High prevalence of malnutrition in an internal medicine department: results from the AMIDO study

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Key words: malnutrition risk; patient malnourished; internal medicine; hospitalized patient.

Contributions: PG, AM, substantial contribution to the conception, design of the work; PG, AM, PC, data acquisition; PG, AM, PC, RM, analysis and interpretation of data, PG, AM, PC, RM, SC, FG, SL, MF, CB, ES, drafting the work; SC, FG, conception design of the work; PG, AM, PC, RM, SL, MF, CB, ES, MB, critical revision for important intellectual content. All the authors read and approved the final version to be published.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: none.

Ethical approval and consent to participate: the study was performed in accordance with good clinical practice and the Declaration of Helsinki, and subsequent revisions (Legislative Decree No. 211 of 24/06/2003). The study protocol was reviewed, approved, and authorized by the SS. Antonio and Biagio and Cesare Arrigo Ethic Committee, Alessandria (EC code: Asl22.MedI.22.02, 23/12/2022), and was recorded on ClinicalTrials.gov platform (code: NCT06496984).

Availability of data and material: all data generated or analyzed during this study are included in this published article.

Informed consent: all patients enrolled were informed about research details and signed written informed consent to have their anonymized data presented or published.

Received: 24 July 2024.
Accepted: 29 July 2024.

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Licensee PAGEPress, Italy
Italian Journal of Medicine 2024; 18:1775
doi:10.4081/itjm.2024.1775

ABSTRACT

The prevalence of malnutrition in patients is very high in Europe (>70%). An Italian FADOI-SINPE survey revealed that malnutrition is an underestimated problem by internists. The AMIDO study examines malnutrition in Acqui Terme Hospital (Alessandria, Italy) Internal Medicine Department patients. Patients were screened for malnutrition using the Malnutrition Universal Screening Tool (MUST) upon admission. 268 patients (49.63% male) were enrolled, with a median age of 83 years. At admission, the prevalence of malnutrition risk was 48.88%. The proportion of patients who came from home resulted to have a slight decreasing trend among the three subgroups according to MUST (84.67%, 82.76%, and 73.53% in increasing order of MUST score respectively), but was not statistically significant (P=0.10). Dementia [odds ratio (OR): 6.36; 95% confidence interval (CI): 2.52-18.63], heart failure (OR: 2.45; 95% CI: 1.33-4.57), neoplasm (OR: 2.24; 95% CI: 1.08-4.77) and infectious diseases (OR: 2.27; 95% CI: 1.226-4.274) increase malnutrition odds. Increasing attention to malnutrition risk is crucial for patients with dementia, neoplasm, heart failure, and infectious diseases, which raise malnutrition risk probability.

Introduction

Malnutrition is defined as a nutritional state characterized by an excess or deficient intake of nutrients. This condition may result in a change in body composition and in organic disfunctions.[1,2]

Malnutrition in hospitalized patients is a condition prevalent worldwide affecting between 20% and 50% of patients at admission, with further increase expected during hospitalization.[2,3]

Patients hospitalized in internal medicine departments are frequently older with multimorbidity and polypharmacy, so very likely to be malnourished, but the prevalence and determinants of malnutrition remain unclear. The multicentered ANUMEDI study,[4] conducted on internal medicine departments of 24 Portuguese public hospitals, found a risk of

malnutrition at admission in more than 70% of patients (56% moderate/suspected malnutrition and 17% severe malnutrition). Malnourished patients are characterized by older age and multimorbidity.[4]

The presence of malnutrition is associated with worse outcomes in hospitalized patients, such as an increased risk of complications with a longer length of hospital stay and a higher hospital mortality rate. Prolonged length of stay (LOS) may be associated with negative patient and staff experience, as well as increased inpatient complications, of these many may be preventable.[5] A multicentered study carried out on 709 patients in 25 hospitals in Brazil highlighted that the incidence of complications in malnourished hospitalized subjects was 27.0%. This was associated with a risk of mortality, *i.e.*, 12.4%, compared to 4.7% in well-nourished patients and with longer LOS.[6]

Another Spanish study by Gomez *et al*.[7] conducted in patients malnourished and hospitalized in internal medicine showed that dysphagia, lower protein, and albumin levels, higher inflammatory marker levels and pressure ulcers were more frequent in these patients, and they had a worse outcome regarding mortality and hospital readmissions.[1,6,7]

The prevalence of malnutrition in hospitalized patients is not only high at admission but also in predischarge. A study conducted in a Dutch Hospital showed that 30% of well-nourished patients became malnourished and 82% of malnourished patients remained so.[3] Several factors contributed to the worsening of nutritional status during hospitalization; among these one of the main factors was the incorrect management of patients' nutrition.

