>2, 20</sup>.

In **study four**, the implementation of the malnutrition screening tool led to positive improvements in multidisciplinary cooperation. The results show that a higher percentage of patients received a referral to a dietitian when a screening tool was used. An improvement in multidisciplinary cooperation was also supported by the qualitative data collected in this study. The healthcare professionals perceived an improved integration of dietitians on the wards, which had a positive impact on the daily patient care. Taking into account the results of **study one**, which revealed that multidisciplinary cooperation is rarely included in nursing/medical education, multidisciplinary management

should be given great attention when discussing the quality of nutritional care in hospitals <sup>21-27</sup>.

*Perceptions of healthcare staff regarding use of malnutrition screening*

The results of the qualitative part of **study four** revealed that nearly all interviewed healthcare professionals perceived the overall process of the implementation of a malnutrition screening tool positively. The interviewees highlighted numerous advantages of the use of the screening tool and generally perceived the screening as an intervention that required little effort. Few barriers were identified with regard to the use of the screening tool, and these included difficulties measuring the weight and height of the patients, criticism of physicians about the screening tool, or low levels of active support from the management.

The interviewees stated that the organisational factors were crucial the use of the malnutrition screening tool. Especially support from the decision-makers and the management were mentioned as key to use the screening tool. If healthcare staff received an order to use the screening tool and recognition that they were contributing to an improvement in the quality of nutritional care, it was easier for them to fully integrate screening into their daily routines. This result is in accordance with those of other studies in which barriers to the use of malnutrition screening tools were examined <sup>2, 3, 11, 20</sup>. In many studies, healthcare staff have expressed the feeling that sufficient support from the hospital management and management is an important factor that influences the success of malnutrition screening <sup>1, 2, 20, 28</sup>.

In addition to the management, the commitment of individual nurses, physicians and dietitians was identified as an important factor for success. This has been confirmed by other studies <sup>11, 28</sup>. One study, for example, asked for enablers for optimal malnutrition screening and revealed that the engagement of nurses and specialists is one important facilitator for conducting malnutrition screening <sup>11</sup>. In this context, these persons could be nominated as 'local opinion leaders' <sup>29, 30</sup>. In studies that have dealt with effective implementation strategies, the nomination of opinion leaders was found to be an effective way of promoting evidence-based practice and improving the performance of healthcare professionals <sup>29</sup>. This potential should be used to facilitate malnutrition screening and provide adequate nutritional care for hospitalized patients.

### **Methodological reflection**

This chapter includes a critical reflection on the methods used in the individual studies included in this doctoral thesis. The strengths of the studies are highlighted, and limitations that have to be taken into account when interpreting the data are presented.

**Study one** was a cross sectional study conducted in all European countries using an online-survey. As it is known from the literature that online-surveys often achieve low response rates <sup>31</sup>, many interventions were undertaken to increase the response rate in the online-survey, e.g., sending two reminders and cooperating with country-specific associations. Despite the great efforts that were taken, response rates of 14.2 % for the nursing education institutions and 8.4 % for the medical education institutions were achieved. These rather low rates did not allow us to draw general conclusions about all European institutions. In addition, the amount of nutrition education may have been overestimated, because we assumed that institutions with an interest in nutrition education participated in the survey. Persons who filled out the online-survey may have not known specific details about the content of the nutrition education courses offered by the institutions, and this may have influenced their answers and the results. A response bias is possible because the online-survey was presented in the English language, which might have been a barrier for participation. However, the online-survey was conducted across all European countries, which allows the results to provide a broad picture of the education of healthcare professionals. Furthermore, it is one of few studies that evaluated the provision and content of education of nurses and physicians on nutrition. In particular, this study provides one of the first pieces of information about the education of nurses and physicians on malnutrition and malnutrition screening in older adults.

In **study two**, a secondary data analysis was conducted of data collected from 53 Austrian hospitals and 5255 patients of all age groups. A potential limitation encountered in this study was that the need to receive written informed consent of all patients could have led to the patient's refusal if the patient's health was too poor for participation. Exactly these patients, however, were assumed to be at a high risk of malnutrition and, therefore, potentially the most interesting. The cross-sectional design of the present study did not allow us to make conclusions with regard to causalities. The major strength of the study was the large sample size, which provided us with comprehensive insights into the

quality of nutritional care as well as into associations of structure, process and outcome parameters of nutritional care in hospitals.

