

# Association between malnutrition risk and pain in older hospital patients

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**Objective:** To describe the prevalence of malnutrition risk and pain in older hospital patients and characterise the association between these two problems.

**Research methods and procedures:** The study includes a secondary data analysis of data collected in two cross-sectional studies. Data collection was performed in 2017 and 2018 using a standardised and tested questionnaire. The study protocol was approved by an ethical committee.

**Results:** Data from 3406 patients were analysed. Among the participants, 24.6% of the patients were at risk of malnutrition, and 59.6% of the patients reported feeling pain. A significantly higher number of patients with pain (26.4%) were at risk of malnutrition than patients without pain (22.1%). The multivariate logistic regression

analysis showed that patients with severe/very severe or unbearable pain were 1.439 times more likely to develop a risk of malnutrition than patients without pain. Patients with cancer or diseases of the digestive system were twice as likely to develop malnutrition than those without these diseases.

**Conclusions:** The results of this study show that older patients with severe pain are at higher risk of developing a risk of malnutrition than those without pain, although the study design (cross-sectional) does not imply causality. Therefore, special efforts should be made to assess pain in these patients to reduce the negative consequences of this pain, such as malnutrition.

**Keywords:** malnutrition risk, pain, older, hospital.

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## Introduction

Malnutrition can be defined as a state that results from a lack of intake or uptake of nutrients, leading to altered body composition (decreased fat free mass) and body cell mass. This eventually results in diminished physical and mental functions and impaired clinical outcomes from disease (1). If a patient is malnourished, in terms of undernutrition, consequences such as longer hospital stays, complications (e.g. prolonged wound healing, increased morbidity and mortality) and high healthcare costs can be expected (1–5). Malnutrition especially affects older patients due to age-related changes in their appetites, senses of smell and taste and socio-economic status (6, 7). Institutionalisation (6, 7) and acute or chronic diseases may influence nutritional status (6), so can pain and the side effects of medications (8, 9). As a result, pain is one potential risk factor for malnutrition,

which increases with age and can lead to decreased quality of life, problems carrying out daily activities, increased mortality and high direct and indirect healthcare costs if not or inadequately treated (10, 11).

Numerous studies have reported the prevalence of malnutrition in hospital patients. Correia, Perman and Waitzberg (2) performed a systematic review of studies performed in Latin America and found that malnutrition occurred in 38.5%–71.0% of older hospital patients. Another review found that prevalence rates in hospitals ranged from 11.0 to 45.0% (12).

The prevalence of pain in hospitalised patients has also been described by several authors. Damico et al. (13) found that 38% of the adult hospital patients ( $n = 268$ ) in Italian hospitals reported feeling pain. An investigation in German hospitals showed prevalence rates of moderate to severe pain in 29.5% of surgical patients and 36.8% of nonsurgical patients (14). A recent systematic review found pain prevalence rates of 37.7%–84.0%, whereas severe pain was reported by 7.0%–36.0% of hospital patients (15). However, the prevalence rates of malnutrition and pain vary widely because of differences in definitions, instruments, methods and populations.

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Furthermore, most of the studies were performed in the general hospital population and not in older hospital patients, even though older hospital patients are of special interest with regard to both malnutrition and pain (6, 7, 10, 11).

Due to the high reported prevalence rates of pain, it is important to assess and treat pain adequately and subsequently prevent the harmful consequences of unrelieved pain, such as malnutrition (15). Several authors have attempted to describe the association between nutrition (e.g. appetite) and pain. They found that pain can lead to depression, which often occurs in older patients and is seen as one of the most common causes of weight loss and malnutrition. Pain also negatively affects the cognitive status of a person by impairing attention and concentration, which can result in lower appetite and weight loss. Furthermore, medications can lead to nausea and vomiting, thus decreasing the appetite as does polypharmacy (8, 9, 16, 17).