Despite the relevance and the prevalence of the problem, malnutrition in internal medicine departments remains underdiagnosed and undertreated. In the Italian context, the SINPE-FADOI survey once again highlighted the need to investigate the aspect of malnutrition in internal medicine wards.[8] Results showed that 85% of the facilities participants agreed that the risk of malnutrition in internal medicine is closely linked with negative outcomes of pathology but only 22% of responders carried out the malnutrition risk assessment.[9]

The malnutrition screening on admission may provide an important basis for better nutritional management in hospitalized patients. An accurate screening to identify patients at risk of malnutrition or malnourishment is very important to elaborate a personal nutritional intervention.

Materials and Methods

Study design and participants

The AMIDO study is a no-profit clinical trial, promoted and conducted by the internal medicine unit of Acqui Terme Hospital (ASL of Alessandria, Italy) and supported by the "SS Antonio and Biagio and C. Arrigo" Hospital of Alessandria (University Hospital of Alessandria).

The aim of this work was to identify the risk of malnutrition in patients admitted to the Internal Medicine departments using the Malnutrition Universal Screening Tool (MUST).[10-12] Additional aspects were to evaluate malnourished patients' characteristics and effectiveness of an early nutritional program started during hospitalization.

The study was performed in accordance with good clinical practice and the Declaration of Helsinki, and subsequent revisions (Legislative Decree No. 211 of 24/06/2003). The study protocol was reviewed, approved, and authorized by the SS. Antonio and Biagio and Cesare Arrigo Ethic Committee, Alessandria (EC code: Asl22.MedI.22.02, 23/12/2022), and was recorded on ClinicalTrials.gov platform (code: NCT06496984). All patients enrolled were informed about research details and signed written informed consent prior to enrollment. They provided written informed consent to have their anonymized data presented or published.

Patients were enrolled in our study between 1st January 2023 and 15th May 2023. Enrolled patients were all hospitalized in the Internal Medicine department of Acqui Terme Hospital. Demographic and anthropometric data, reason for admission, LOS, discharge destination (home or healthcare center and exitus), and medical history with comorbidities were collected.

Screening tool

AMIDO study is a prospective nutritional screening study of patients consecutively admitted to an internal medicine department. According to indications by the European Society for Clinical Nutrition and Metabolism (ESPEN), patients were evaluated within the first 72 hours of admission by a MUST.[11-13] This tool is easy, fast, reproducible and provides consistent results.

Measurement of weight and height to obtain a body mass index (BMI)-associated score represents step 1. The MUST can be also used in patients for whom BMI cannot be obtained using recent self-reported measurements,[8,9] if reliable, or different measurements to the British Association for Parenteral and Enteral Nutrition (BAPEN) guidelines' reference tables,[13] such as length of the ulna and average arm circumference [mid-upper-arm-circumference (MUAC)]. If MUAC changes by at least 10%, weight and BMI are likely to vary by the same percentage.[14] Step 2 is characterized by unplanned weight loss over the last 3-6 months. This value is according to the percentage of weight lost over time, compared to the actual weight measured or reported. Lastly, in step 3, the potential effect of acute illness on the risk of malnutrition was assessed. There is a correlation between acute illness status and fasting due to disease. If there has been, or is likely to be, no nutritional intake for more than 5 days, the score assigned for acute illness is 2, as it predisposes to fasting and thus to an increased risk of malnutrition.[11]

MUST questionnaire classifies patients as: low risk of malnutrition (0 points), requiring routine clinical care; moderate risk of malnutrition (1 point), requiring observation; high risk of malnutrition (≥2 points), requiring treatment from the nutritional support team. MUST can also be interpreted as a chart that takes into account the patient's clinical course: from the historical, in which the unintentional weight loss is assessed, to the present, in which weight, height, and BMI are identified, and to the future, in which the probable effect the clinical condition will have on the risk of malnutrition is considered.[11]

Patients with a MUST 0 score, as per BAPEN Guidelines,[13] were treated as normal clinical practice, while patients with MUST 1 or MUST 2 received dietary supplementation based on their nutritional condition.

Statistical analysis

Descriptive statistical analysis was performed. Continuous variables were reported as median and interquartile range (IQR). Categorical variables were reported as absolute frequencies and percentages. For quantitative data, a two-tailed Kruskal-Wallis rank sum test was performed to evaluate the association with MUST assessment. For categorical data, on the other hand, Fisher's two-tailed exact test was performed. Only in case of significance, Bonferroni correction was used for multiple comparisons.