**Study three** used a pretest-posttest design. One limitation of the study was that it was not possible to randomise the participants either to the control or the intervention group, because the malnutrition screening tool was implemented in entire wards. The two participating hospitals could choose whether they wanted to represent the intervention or the control group, which can indicate a selection bias. Furthermore, the questionnaire used in the study for data collection was a subjective measurement method. The questions were answered by the participants themselves and, therefore, self-perceived. This is especially relevant with reference to the nutritional practices, since these are self-perceived nutritional practices and not objectively-observed practices. The prospective pretest-posttest design and the inclusion of a non-equivalent control group were the major strengths of this study. The pretest-posttest design is considered as a strong design<sup>32</sup>. The intervention and control group had similar baseline characteristics; therefore, we concluded that the pretest-posttest differences were the result of the implementation of the malnutrition screening tool. In addition, a high percentage (70.6 %) of the participating healthcare staff who participated in the study filled out the questionnaire at both measurement time points (T0 and T1). This made it possible to analyse paired responses, which strengthens the results of the study.

In **study four**, a mixed-methods design was chosen. The wards that participated in the study were only from two different hospitals, which kept us from broadly generalising the results. The relatively short intervention phase may mean that long-term improvements could not be achieved. Moreover, we did not assess whether the positive changes in process quality of nutritional care led to improved patient outcomes. The strength of this study was the mixed methods research design used, which allowed us to gain a more complete understanding of the process of implementing and using a validated malnutrition screening tool in a hospital setting. The inclusion of various professions in the interviews gave us comprehensive insights into the different perceptions. Data was collected at three time points, which allowed us not only to obtain short-term results but also draw long-term conclusions after three months.

Standardised data collection processes were applied in all four studies conducted as part of this doctoral thesis work. To measure the different dimen-

sions of the quality of nutritional care in **study two**, the standardised and tested questionnaire of the international LPZ project was used <sup>33</sup>. This uniform way of measuring the quality of care is important to enable comparison of the results with those from other institutions, settings, or countries. This questionnaire covered items of structural, process and outcome level and provided us with a complete picture of the quality of nutritional care on different levels <sup>33</sup>. Furthermore, the use of a valid and reliable questionnaire for data collection about knowledge, attitudes and perceived practices (KAP) of healthcare staff improved the overall data quality of **study three**. However, at the time we conducted study <sup>3</sup>, there was only one study available that tested this KAP questionnaire <sup>16</sup>. Further studies would be necessary to evaluate the psychometric properties as well as appropriateness of the single items on the questionnaire to increase the acceptance of the tool.

In **study three** and **study four**, the Graz Malnutrition Screening Tool (GMS) was used and implemented in one hospital. The GMS is an Austrian malnutrition screening tool that is based on the Nutritional Risk Screening (NRS), and it was developed by experts in the field. It is psychometrically tested with appropriate criterion-related validity and excellent inter-rater reliability <sup>34, 35</sup>. The GMS is a well-known and frequently used tool in Austria <sup>34</sup>. However, expert associations such as ESPEN recommend malnutrition screening tools that are internationally more common, e.g., the NRS for acute care. Despite the recommendations of ESPEN, we decided to use the local GMS in our studies to improve its acceptability among the healthcare professionals. Furthermore, it was easier to implement the GMS into the electronic documentation tool because this had already been done in another hospital in the respective hospital association in Austria.

Face-to-face interviews, which we used in **study four**, are an appropriate instrument for exploring opinions and perceptions of people <sup>36</sup>. We conducted these interviews with members of different healthcare professionals, who have to deal with the topic of malnutrition in their daily clinical practice (dietitians, nurses, physicians) as well as with stakeholders. This strengthened the results of the study since it offered insight into different views and perspectives about malnutrition screening. The qualitative results of the interviews support the quantitative results.

## **RECOMMENDATIONS FOR FUTURE RESEARCH**

Based on the results of the studies conducted as part of this doctoral thesis work, some recommendations should be taken into account by future researchers.