Most of the studies carried out on malnutrition and pain were performed in community settings, and the primary focus of most of these studies was not placed on the association between malnutrition and pain. Silva et al. (18) described the prevalence of malnutrition and pain in an oncological hospital in Brazil and found that 37.6% of the older patients ( $n = 109$ ) reported feeling pain and 31.2% suffered weight loss. However, they did not use indicators to measure nutritional status other than decreased food intake. Bosley et al. (16) analysed the association between chronic nonmalignant pain and decreased appetite in older adults in Pittsburgh and found that 43% of the persons ( $n = 65$ ) reported that pain interfered with their appetite, resulting in a significant association between poor appetite and higher levels of pain intensity. Most of these studies placed a focus on examining site-specific pain; few studies have concentrated on pain in general (15). Furthermore, the previously performed studies rarely used objective measurements of nutritional status (e.g. BMI) and were based on small sample sizes. Virtually no studies have described the association between malnutrition and pain in older hospital patients, although the prevalence of both problems is high in this population (2, 15). Obtaining results from a large-scale study that uses objective measurement methods would add to the knowledge about the association between these two problems and help healthcare professionals raise awareness about two giant geriatric problems that should not be seen as a 'normal' part of ageing.

## The study

### Aims

The aims of this study were to describe the prevalence of malnutrition risk and pain in older hospital patients in

Austria and subsequently characterise the association between malnutrition risk and pain.

### Design

The 'Nursing Quality Measurement 2.0' is the Austrian version of the 'International Prevalence Measurement of Care problems' (LPZ) (19). It is an annual cross-sectional study using convenience sampling which is carried out on one specific day.

### Participants

All Austrian healthcare institutions ( $n = 243$ ) with more than 50 beds are annually invited to participate in the measurement. The Austrian research team holds a training session about the study process, the applied questionnaire and the online data-entry programme, inviting all participating nursing staff to attend. Only data obtained from hospital patients in 2017 and 2018 were used for this secondary data analysis. Patients over 65 years of age were considered eligible for inclusion in the studies only after their informed consent was given.

### Data collection

Data collection was performed by two trained nurses together, one from the patient's ward and one from another ward. In case of disagreement, the external nurse made the decision. A standardised questionnaire was used to assess the general patient characteristics and collect information on the nursing care problems (pressure ulcers, continence, malnutrition, falls, physical restraints and pain).

General characteristics included demographics, medical diagnosis according to ICD 10 (20) and level of care dependency (21, 22). The level of care dependency was assessed using the Care Dependency Scale (CDS). The CDS consists of 15 items which were assessed on a five-point Likert scale (totally dependent to totally independent), whereas lower scores indicate higher levels of care dependency.

The malnutrition risk was assessed with the Malnutrition Universal Screening Tool (MUST). This tool consists of three items, namely the patient's BMI, unintentional weight loss in the last 3–6 months and effect(s) of acute diseases. The question about BMI and unintentional weight loss can be scored with 0, 1 or 2 points. The question about the effect of an acute disease can be judged with 0 or 2 points. In general, more points signify a higher risk of malnutrition. All points are summarised to identify the overall risk of malnutrition. A score of one point shows that the patient has a medium risk, and a score of two or more points indicates a high risk of

malnutrition (23). The advantage of the MUST tool is that it can be used by all healthcare employees (24).

The questionnaire also included questions on pain experienced in the seven days prior to the survey (no, yes but not daily, daily pain) and the pain level experienced over the seven days prior to the survey ('no pain' to 'unbearable pain').

### Data analysis

IBM SPSS Statistics 26 for Windows was used for data analysis (25). Descriptive analyses of all variables were performed to determine their distribution and identify outliers. Differences between groups were identified using the chi-squared test or the Mann–Whitney *U*-test. A logistic regression analysis was performed. After ensuring the congruence of the assumptions for logistic regression, a univariate analysis with malnutrition as the dependent variable was performed. Possible influencing variables were identified from an examination of the literature and were analysed as univariate variables with the aim to control for their potential influence on the outcome variable. No multicollinearity was assumed if the variance inflation factors were under four (26). All significant variables were included in the multivariate logistic regression analysis using the Enter method (27). Odds ratios with 95% confidence intervals were calculated, and the Hosmer–Lemeshow goodness-of-fit test was used to indicate the fit of the final model. *P*-values lower than 0.05 were considered statistically significant.