Risks of malnutrition (score 1 or 2 of the MUST questionnaire) have been assessed by calculating ORs, with their respective profile-likelihood confidence intervals and P-values, estimated by a multivariate logistic regression model. Sex, age, origin of patients (from home or health care centers) and a set of diseases that affect patients were included as covariates in the model.

All statistical tests are two-tailed and P-values <0.05 are considered statistically significant.

All statistical analyses have been performed using R software (R Foundation for Statistical Computing), version 4.3.2.

Results

A total of 268 patients were enrolled in the study, of whom 133 were males (49.63%). The median age is 83 (IQR 75-89) years and does not differ in a statistically significance way (P-value = 0.074), as well as gender (P-value = 0.68), among the three MUST score groups. 250 patients (80.22%) came from home, while the other ones were from residential care facilities. The proportion of patients who came from home resulted to have a slight decreasing trend among the three subgroups according to MUST (84.67%, 82.76% and 73.53% in increasing order of MUST score respectively), but it is not statistically significant (P-value = 0.10). High or moderate risk of malnutrition patients had a longer hospitalization than the other ones, in particular, the median LOS is nine days for MUST 1 and MUST 2 groups, while for MUST 0 group is equal to 7 days, but the difference resulted not to be statistically significant (P-value = 0.11).

Most common comorbidities are metabolic diseases, affecting 41.04% of patients, heart failure (29.85%), chronic obstructive pulmonary disease (COPD) (20.90%), neoplasm (16.04%), and senile dementia or Alzheimer's disease (13.06%) (Table 1).

The three MUST groups differ for presence of heart failure (P=0.011; MUST 0 *vs*. MUST 2: adj. P=0.171; MUST 1 *vs*. MUST 2: adj. P=0.585; MUST 0 *vs*. MUST 1: adj. P=0.030), infectious diseases (P=0.024; MUST 0 *vs*. MUST 2: adj. P=0.026; MUST 1 *vs*. MUST 2: adj. P=1.000; MUST 0 *vs*. MUST 1: adj. P=1.000) and senile dementia or Alzheimer's disease (P<0.001; MUST 0 *vs*. MUST 2: adj. P<0.0001; MUST 1 *vs*. MUST 2: adj. P=1.000; MUST 0 *vs*. MUST 1: adj. P=0.075).

The prevalence of malnutrition risk at admission was 48.88% (n=131), in particular, 10.82% of the total sample (n=29) got a score equal to 1 at the MUST assessment and 38.06% (n=102) got a score equal to 2. In the multivariate logistic model, patients' characteristics resulted associated

Table 1. Characteristics of patients, both considering the overall cohort and separately the three subgroups of the cohort according to the Malnutrition Universal Screening Tool score, assessed at admission.

Characteristics	Overall cohort (N=268), n (%)	MUST =0 (N=137), n (%)	MUST =1 (N=29), n (%)	MUST =2 (N=102), n (%)	P*
Demographics					
Age (yr), median (IQR)	83.00 (75.00-89.00)	82.00 (71.00-89.00)	88.00 (82.00-89.00)	83.50 (77.25-89)	0.074
Men	133 (49.63)	71 (51.82)	15 (51.72)	47 (46.08)	0.68
Hospitalization					
Length of stay (days), median (IQR)	8.00 (6.00-11.00)	7.00 (5.00-10.00)	9.00 (6.00-12.00)	9.00 (6.00-11.00)	0.11
Home origin	215 (80.22)	116 (84.67)	24 (82.76)	75 (73.53)	0.10
Death during hospitalization or within 90 days from discharge	75 (27.99)	8 (5.84)	11 (37.93)	56 (54.90)	<0.001
Comorbidities					
Heart failure	80 (29.85)	31 (22.63)	14 (48.28)	35 (34.31)	0.011
Neoplasm	43 (16.04)	16 (11.68)	4 (13.79)	23 (22.55)	0.079
Metabolic disease	110 (41.04)	59 (43.07)	9 (31.03)	42 (41.18)	0.50
Infectious disease	75 (27.99)	29 (21.17)	8 (27.59)	38 (37.25)	0.024
Kidney failure	20 (7.46)	11 (8.03)	3 (10.34)	6 (5.88)	0.59
Cerebrovascular disease	28 (10.45)	19 (13.87)	1 (3.45)	8 (7.84)	0.16
Senile dementia or Alzheimer's disease	35 (13.06)	6 (4.38)	5 (17.24)	24 (23.53)	<0.001
Parkinson's disease or multiple sclerosis	19 (7.09)	11 (8.03)	3 (10.34)	5 (4.90)	0.47
Chronic obstructive pulmonary disease	56 (20.90)	27 (19.71)	7 (24.14)	22 (21.57)	0.80
Psychiatric disease	11 (4.10)	7 (5.11)	0 (0)	4 (3.92)	0.68