### **Develop and evaluate innovative education tools**

This research revealed that education on malnutrition is rarely provided in the basic educational programmes of nurses and physicians. Therefore, I recommend developing high-quality and comprehensive education tools or adapting existing courses that are already included in the education of healthcare staff. These courses should include at least the topic of malnutrition screening, evidence-based interventions for prevention and treatment of malnutrition and multidisciplinary cooperation. These educational tools should be innovative and may be online-education tools such as Massive Open Online Courses (MOOCs), which can reach as many persons as possible. Furthermore, it would be of great interest to conduct analyses on the effectiveness of educational interventions in the education and clinical practice of healthcare staff regarding malnutrition and malnutrition screening.

### **Investigate long-term effects of malnutrition screening**

During this research, an association of using a malnutrition screening tool and good nutritional practice was identified in a cross-sectional as well as in a prospective pretest-posttest study. However, the intervention phase was relatively short. Future studies on malnutrition screening should investigate the long-term effects of using a malnutrition screening tool in different settings. A special focus should be placed on the sustainability of the results. Studies that address not only process indicators or knowledge, attitudes and perceived practices but also patient outcomes (e.g. on nutritional intake, weight or length of stay) would be of great interest.

### **Focus on supporting malnutrition screening in different settings**

Several clinical guidelines and expert consensus papers exist on the management of malnutrition. Nevertheless, the studies included in this doctoral thesis as well as other publications show that, at least in some countries, a research-practice gap exists. Therefore, I recommend conducting studies that focus on interventions, which may improve the screening rates as well as

good nutritional care (e.g. make screening mandatory, educational interventions, launching multidisciplinary teams). These studies could provide arguments for stakeholders to support structured, evidence-based nutritional care in hospitals.

## **RECOMMENDATIONS FOR CLINICAL PRACTICE**

### **Make screening mandatory**

To facilitate good nutritional care in hospitals, malnutrition screening is crucial. One way to improve screening practice would be to make it mandatory. The hospital management may initiate this process. Another possibility is to make screening obligatory at the national level. Examples from other countries show that this substantially contributes to high screening rates and, thus, to more interventions for malnourished patients.

### **Facilitate malnutrition screening**

As part of this thesis work, practicability was identified as one important factor for the use of a malnutrition screening tool. To facilitate malnutrition screening, I recommend integrating the malnutrition screening tool into the electronic documentation systems. Additionally, it should be part of the daily routines to minimize additional workload (e.g. conduct the malnutrition screening within the nursing assessment upon the patient's admission). The nomination of opinion leaders that are responsible for the topic of malnutrition screening may also be an effective facilitator. Providing education on malnutrition screening may further support its use as well as support the clear assignment of responsibilities, the development of in-house guidelines, or encourage the support of the hospital management.

### **Use valid and reliable malnutrition screening tools**

In clinical practice, the screening of the patient's nutritional status is often done with invalid and unreliable indicators, e.g., clinical view of healthcare staff, weight, or BMI. I strongly recommend using a valid and reliable malnutrition screening tool in all settings. I do not recommend one specific malnutrition screening tool, since several screening tools exist; all countries and institutions have preferred screening tools. So long as the screening tool is psychometrically tested and shows good validity, reliability and practicability, it

should be acceptable. Furthermore, I recommend rescreening at defined time intervals to evaluate the nutritional status of the patients and guarantee the provision of sustainable nutritional care.

### **Diagnose and document malnutrition and malnutrition indicators**

The diagnosis of malnutrition in the patient records is necessary to guarantee adequate and sustainable nutritional care. The documentation is important, especially if patients are transferred to another ward or setting, since incomplete documentation can reduce the quality of care and the sustainability of nutritional interventions. Since malnutrition is a topic that requires multidisciplinary cooperation, I recommend the diagnosis of malnutrition by members of all professions (nutrition diagnosis by dietitians, medical diagnosis by physicians and nursing diagnosis by nurses). Furthermore, the documentation of malnutrition indicators, such as weight, height and weight loss history, is of utmost importance. Within the studies included in this doctoral thesis, proper documentation was shown to simplify the interdisciplinary management. Dietitians, for example, can calculate the patients' nutritional requirements and create adequate nutritional care plans more easily if proper documentation was available.

