Nutrición Hospitalaria

Nutr Hosp. 2010;25(5):774-780
ISSN 0212-1611 • CODEN NUHOEQ
S.V.R. 318

Original

Influence of the assessment method on the prevalence of hospital malnutrition: a comparison between two periods

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Abstract

There is no consensus on the best method to assess the nutritional status of hospitalized adults although many methods are available. This study evaluated the prevalence of malnutrition in adults at different times of hospitalization (admission, 7th, 14th, 21st, and 28th days) in two years (2002 and 2006). All patients were submitted to anthropometric assessment, Subjective Global Assessment (SGA), determination of serum albumin, and lymphocyte count. There were no differences in prevalence of malnutrition between the years of assessment, but great variability was found when different methods were used. An increase in malnutrition was detected when the diagnostic criterion was the total count of lymphocytes, while a decrease was detected in the case of the Body Mass Index (BMI). In both years, the increase in malnutrition was not statistically significant over the weeks of hospitalization. Over the years, malnutrition remains an important health problem of hospitalized adults, requiring appropriate diagnosis and management. Each institution is recommended to adopt one or more appropriate methods of nutritional assessment, which have been validated for the population under their care.

Key words: *Malnutrition. Nutritional assessment. Weight loss. Hospitalization.*

(*Nutr Hosp.* 2010;25:774-780)

DOI:10.3305/nh.2010.25.4511

INFLUENCIA DEL MÉTODO DE EVALUACIÓN DE LA PREVALENCIA DE LA DESNUTRICIÓN HOSPITALARIA: UNA COMPARACIÓN ENTRE DOS PERÍODOS

Resumen

No hay consenso sobre el mejor método para evaluar el estado nutricional de adultos hospitalizados aunque muchos métodos estén disponibles. Este estudio evaluó la prevalencia de desnutrición en los adultos en distintos momentos de la hospitalización (admisión, 7, 14, 21 y 28 días) en dos años: 2002 y 2006. Todos los pacientes se sometieron a la evaluación antropométrica, Valoración Subjetiva Global (VSG), la determinación de la albúmina sérica y linfocitos. No hubo diferencias en la prevalencia de desnutrición entre los años de evaluación, pero se encontró gran variabilidad en el empleo de diferentes métodos. Se ha detectado mayor desnutrición cuando el criterio de diagnóstico fue el recuento total de linfocitos y menor al adoptar el Índice de Masa Corporal (IMC). En ambos años, a lo largo de las semanas de hospitalización, hubo aumento, pero no estadísticamente significativo, de la desnutrición. A lo largo de los años, la desnutrición sigue siendo un importante problema de salud de los adultos hospitalizados, lo que requiere diagnóstico y tratamiento adecuados. Se recomienda que cada institución adopte uno o más métodos de evaluación nutricional, adecuada y validada para la población bajo su cuidado.

(*Nutr Hosp.* 2010;25:774-780)

DOI:10.3305/nh.2010.25.5.4511

Palabras clave: *Desnutrición. Evaluación nutricional. Pérdida de peso. Hospitalización.*

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Recibido: 20-VII-2009.
Revisado: 16-IX-2009.
Aceptado: 16-XI-2009.

Introduction

Undernourished patients at hospital admission demand more attention than eutrophic individuals, given the complexity involved in recovering the nutritional deficit present, instead of simply maintaining the nutritional status. This, allied to the clinical complications deriving from malnutrition[1-4], explains the fact that costs are four times greater than undernourished patients are hospitalized[5].

The management of hospital malnutrition is more difficult because there is no method that can be employed isolatedly as a "gold standard" in nutritional diagnosis[6]. Thus, in clinical practice, different methods are adopted, according to the convenience of each Institution, Service or patient. This lack of a standard makes it difficult to establish the comparisons between institutions, or in the same institution along the time. Combinations of methods can improve the accuracy of the nutritional diagnosis[4,7]. Cereceda et al.[1] propose that the Subjective Global Assessment (SGA), along with the measurement of height and weight, be adopted systematically so as to determine the nutritional status at hospital admission. Using the SGA, in 1996, the multicentric study IBRANUTRI found a prevalence of malnutrition of approximately 50% in adults hospitalized at our Institution and at other Brazilian university hospitals[4]. A similar prevalence of malnutrition was identified at our Institution when a similar study was repeated in 2002[2].