### Validity and reliability

The original Dutch questionnaire was developed based on the literature, guidelines and by consulting experts. The questionnaire was translated into German by professional translators and then back-translated and checked for nomenclatural and cultural differences (19). In November 2008, a pilot study was performed in 11 Austrian institutions to test the comprehensibility and applicability of the questionnaire. The questionnaire is updated annually to take new guidelines and current evidence into account. The reliability of the questionnaire was assumed because each patient was assessed by two healthcare professionals (one from the patient's ward and one from another ward) (19). The inter-rater reliability was tested and found to be good (Cohen's  $k$  0.87) (28). Furthermore, psychometrically tested tools such as the CDS and the MUST were included in the questionnaire (19, 21, 23). For instance, in a recent systematic review among hospitalised older patients, the MUST was shown to have good psychometric properties and to be effective in identifying patients at risk (24).

## Results

Seventy-two hospitals and a total of 8970 patients took part in the 'Nursing Quality Measurement 2.0' 2017 and 2018, and 73.6% gave their informed consent. The main reasons for not taking part were a refusal to participate and cognitive impairment. In further analyses, patients younger than 65 years ( $n = 2664$ ) and patients with no data on weight or weight loss ( $n = 534$ ) were excluded. Data from 3406 hospital patients were finally used. Of these participants, 54.4% were female and the mean age was 77 years (Table 1). Diseases of the circulatory, musculoskeletal and genitourinary systems were most common among the participants. Most patients were completely independent (55.1%), and 21.6% had undergone surgery during the two weeks prior to the study.

A risk of malnutrition according to MUST (moderate and severe) was identified in 24.6% of the hospital

**Table 1** Sample characteristics ( $n = 3406$ )

Female (%)	54.4
Age (years) <sup>a</sup>	77.0 (71.0-83.0)
BMI (kg/m <sup>2</sup> ) <sup>a</sup>	25.8 (22.9-29.1)
Surgery in the last 2 weeks (%)	21.6
CDS categories (%) <sup>b</sup>	
Completely care dependent	3.7
To a great extent care dependent	7.6
Partially care dependent	13.7
To a limited extent care independent	19.9
Almost independent	55.1
CDS (sum score) <sup>a,b</sup>	71.0 (60.0-75.0)
Most prevalent medical diagnosis (%) <sup>c</sup>	
Diseases of the circulatory system	61.2
Diseases of the musculoskeletal system and connective tissue	29.9
Diseases of the genitourinary system	26.6
Diseases of the respiratory system	24.6
Diseases of the digestive system	23.5
Number of medical diagnosis ( $n$ ) <sup>a</sup>	3.0 (2.0-4.0)
Malnutrition risk prevalence (%) <sup>d</sup>	24.6
Pain prevalence (%)	59.6
Pain intensity in the last 7 days (%)	
Mild	13.4
Moderate	23.6
Severe	15.0
Very severe	6.3
Unbearable	1.3

BMI: body mass index.

<sup>a</sup>Nonparametric distribution; data are presented as median (25th–75th).

<sup>b</sup>CDS, Care Dependency Scale, was used for the measurement of the level of care dependency. Sum scores ranged from 15 to 75, with a low score indicating a high level of care dependency.

<sup>c</sup>More than one answer possible.

<sup>d</sup>Malnutrition risk was assessed using the MUST (Malnutrition Universal Screening Tool).

patients (Table 1). Pain was reported by 59.6% of the patients. Patients also reported their pain level, and 22.6% of the patients indicated that they had experienced severe, very severe or unbearable pain during the seven days prior to the study. Of these, 56.3% experienced pain daily.

The analysis of the association between malnutrition risk and pain showed that 26.4% of the patients with pain were at risk of malnutrition, while 22.1% of the patients without pain were at risk of malnutrition ( $p = 0.004$ ). In the univariate analysis, six variables were significantly associated with malnutrition risk (Table 2), with all of these being included in the multivariate analysis. The Hosmer–Lemeshow test results demonstrated a reasonably good fit for the model (17 909). All included variables were identified as significant (Table 3). The results showed that patients with severe/very severe or unbearable pain had a 1.439 times higher probability of developing malnutrition risk than those without pain. Patients with cancer or diseases of the digestive system were twice as likely to develop malnutrition risk than those without these diseases. The higher the CDS sum score (indicative of lower levels of care dependency), the lower the risk of malnutrition risk (OR = 0.983).

## Discussion

This study was one of the first in which the association between malnutrition risk and pain in older hospital

**Table 2** Results of the univariate logistic regression analysis with malnutrition risk as the outcome variable ( $n = 3406$ ).