### **Use further education to improve nutritional awareness and knowledge**

Healthcare staff should be encouraged to attend further education courses on malnutrition. Since the extent and content of education on malnutrition in the basic education of nurses and physicians is limited, they should educate themselves independently. For this purpose, healthcare staff should choose high-quality education courses provided by official educational institutions (e.g. universities).

### **Include nutrition professionals into the education of healthcare staff**

In nursing education institutions, our studies showed that the topic of nutrition and malnutrition was mainly taught by nurses, and in medical education institutions, by physicians. I recommend including nutrition professionals, such as dietitians, in the education programme provided for healthcare staff in close cooperation with members of multi-professional teams to provide different perspectives on the problem. Integrating different professions that are present in clinical practice may already strengthen positive attitudes towards multidis-

ciplinary cooperation during the period of basic education. Furthermore, this integration has the potential to raise awareness about the roles of the different professions in nutritional care in clinical practice.

### **Participate in measurements of quality of nutritional care**

Quality measurements are important instruments for improving clinical practice. The evaluation of the quality of nutritional care in institution provides insights into the prevalence of malnutrition and nutritional practice and gives great opportunities for further developments. Based on the QoNC (Quality of Nutritional Care) model, which underlies the work described in this doctoral thesis, quality measurements should be based on different levels, i.e., structure, process and outcome level. The patient, with his or her unique characteristics, culture and environment, should always be in the focus of quality improvement interventions. Examples for such measurements are the “*National Prevalence Measurement of Quality of Care*” (LPZ, <https://at.lpz-um.eu/de>) in which malnutrition is one part or the project “*nutritionDay worldwide*” (<https://www.nutritionday.org/>).

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## SUMMARY

Malnutrition is a highly prevalent health problem in hospitals, and it is essential to deal with this problem in research and clinical practice. The overall aim of the work described in this doctoral thesis was to gain insight into the quality of nutritional care in hospitals regarding malnutrition, and especially into healthcare staff education and malnutrition screening. The results of all five studies presented in this thesis show that there are shortcomings in education and clinical practice regarding malnutrition in hospitals, but that an investment in good quality nutritional care provides benefits for patients, healthcare professionals and institutions. A short summary of the chapters appearing in this doctoral thesis is provided below.

The **first chapter** includes background information on malnutrition, the relevance of the topic and research gaps. Furthermore, the *Quality of Nutritional Care model (QoNC)* is described, which is based on the *Quality of Care* model of Donabedian and which presents the theoretical background for the thesis work.

The **second chapter** provides an overview of the five studies conducted within the framework of the doctoral research. The chapter comprises a short description of the study designs, sampling methods, settings, data collection and methods of data analysis.

In **chapter three** the extent and content of nutrition education and education on malnutrition in older adults in basic nursing education programmes were examined. A cross-sectional study using a web-based online survey was conducted to gather information about the curricular content. Data were collected with an online questionnaire that was e-mailed to those responsible for curriculum development in nursing education institutions. We analysed data received from 131 nursing education institutions based in 26 European countries. The results indicate that 86.3 % of the participating institutions included courses on nutrition in their curricula, and 73.7 % of the institutions addressed the topic of malnutrition in older adults as part of the curriculum. Nurses mostly were provided with background information on malnutrition, such as its consequences (68.7 %) or causes (67.2 %). Some content, such as multi-professional nutrition support (28.2 %), the responsibilities of various professions within nutritional care (35.1 %) and certain interventions (e.g. methods for food fortification, 38.9 %), as well as their monitoring and evaluation (46.6 %),

were not frequently taught. These results indicate that nurses have to educate themselves further to gain more knowledge about the topic of malnutrition.

In **chapter four**, the extent and content of nutrition education and education on malnutrition in older adults in basic medical education programmes were highlighted. Again, an online-survey was conducted, and representatives from 26 medical schools in twelve European countries responded. The results are similar to those found for nursing education institutions. 79.9 % of the medical education institutions integrated nutrition education in their curricula, and 50.0 % provided education on malnutrition in older adults. The topics taught most frequently at the institutions were topics of basic knowledge such as causes (50.0 %), consequences (46.2 %), or assessment of malnutrition (50.0 %). Again, specific interventions and multidisciplinary cooperation were rarely included. The findings of this study suggest that a high percentage of physicians have never been exposed to the topic of malnutrition prior to starting their clinical work.