The importance of an adequate follow up of hospitalized patients, especially those who are undernourished, and the high complexity involved in diagnostic and treatment procedures demand the constitution of specialized multiprofessional teams[8-10]. They are responsible for the normatization of procedures, support to the assisting teams, and establishing procedures of clinical and epidemiological vigilance. In order to assess the prevalence of hospital malnutrition along the years in our hospital, this study evaluated the prevalence of undernourished patients at admission and at different moments of hospitalization in a high complexity hospital in the south of Brazil in the year of 2006 and compared it with the prevalence of malnutrition obtained in 2002[2].

Patients and methodology

The study took place at a general high complexity university hospital in the south of Brazil, with 749 beds for clinical and surgical adults, and comprised the evaluation of 2 groups of patients, formed in 2 different moments: 1) *Group 2002* (G2), when 185 adults from the clinical and surgical units were included in a cross-sectional study and 2) *Group 2006* (G6), when 1503 adults with the same characteristics were evaluated in a cohort. In both periods, patients wearing casts, submitted to member amputation, interned in Intensive Care Units or bone marrow transplantation units, carriers of the Acquired Immunodeficiency Syndrome, pregnant and postpartum women, those remaining in the Emergency Room or postoperative recovery room for more than 72 hours, those who obtained hospital release in less than 24 hours, and those unable to provide information on their clinical condition or unable to undergo anthropometric measures were excluded. Patients in G2, despite their number of days of hospitalization, were submitted to a single assessment, when the prevalence of hospital malnutrition in the institution was identified[2]. For the constitution of G6, 60% of all the hospital admissions in the eligible units in the period from October of 2005 to June 2006 were randomly selected. Patients that completed the inclusion criteria had their nutritional status evaluated at admission and every 7 days until their discharge from hospital.

Each patient was included only once, even in the event of a new hospitalization in study period. The same protocol was used for all the patients (G2 and G6). First, the SGA[11] was carried out. After that, weight and height were measured for the calculation of the Body Mass Index (BMI)[12] and percentage of Weight Loss (WL)[13]. Serum albumin level and total lymphocyte count were obtained from medical records or requested by the researchers. The measurement of the weight and height was made using scales and stadiometers available at the hospital wards, checked annually by the National Institute of Metrology, Standardization and Industrial Quality of Brazil (INMETRO). Bedridden patients had their weight measured by Eleve® and the height measured by an adequate stadiometer[14]. In G6, the agreement among evaluators was tested[6]. Serum albumin was analyzed by the colorimetric bromocresol green method and the total lymphocyte count was obtained by cytometry and volumetric impedance. For the classification of "malnutrition", the criteria that are usually described in literature were adapted: Categories B and C of SGA[11], BMI < 18.5kg/m^2 [12], WL loss >5% in 6 months[15], albumin <3.5 g/dL[16], lymphocyte ≤1500 U/μL[17].

The study was approved by the Research Ethics Committee of the Institution and all patients signed the Informed Consent Form.

Statistical analysis

The software SPSS 13.0 was used for data analysis. Variables were evaluated considering their characteristics and distribution, using parametric and non-parametric tests. The results are expressed in means ± standard-deviation, median (interquartile range) or proportion, as indicated. Initially, general characteristics of the patients at the moment of assessment were described. Next, 2002 patients (G2) were stratified according to the time of the nutritional assessment: admission, 7th, 14th, 21th, 28st days of hospitalization. The different methods of malnutrition assessment and

groups (2002 *vs* 2006) were compared to chi-square test. In order to evaluate possible changes in the prevalence of malnutrition throughout the hospital stay, the chi-square test (G2) and McNemar's test (G6) were carried out.