	OR	95% CI	p-Value
Age (years)	0.996	0.986–1.006	0.460
Surgery during the last 2 weeks <sup>a</sup>	1.207	1.004–1.452	0.046
CDS (sum score) <sup>b</sup>	0.984	0.979–0.989	0.000
Mild/moderate pain <sup>a</sup>	1.135	0.947–1.360	0.172
Severe/very severe/unbearable pain <sup>a</sup>	1.491	1.221–1.822	0.000
Number of medical diagnoses	1.016	0.973–1.061	0.467
Cancer <sup>a</sup>	1.957	1.626–2.356	0.000
Endocrine, nutritional and metabolic diseases <sup>a</sup>	0.819	0.677–0.991	0.040
Dementia <sup>a</sup>	0.814	0.567–1.170	0.267
Diseases of the digestive system <sup>a</sup>	2.008	1.689–2.386	0.000
Infectious and parasitic diseases <sup>a</sup>	1.347	0.998–1.818	0.051
Stroke <sup>a</sup>	0.762	0.572–1.015	0.063
Diseases of the nervous system <sup>a</sup>	0.885	0.700–1.118	0.304

CI: confidence interval; OR: odds ratio.

<sup>a</sup>The non-occurrence of the disease (no) as reference category.

<sup>b</sup>CDS, Care Dependency Scale, was used for the measurement of the level of care dependency. Sum scores ranged from 15 to 75, with a low score indicating a high level of care dependency.

**Table 3** Results of the multivariate logistic regression analysis with malnutrition risk as the outcome variable ( $n = 3406$ ).

	OR	95% CI	p-Value
Mild/moderate pain <sup>a</sup>	1.144	0.949–1.380	0.159
Severe/very severe/unbearable pain <sup>a</sup>	1.439	1.171–1.769	0.001
Surgery during the last 2 weeks <sup>a</sup>	1.254	1.034–1.521	0.022
Cancer <sup>a</sup>	1.994	1.648–2.412	0.000
Endocrine, nutritional and metabolic diseases <sup>a</sup>	0.784	0.644–0.954	0.015
CDS (sum score) <sup>b</sup>	0.983	0.978–0.988	0.000
Disease of the digestive system <sup>a</sup>	1.968	1.649–2.349	0.000

Cox & Snell  $R^2$  0.049; Nagelkerke  $R^2$  0.073; Hosmer–Lemeshow test  $\chi^2$  17.909; d.f. = 8;  $p = 0.022$ .

CI: confidence interval. OR: odds ratio.

<sup>a</sup>The non-occurrence of the disease (no) as reference category.

<sup>b</sup>CDS, Care Dependency Scale, was used for the measurement of the level of care dependency. Sum scores ranged from 15 to 75, with a low score indicating a high level of care dependency.

patients was carefully examined. The results show that the malnutrition risk was more prevalent in patients with pain than in patients without pain. The multivariate logistic regression results also show that patients with severe/very severe or unbearable pain had a significantly higher risk of developing malnutrition risk (OR = 1.439) than those without pain. While other risk factors for malnutrition could have been identified, having cancer or diseases of the digestive system were identified as the most important risk factors for malnutrition risk in older hospital patients.

When the prevalence rates of malnutrition and pain are considered separately, it can be seen that the prevalence of malnutrition risk (24.6%) is slightly higher than that reported in former studies carried out in general hospital settings (12, 29). This result may be explained by the fact that the current study only included older hospital patients, among whom the problem of malnutrition is more prevalent as compared to a general hospital population. Furthermore, patients with a medium or high risk of developing malnutrition (according to MUST) – not only those who have received a diagnosis of malnutrition – were included in the study, which contributed to a high prevalence rate.

The prevalence rate of pain was 56.3%, while the prevalence rate of severe, very severe and unbearable pain was 22.6%. These results are in accordance with those reported in a systematic review on general (not only older) hospital patients (15).

A positive association between pain and nutrition as evinced by decreased food intake and low appetite has been previously suggested in the literature (16, 18). Our study built on these findings and helped deepen the

knowledge in this area by providing support for this positive association between pain and malnutrition risk in older hospital patients. This was possible due to the use of a large sample size and objective measurement methods.

Other risk factors that influence the risk of developing malnutrition are also of particular importance. Especially cancer and diseases of the digestive tract were found to increase the risk of malnutrition in our study; this result is in accordance with results reported in the literature (30, 31).