**Chapter five** includes a description of the association between quality indicators on the structure, process and outcome levels of nutritional care and malnutrition screening in hospitals. A secondary data analysis was conducted of data collected in a cross-sectional multi-centre study performed in 2015. Nurse directors used a standardized questionnaire for data collection on an institutional level, and two nurses collected data on the patient level in person and with the help of patient records. A total of 53 Austrian hospitals and 5255 patients participated in the study. The results revealed that there is a strong association between quality indicators on the structure, process and outcome levels. In hospitals with a malnutrition guideline, the wards used a validated screening tool significantly more often. Wards that integrated a validated malnutrition screening tool in their daily work provided more interventions to their patients and showed a significantly lower prevalence of malnutrition. These wards also more frequently referred the patients to a dietitian, provided energy-enriched snacks or consistency-adjusted food/drinks, monitored the nutritional intake and adjusted the meal ambiance. These results clearly show that the quality of nutritional care on the structural, process and outcome levels is interrelated. Furthermore, it demonstrates that using a valid and reliable malnutrition screening tool is associated with the provision of better nutritional care.

**Chapter six** describes the effect of the use of a valid and reliable malnutrition screening tool on the knowledge, attitudes and practices of nurses, nurses' aides and physicians. We conducted a controlled pretest-posttest study that involved two hospitals. The intervention hospital implemented the Graz Malnutrition Screening Tool (GMS), and the control hospital did not. A standardized self-reported questionnaire was used to assess the knowledge, attitudes and perceived practices (KAP) of 269 nurses, nurses' aides and physicians working at the respective hospital wards. Of the 269 participants at baseline, 190 persons completed the questionnaire again after one month of screening. We found that the sum score for the KAP questionnaire changed significantly after the implementation of the malnutrition screening tool in the intervention group, but not in the control group. In all, 54.2 % of the participants in the intervention group stated that their knowledge of malnutrition improved, whereas this was indicated by only 20.7 % of the participants in the control group. 77.8 % of the participants in the intervention group stated that their perception of nutritional practices regarding malnourished patients improved, whereas only 34.8 % of those in the control group issued this statement. In conclusion, the use of a valid and reliable malnutrition screening tool positively affected the KAP of nurses and physicians. However, one possible limitation of this study was that these changes were measured with a self-reported questionnaire.

Therefore, in **chapter seven**, we evaluated the impact of the use of a malnutrition screening tool on process indicators of nutritional care in an objective manner by collecting data on process indicators of nutritional care by referring to patient records. Furthermore, we explored healthcare professionals' perceptions and opinions with regard to the use of a malnutrition screening tool. A mixed methods design (convergent parallel design) was applied. We conducted a controlled pretest-posttest study for the quantitative part of the study and semi-structured interviews for the qualitative part. In the quantitative part, 1171 patients participated at T0 (pretest), 1186 at T1 (after 1 month) and 1253 at T2 (after 3 months). In the qualitative interviews, eleven healthcare professionals (nurses, physicians, dietitians) and managers participated. The results indicated that the use of a valid and reliable malnutrition screening tool significantly improved process quality indicators of nutritional care after one month (T1). This meant that the number of nutritional interventions initiated by a dietitian, the frequency of malnutrition diagnosis by physicians and the frequency of documentation of weight and height (BMI) by nurses increased. After three months (T2), the screening rate decreased tremendously, and the process

quality indicators simultaneously deteriorated. The results of the qualitative interviews revealed that the use of the screening tool was perceived as a positive process which raised awareness about the problem, improved multi-disciplinary cooperation and positively affected the quality of patient care. Few barriers were identified regarding the use of the screening tool. These results clearly show that the use of a malnutrition screening tool benefits both the patients as well as the healthcare staff. However, it is of utmost importance for staff, and especially managers, to make great efforts to ensure high screening rates and maintain these positive changes sustainably.