Results

Two independent patient groups were evaluated at different moments in time. In 2002, 185 patients were evaluated, and only 61 of them were evaluated in the first 72 hours of hospital admission. In 2006, 1503 patients were followed, and all of them were evaluated at admission. The groups were similar regarding age, sex, cancer diagnosis and evolution to death. However, in G6, more patients were hospitalized for surgical reasons, which might explain the lower incidence of infection and shorter hospital stay (Table I).

In both years, prevalence of malnutrition at hospital admission varied according the method used. Higher malnutrition was identified when the lymphocyte count ≤ 1500U/μL was adopted as the diagnostic criterion, followed by SGA – B and C. Lower prevalence was found as the BMI was adopted as the diagnostic criterion (Fig. 1a).

When albumin < 3.5g/dL was adopted as a diagnostic criterion, higher malnutrition was found at admission ($p = 0.05$) and after 7 days of hospitalization ($p < 0.001$) in 2006 (Figure 1a and 1b). There were more malnutrition in 2002 by BMI criterion (Fig. 1) at 7th day stay. When the criterion adopted was the lymphocyte count ≤ 1500U/μL, higher malnutrition was found at admission ($p < 0.001$) and on the 14th day of hospitalization ($p = 0.05$) in the G2 (Figs. 1a and 1c). For the other comparisons between years, no statistically significant differences were found (Figs. 1d and 1e).

Table II shows malnutrition, according to different methods, along hospitalization. In 2002, in the 7th day was found increase of malnutrition by BMI criterion ($p = 0.01$). Furthermore, when adopting albumin, greater malnutrition was found in 21st ($p = 0.03$) and 28th ($p = 0.03$) days. In 2006, according to different methods, there was an increase in the malnutrition in the hospital stay, despite the fact that not all the com-

Table I
Comparison between G2 (2002) and G6 (2006). Data expressed in means ± standard deviation[a], median (interquartile range)[b] or number (proportion)[c] as indicated

	2002	*2006*	*P*
Age (years) [a]	54.1±15.7	55.5±16.1	0.239
Male [c]	88 (47.6%)	711 (47.3%)	0.946
Surgical patients reasons [c]	90 (48.6%)	924 (61.5%)	0.001
Cancer diagnosis [c]	65 (35.1%)	491 (32.7%)	0.500
Hospital infection [c]	58 (31.4%)	195 (13%)	<0.001
Days of hospitalization [b]	16 (9 – 30)	8 (4 – 15)	<0.001
Death at hospitalization [c]	7 (3.8%)	82 (5.5%)	0.337