*According to the two-tailed Kruskal-Wallis test for continuous variables or to two-tailed Fisher's exact test for categorical variables. IQR, interquartile range.

with moderate or high risk of malnutrition are the presence of the following comorbidities: dementia [OR =6.36; 95% confidence interval (CI): 2.52-18.63], infectious diseases (OR =2.27; 95% CI: 1.23-4.27), heart failure (OR =2.45; 95% CI: 1.33-4.57) and neoplasm (OR =2.24; 95% CI: 1.08-4.77). Contrarily, Parkinson's disease and multiple sclerosis, metabolic diseases, kidney failure, psychiatric diseases, COPD, and cerebrovascular diseases did not result associated with malnutrition risk, as well as sex, age, and place of origin (Table 2).

Patients who scored 2 or 1 at the MUST assessment experienced a mortality rate at 90 days after admission or during hospitalization of respectively 54.90% (n=56) and 37.93% (n=11), while MUST 0 patients had a lower mortality rate, that is 5.84% (n=8). The difference among these three groups resulted to be statistically significant (P<0.001; MUST 0 *vs*. MUST 2: adj. P<0.0001; MUST 1 *vs*. MUST 2: adj. P=0.423; MUST 0 *vs*. MUST 1: P<0.0001).

During hospitalization, 6.57% (n=9) MUST 0 patients experienced a worsening of nutritional conditions: 8 of them had a MUST score equal to 2 at discharge, while the other one equal to 1.

In the AMIDO study, all patients with MUST 1 and 2 (n=131) were visited by a dietitian. Among those patients, 68 (51.91%) received nutrition therapy: 36 of them received oral nutritional support (ONS), 6 received extra nutritional care (enriched meals from the canteen), while in 11 patients their type of diet was changed without supplementation, and in 15 patients artificial nutrition was used.

In the end, another result to mention is related to dysphagia: it was reported in 13.8% of MUST 1 patients and in 10.8% of those with MUST 2.

Table 2. Odds ratios (with their respective 95% confidence intervals and P-values) from the logistic regression, modeling the probability of having a score equal to 1 or 2 in the Malnutrition Universal Screening Tool questionnaire.

Variables	ORs	95% CI	P
(Intercept)	0.258	0.033-1.874	0.188
Gender			0.381
Women	1	Ref.	
Men	0.780	0.446-1.358	
Age	1.008	0.985-1.033	0.503
Origin			0.818
Home	1	Ref.	
Residential care facility	1.088	0.529-2.240	
Infectious diseases			0.010
No	1	Ref.	
Yes	2.269	1.226-4.274	
Neoplasm			0.032
No	1	Ref.	
Yes	2.243	1.084-4.774	
Heart failure			0.004
No	1	Ref.	
Yes	2.447	1.332-4.571	
Metabolic diseases			0.764
No	1	Ref.	
Yes	0.920	0.530-1.593	
Kidney failure			0.734
No	1	Ref.	
Yes	0.838	0.294-2.314	
Cerebrovascular diseases			0.164
No	1	Ref.	
Yes	0.521	0.199-1.271	
Senile dementia or Alzheimer			0.0002
No	1	Ref.	
Yes	6.364	2.516-18.626	
Parkinson or Multiple Sclerosis			0.986
No	1	Ref.	
Yes	1.010	0.342-2.855	
COPD			0.446
No	1	Ref.	
Yes	1.289	0.670-2.482	
Psychiatric diseases			0.700
No	1	Ref.	
Yes	0.767	0.181-2.875	

OR, odds ratio; CI, confidence interval; COPD, chronic obstructive pulmonary disease.

Discussion

AMIDO study revealed that the mortality rate increases significantly among the three groups of patients according to MUST score (P<0.001) and the median LOS was higher in moderate or high risk of malnutrition patients than those without malnutrition risk, even if the difference is not statistically significant (P=0.11). These results agree with those of other studies, which have demonstrated the negative impact of malnutrition on patients' outcomes with a markedly higher risk of life-threatening complications during hospitalization.[1,3,4,8]