**Chapter eight** includes a summary and discussion of the main results of the individual studies presented in this doctoral thesis. The strengths and limitations of the studies are highlighted, and a general critical methodological reflection is presented. Finally, recommendations for future research and clinical practice are given.









## ZUSAMMENFASSUNG

Mangelernährung ist ein häufig auftretendes Problem bei hospitalisierten PatientInnen. Daher ist es essentiell, sich diesem relevanten Thema sowohl in der Forschung als auch in der klinischen Praxis anzunehmen. Das übergeordnete Ziel dieser Dissertation war es, einen Einblick in die Qualität der Ernährungsversorgung in Krankenhäusern bezugnehmend auf das Thema Mangelernährung zu bekommen. Ein spezieller Fokus wurde dabei auf die Ausbildung von Gesundheitspersonal sowie auf das Thema Mangelernährungs-Screening gelegt. Die Ergebnisse aller fünf Artikel, die im Rahmen dieser Dissertation publiziert wurden, zeigen, dass Defizite in der Ausbildung von Personen in Gesundheitsberufen sowie in der klinischen Praxis in Bezug auf Mangelernährung bei hospitalisierten PatientInnen bestehen. Investitionen in eine adäquate Betreuung mangelernährter Personen führten jedoch zu Vorteilen für PatientInnen, Gesundheitspersonal und Institutionen. Nachfolgend werden die einzelnen Kapitel dieser Dissertation kurz zusammengefasst.

Das **erste Kapitel** beinhaltet Hintergrundinformationen zum Thema Mangelernährung sowie zur Relevanz des Themas und zeigt bestehende Forschungslücken auf. Darüber hinaus wird das „*Quality of Nutritional Care Modell (QoNC)*“ beschrieben, welches auf dem Modell „*The Quality of Care*“ von Donabedian basiert und den theoretischen Hintergrund dieser Dissertation darstellt.

Das **zweite Kapitel** gibt einen Überblick über die fünf Studien, welche im Rahmen dieser Dissertation durchgeführt wurden. Es enthält eine kurze Beschreibung der Studiendesigns, Stichproben, Settings und Methoden zur Datensammlung sowie zur Datenanalyse.

**Kapitel drei** beschreibt, inwiefern das Thema Mangelernährung bei älteren Menschen in der Grundausbildung von Pflegepersonen in Europa behandelt wird. Zu diesem Zweck wurde eine Querschnittstudie durchgeführt. Es wurde ein Link zu einem Online-Survey an alle Ausbildungseinrichtungen auf tertiärem Niveau in Europa ausgesendet, um Informationen über den Inhalt der Lehrpläne zu erhalten. Der Link wurde an die Verantwortlichen für die Lehrplanentwicklung der Bildungseinrichtungen gesendet. Es konnten Daten aus 131 Pflegeeinrichtungen in 26 europäischen Ländern analysiert werden. Die Ergebnisse zeigen, dass 86,3 % der teilnehmenden Einrichtungen das Thema Ernährung in die Lehrpläne integrierten und 73,7 % der Institutionen gaben

an, das Thema Mangelernährung bei älteren Menschen zu unterrichten. Die am häufigsten gelehrteten Inhalte waren Hintergrundinformationen zum Thema Mangelernährung, beispielsweise Folgen (68,7 %) oder Ursachen (67,2 %) von Mangelernährung. Einige Inhalte, wie zum Beispiel die Zusammenarbeit verschiedener Berufsgruppen (28,2 %), die Verantwortlichkeiten der Berufsgruppen im Rahmen des Ernährungsmanagements (35,1 %) und spezielle Interventionen (z.B. Methoden zur Anreicherung von Nahrungsmitteln (38,9 %)) oder das Thema Monitoring und Evaluierung von gesetzten Interventionen (46,6 %) wurde in der Mehrheit der Einrichtungen nicht aufgegriffen. Die Ergebnisse dieser Studie zeigen, dass sich Pflegekräfte selbstständig weiterbilden müssen, um sich grundlegendes Wissen zum Thema Mangelernährung anzueignen.