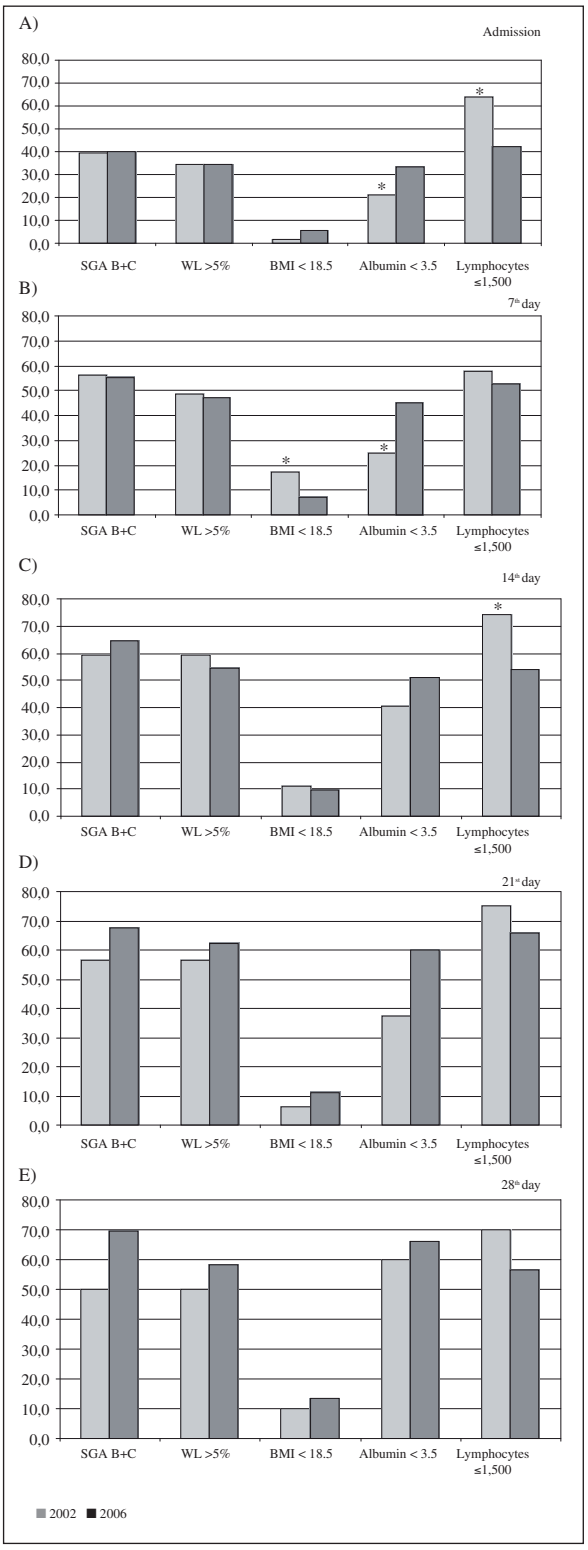

*Fig. 1.—Comparison of malnutrition prevalence by different nutritional assessment methods in the years 2002 and 2006: a) admission, b) 7th day of hospitalization, c) 14th day of hospitalization, d) 21st day of hospitalization and e) 28th day of hospitalization. * Significant differences between 2002 and 2006. SGA B + C: Suspicion of malnutrition or moderate malnutrition (category B) and severe malnutrition (category C) of the Subjective Global Assessment; WL: Weigh Loss; BMI: Body Mass Index;*

Table II

Comparison of malnutrition prevalence by different diagnostic methods along hospitalization. Results shown in percentages (%)