Our study revealed that patients with severe/very severe or unbearable pain are at higher risk of developing malnutrition risk than those without pain. As a result, an adequate assessment of pain can be considered as the first step towards providing help and improving the pain management practice (15, 32–34), which can help reduce consequences of pain like malnutrition. The accurate assessment of pain is a great challenge, because pain cannot be easily measured using a single biological marker (35). Numerous pain assessment scales are available, but pain assessment is not performed routinely (10, 36, 37). This has been described as a substantial barrier to the accurate treatment of older people with pain (32, 33). Furthermore, older patients may attempt to avoid taking too many pain killers, because they may be afraid of adverse effects or addiction. Xiao et al. (37) also found that nearly half of those patients who refused pain medication were worried about the adverse effects of analgesics. Patients have been reported to avoid telling healthcare staff about their pain due to concerns about disturbing the healthcare staff or the long waiting times until healthcare staff attend them (14). In addition, many patients assume that pain is a normal part of the ageing process (10, 39). For these reasons, a group of special interest is the group of older persons with dementia, because pain is frequently under-recognised, underestimated and undertreated in this group (32, 33, 35).

Healthcare professionals should be aware of that they are responsible for detecting their patients' pain early on, because the quality of the pain management depends on the knowledge and attitudes of health care staff (13, 15). This is especially important because insufficient pain management can lead to impaired functional limitations, impaired nutritional status, reduced quality of life, depression and increased healthcare utilisation (16, 40).

In practice, it is important to encourage older patients to tell healthcare staff about their pain and increase patient education (38). Active patient participation in pain management reduces the amount of time these patients spend in severe pain and increases pain relief (41). Furthermore, healthcare staff need to learn how to properly assess pain (15, 32–35). In addition, the nutritional status of all patients should be screened at the time of patient admission and at regular time intervals (42,

43). Special attention should be paid to the nutritional status of patients who report experiencing severe to unbearable pain since our results show that these patients are at high risk of becoming malnourished. During pain treatment, painkillers should never be used as the only intervention when performing optimal pain management (13). A huge variety of nonpharmacological interventions (e.g. physiotherapy) can be used to help reduce pain (34, 44).

Only a limited amount of information about pain prevalence, type and intensity and subsequent pain-reducing interventions are available, collected from large-scale studies in different settings. Therefore, more research should be performed on these topics to improve pain management in the future. The prevalence and subsequent treatment of pain in special patient groups, such as older patients or patients with dementia, is of particular interest. More studies should also be conducted to examine the association between malnutrition and different levels of pain to further increase knowledge on this topic and improve healthcare practice.

The study design (cross-sectional) does not imply causality, and these results should be interpreted with caution. Although our study is based on a convenience sample with a high sample size, 26.4% of the patients did not give their informed consent; this potentially influenced the generalisability of the results. Furthermore, other variables that influence malnutrition risk, such as the length of hospital stay or education level, were not collected. Our study only included malnutrition risk screening and not a diagnosis of malnutrition, which should be considered in future studies. Pain was measured only during the last 7 days, which may be regarded a minor limitation in this study.

## Conclusion

The results of this study show that older patients with severe/very severe or unbearable pain have a higher risk of developing malnutrition risk than patients without pain. Therefore, the assessment of pain should always be considered in patients with nutritional problems. Our results indicate that adequate assessment and subsequent treatment can help reduce the negative consequences of (unrelieved) pain, such as malnutrition. It is important to urge healthcare staff to encourage patients to participate actively in their pain assessment and treatment and increase their level of awareness regarding their responsible role in the whole care process of patients with pain.

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## Author contributions

All authors contributed actively to the design of the study and the selection of the methods, as well as having read and approved the final version of the manuscript. Additionally, the contribution by each author was: Silvia Bauer made the conceptualization, performed the statistical analyses and wrote the first draft of the paper. Manuela Hödl was responsible for the project administration and review and editing of the draft. Doris Eglseer was also responsible for the project administration and review and editing of the draft.

## Declaration of interest

None.

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## Ethical approval

All participating patients or their legal representatives had to sign a written informed consent prior to their inclusion in the study. The study protocol was approved by the ethical committee of the Medical University of Graz and conforms to recognised standards, like the Declaration of Helsinki.

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