In **Kapitel vier** wurde erhoben, inwiefern das Thema Mangelernährung bei älteren Menschen in der Grundausbildung von MedizinerInnen in Europa behandelt wird. Es wurde erneut eine Querschnittstudie durchgeführt und im Rahmen dessen ein Link zu einem Online-Survey an alle medizinischen Universitäten Europas ausgesendet. Vertreter von 26 Universitäten in 12 europäischen Ländern füllten den Fragebogen vollständig aus. Die Ergebnisse ähneln jenen zur Ausbildung von Pflegepersonen. 79,9 % der Bildungseinrichtungen gaben an, das Thema Ernährung im Lehrplan aufgenommen zu haben und 50,0 % gaben an, auch das Thema Mangelernährung bei älteren Personen während der Ausbildung zu behandeln. Die häufigsten Themen waren erneut Hintergrundinformationen wie zum Beispiel Ursachen (50,0 %) oder Folgen (46,2 %) der Mangelernährung oder Assessment-Methoden (50,0 %). Spezifische Interventionen und die multidisziplinäre Zusammenarbeit mehrerer Berufsgruppen wurden selten behandelt. Die Ergebnisse dieser Studie legen nahe, dass viele MedizinerInnen kaum Kontakt mit dem Thema Mangelernährung hatten, bevor diese in ihrem Beruf tätig werden.

**Kapitel fünf** beschreibt Zusammenhänge zwischen verschiedenen Qualitätsindikatoren auf Struktur-, Prozess- und Ergebnisebene bezugnehmend auf die Ernährungsversorgung und das Thema Mangelernährungs-Screening in Krankenhäusern. Es wurde eine sekundäre Datenanalyse mit Daten einer im Jahr 2015 durchgeführten Querschnittsstudie durchgeführt. Die PflegedirektorInnen der teilnehmenden Krankenhäuser füllten einen standardisierten Fragebogen zur Einrichtung bzw. zu den einzelnen Stationen der Einrichtung aus, während zwei Pflegepersonen Daten auf PatientInnenebene sammelten.

Die Daten zu den PatientInnen wurden mittels PatientInnenbefragung sowie mit Hilfe der PatientInnen-Dokumentation erhoben. 53 österreichische Krankenhäuser mit 5255 PatientInnen nahmen an der Studie teil. Die Ergebnisse zeigten, dass ein enger Zusammenhang zwischen Struktur-, Prozess- und Ergebnisindikatoren in Bezug auf Mangelernährung besteht. Krankenhäuser, welche eine Leitlinie zum Thema Mangelernährung hatten, verwendeten signifikant häufiger validierte Mangelernährungs-Screening-Tools. Stationen, die ein validiertes Mangelernährungs-Screening-Tool verwendeten, hatten eine niedrigere Prävalenz mangelernährter PatientInnen und führten mehr Maßnahmen durch als Stationen ohne Screening-Tool. Auf Stationen mit einem validierten Screening-Tool wurden PatientInnen häufiger an die Diätologie überwiesen, erhielten häufiger energieangereicherte Zwischenmahlzeiten sowie konsistenzadaptierte Speisen und Getränke. Auf diesen Stationen wurde außerdem die Nahrungsaufnahme der PatientInnen häufiger evaluiert und das Ambiente während der Mahlzeiten adaptiert. Die Ergebnisse dieser Studie zeigen deutlich, dass die Qualität der Ernährungsversorgung auf Struktur-, Prozess- und Ergebnisebene eng korreliert.

**Kapitel sechs** beschreibt, welchen Effekt die Verwendung eines validen und reliablen Mangelernährungs-Screening-Tools auf das Wissen, die Einstellungen und die Praxis von Pflegepersonen und MedizinerInnen hat. Es wurde eine kontrollierte Pretest-Posttest Studie durchgeführt, in welche zwei Krankenhäuser eingeschlossen wurden. Ein Krankenhaus implementierte das Grazer Mangelernährungs-Screening (GMS) (Interventionsgruppe) während das andere Krankenhaus kein Screening-Tool verwendete (Kontrollgruppe). Die Datensammlung erfolgte mittels standardisiertem Fragebogen, der das Wissen, die Einstellungen und die Praxis von Pflegepersonen und MedizinerInnen auf den teilnehmenden Stationen erfasste. 269 TeilnehmerInnen füllten den Fragebogen zu Beginn der Studie aus, 190 Personen füllten den Fragebogen nach einem Monat erneut aus. Der Gesamt-Score des Fragebogens verbesserte sich signifikant nach der Einführung des Mangelernährungs-Screening-Tools in der Interventionsgruppe, nicht jedoch in der Kontrollgruppe. Insgesamt gaben 54,2 % der TeilnehmerInnen in der Interventionsgruppe an, dass sich ihr Wissen zum Thema Mangelernährung verbessert hat, während dies in der Kontrollgruppe nur bei 20,7 % der TeilnehmerInnen der Fall war. 77,8 % der TeilnehmerInnen in der Interventionsgruppe gaben an, dass sich ihre Praxis verbesserte. Dies wurde nur von 34,8 % der Personen in der Kontrollgruppe geäußert. Zusammenfassend kann festgehalten werden, dass die