Comorbidities and nutritional status seem distinct conditions instead they are closely related.[2] The prevalence of chronic diseases has substantially increased in the last years along with the aging of the population. Our study revealed that the presence of some comorbidities in patients admitted to the internal medicine department increased the probability of having a moderate or high risk of malnutrition. Having senile dementia or Alzheimer's disease increases more than six times the probability of being at risk of malnutrition. Other comorbidities associated with being at risk of malnutrition are heart failure, infectious diseases and neoplasm. If the association between malnutrition and dementia or neoplasm is clear, the research highlights the strong correlation between heart failure and malnutrition.[4] Malnutrition is highly common in patients with chronic heart failure and is often overlooked. A meta-analysis conducted on the Chinese population analyzed 10 cross-sectional studies and 21 cohort studies including a total of 12.537 patients with chronic heart failure. It suggests that the prevalence of malnutrition in patients with heart failure was very high (46%; 95% CI: 43-49%) and that malnutrition increased the risk of all-cause mortality in patients with heart failure (OR: 2.15; 95% CI: 1.89-2.45, P<0.05).[15] Based on their additional prognostic value, nutritional scores could be included into routine examination in patients with heart failure to identify the risk of malnutrition. In our study, weight loss and fasting due to pathology were the most important predisposing factors for the development of malnutrition during hospitalization. Another important predisposing factor was dysphagia that had been reported in 13.8% of MUST 1 and 10.8% of MUST 2, respectively. Nutritional screening made it possible also to identify MUST 0 patients who needed a specific nutritional intervention regardless of the risk of developing malnutrition.

The main nutritional intervention that we made was dietary treatment using oral nutritional supplements or a change of diet type. A 2009 Cochrane systematic review examined the effects of protein and energy supplementation, via liquid ONS, in elderly individuals at risk of malnutrition.[16,17] The review found that oral nutritional supplements led to weight improvement in the elderly and a possibility of reduced complications. It emerged that to avoid the serious consequences of malnutrition, intervention strategies involving the administration of energy and/or protein-enriched meals as well as liquid oral nutritional supplements to the elderly are crucial.[18] The main advantage is the balanced composition and reduced volume of supplementation that, in the case of patients with reduced appetite, can ensure nutrient support.[19] In our study, the activation of specific dietary plans made it possible to optimize the organization of the ward in the management of diets and supplementation by OS and also allowed the PDTA to be taken over to manage the dysphagic patient and the revision of his specific diet (thickened diet).

We showed that patients arriving from residential care facilities had a higher risk of malnutrition. The need to improve the nutrition of older adults living in long-term care facilities has been known for years. Routine screening for the risk of malnutrition should be mandatory for patients residing in residential care facilities, but nutritional status is often transcribed.[20] A 2019 European systematic review by Leij-Halfwerk *et al.* outlined the prevalence of risk of protein-energy malnutrition in European older adults ≥65 years old regarding living accommodation.[21]

The prevalence of malnutrition risk was 17.5% (n=30) and 8.5% (n=32), respectively for those living in residential care or in the community. Using meta-regression, the prevalence rate results higher in adults aged >80 years (P<0.0001), in women (P=0.03), and in patients with one or more comorbidities (P<0.0001).[20] In our results, older age and living in residential care facilities had no statistically significant associations (P=0.381 and P=0.818, respectively) with the risk of malnutrition development.

There is a strong association with long-term mortality in the elderly, and it is believed that good nutritional status is significantly correlated with a better prognosis. According to the literature, it becomes imperative to set up timely management programs and nutritional support aimed at correcting malnutrition and defining a specific therapeutic approach for each patient providing a correct nutritional strategy during hospitalization and also post-hospitalization. Therefore, according to the ESPEN guidelines, due to the increasing proportion of polymorbid patients, the significance of malnutrition and its treatment is becoming increasingly more important in clinical practice research.[14] Nutritional medicine should nowadays be considered an effective and integral component of holistic treatments in internal medicine. However, further research is necessary to investigate new nutritional biomarkers and for a better integration of evidence-based personalized nutritional medicine into routine clinical practice.

This study was conducted in only one clinical center with a limited sample size. Nutrition intervention was carried out on the risk associated with malnutrition and not in regard to a malnutrition diagnosis at discharge. Also, although 300 patients were enrolled, 32 of them were excluded from the study due to a lack of signed informed consent. Within the analyzed cohort, in order to assess the nutritional status improvement of discharged MUST 1 and MUST 2 patients, the available re-evaluations showed a high number of dropouts, downsizing the number on which to test the usefulness of nutritional support.

Conclusions

The prevalence of malnutrition in the internal medicine population is very high. The systematic clinical use of screening tools enables patients to detect the risk of malnutrition and take appropriate actions. Increasing attention to malnutrition risk using a screening tool in patients admitted to internal medicine wards is very important.

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