Verwendung eines validen und reliablen Mangelernährungs-Screening-Tools das Wissen, die Einstellungen und die Praxis von Pflegenden und MedizinerInnen verbesserte. Eine Limitation der Studie ist jedoch, dass diese Veränderungen mit einem subjektiven Fragebogen erhoben wurden.

Daher wurde in **Kapitel sieben** untersucht, wie sich die Verwendung eines validen und reliablen Mangelernährungs-Screening-Tools auf objektiv erhobene Prozessindikatoren auswirkt. Die Daten dafür wurden mit Hilfe der PatientInnen-Dokumentation erhoben. Zusätzlich wurden die Wahrnehmungen und Meinungen der in den Einrichtungen tätigen Gesundheitsberufe erfragt. Für diese Studie wurde ein Mixed-Methods Design ausgewählt. Für den quantitativen Teil der Studie wurde eine kontrollierte Pretest-Posttest Studie durchgeführt. Für den qualitativen Teil wurden semi-strukturierte Interviews mit verschiedenen Professionen geführt. In den quantitativen Teil der Studie konnten 1171 PatientInnen zu T0 (Baseline) miteinbezogen werden, 1186 zu T1 (nach 1 Monat) und 1253 zu T2 (nach 3 Monaten). Mit elf Personen (PflegerInne, ÄrztInnen, DiätologInnen, KrankenhausmanagerInnen) wurden qualitative Interviews durchgeführt. Es zeigte sich, dass die Verwendung eines validen und reliablen Mangelernährungs-Screening-Tools nach einem Monat signifikant positive Auswirkungen auf Prozessindikatoren hatte. Das bedeutet, dass sich die Anzahl der Interventionen durch eine DiätologIn, die Häufigkeit einer Diagnose Mangelernährung durch MedizinerInnen sowie die Dokumentation von Gewicht und Körpergröße durch Pflegepersonen signifikant erhöhten. Nach drei Monaten sank die Screening-Rate jedoch enorm und damit einhergehend sank die Anzahl an durchgeführten Interventionen. Die Ergebnisse der qualitativen Interviews zeigten, dass der Einsatz eines Mangelernährungs-Screening-Tools hauptsächlich als positiver Prozess wahrgenommen wurde, der auf das Problem aufmerksam macht, die interdisziplinäre Zusammenarbeit verbessert und die Qualität der PatientInnenversorgung positiv beeinflusst. Die interviewten Personen äußerten nur wenige hinderliche Faktoren zur Durchführung des Screenings. Die Ergebnisse dieser Studie zeigen, dass der Einsatz eines Mangelernährungs-Screening-Tools sowohl für PatientInnen als auch für das Gesundheitspersonal positiv ist. Für die MitarbeiterInnen und insbesondere das Management ist es jedoch essentiell, adäquate Screening-Raten sicherzustellen, um diese positiven Veränderungen nachhaltig aufrechtzuerhalten.

**Kapitel acht** inkludiert eine Zusammenfassung und Diskussion der Hauptergebnisse der einzelnen Studien, die im Rahmen dieser Dissertation durchgeführt wurden. Die Stärken und Schwächen der durchgeführten Studien werden beschrieben und eine allgemeine methodologische Reflexion der Ergebnisse wird durchgeführt. Abschließend werden Empfehlungen für zukünftige Forschungsarbeiten und die klinische Praxis formuliert.







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