Days of assessment	*Hospital admission vs (P)*				*7th day vs (P)*			*14th day vs (P)*		*21th day vs (P)*
	7th d	*14th d*	*21st d*	*28th d*	*14th d*	*21st d*	*28th d*	*21st d*	*28th d*	*28º d*
2002										
SGA B+C	39.3 vs 56.3 (0.09)	9.3 vs 59.3 (0.31)	39.3 vs 56.3 (0.35)	39.3 vs 50.0 (0.73)	56.3 vs 59.3 (0.97)	56.3 vs 56.3 (0.78)	56.3 vs 50.0 (0.98)	59.3 vs 56.3 (0.90)	59.3 vs 50.0 (0.90)	56.3 vs 50.0 (0.93)
WL >5%	34.4 vs 48.4 (0.16)	34.4 vs 59.3 (0.05)	34.4 vs 56.3 (0.19)	34.4 vs 50.0 (0.55)	48.4 vs 59.3 (0.48)	48.4 vs 56.3 (0.78)	48.4 vs 50.0 (0.08)	59.3 vs 56.3 (0.90)	59.3 vs 50.0 (0.90)	56.3 vs 50.0 (0.93)
BMI<18.5kg/m²	1.6 vs 17.0 (<0.01)	1.6 vs 11.1 (0.08)	1.6 vs 6.3 (0.37)	1.6 vs 10.0 (0.26)	17.0 vs 11.1 (0.68)	17.0 vs 6.3 (0.48)	17.0 vs 10.0 (0.91)	11.1 vs 6.3 (0.52)	11.1 vs 10.0 (0.62)	6.3 vs 10.0 (0.63)
Albumin <3.5g/dL	21.3 vs 25.0 (0.78)	21.3 vs 40.7 (0.10)	21.3 vs 37.5 (0.031)	21.3 vs 60.0 (0.03)	25.0 vs 40.7 (0.21)	25.0 vs 37.5 (0.49)	25.0 vs 60.0 (0.06)	40.7 vs 37.5 (0.91)	40.7 vs 60.0 (0.50)	37.5 vs 60.0 (0.47)
Lymphocyte <1500U/µl	63.9 vs 57.8 (0.61)	63.9 vs 74.1 (0.49)	63.9 vs 75.0 (0.59)	63.9 vs 70.0 (0.99)	57.8 vs 74.1 (0.22)	57.8 vs 75.0 (0.33)	57.8 vs 70.0 (0.73)	74.1 vs 75.0 (0.77)	74.1 vs 70.0 (0.87)	75.0 vs 70.0 (0.86)
2006										
SGA B+C	40.2 vs 55.2 (<0.001)	40.2 vs 64.4 (<0.01)	40.2 vs 67.6 (<0.01)	40.2 vs 69.7 (<0.01)	55.2 vs 64.4 (0.03)	55.2 vs 67.6 (<0.01)	55.2 vs 69.7 (0.03)	64.4 vs 67.6 (0.50)	64.4 vs 69.7 (1.00)	67.6 vs 69.7 (1.00)
WL >5%	34.5 vs 46.9 (0.14)	34.5 vs 54.6 (0.15)	34.5 vs 62.4 (<0.001)	34.5 vs 58.4 (0.10)	46.9 vs 54.6 (<0.01)	46.9 vs 62.4 (<0.001)	46.9 vs 58.4 (0.02)	54.6 vs 62.4 (<0.001)	54.6 vs 58.4 (0.27)	62.4 vs 58.4 (0.69)
BMI<18.5kg/m²	5.7 vs 7.2 (1.00)	5.7 vs 9.8 (0.51)	5.7 vs 11.0 (1.00)	5.7 vs 13.5 (1.00)	7.2 vs 9.8 (0.03)	7.2 vs 11.0 (0.63)	7.2 vs 13.5 (0.50)	9.8 vs 11.0 (1.00)	9.8 vs 13.5 (1.00)	11.0 vs 13.5 (1.00)
Albumin<3.5g/dL	33.5 vs 45.0 (0.16)	33.5 vs 51.2 (0.08)	33.5 vs 59.8 (<0.01)	33.5 vs 66.3 (0.05)	45.0 vs 51.2 (0.90)	45.0 vs 59.8 (0.03)	45.0 vs 66.3 (0.47)	51.2 vs 59.8 (0.19)	51.2 vs 66.3 (0.35)	59.8 vs 66.3 (0.38)
Lymphocyte ≤1500U/µl	42.2 vs 52.5 (<0.01)	42.2 vs 54.2 (0.03)	42.2 vs 66.0 (<0.001)	42.2 vs 56.5 (0.53)	52.5 vs 54.2 (0.54)	52.5 vs 66.0 (0.19)	52.5 vs 56.5 (0.73)	54.2 vs 66.0 (0.04)	54.2 vs 56.5 (0.38)	56.5 vs 66.0 (0.04)

SGA: Subjective Global Assessment; B: Suspicion of malnutrition or moderate malnutrition; C: severe malnutrition; WL: Weight Loss; BMI: Body Mass Index.;

parisons have been statistically different. The SGA (B and C categories) found a higher malnutrition than all other criteria at admission ($p < 0.05$). The same was found when the 7th-day was compared to the subsequent assessments ($p < 0.05$). When malnutrition was diagnosed based on WL >5%, a higher malnutrition was found from the 4th assessment (21 days) to admission ($p < 0.001$), from the 3rd (14 days), 4th (21 days) and 5th (28 days) assessments to the 2nd assessment (7 days) ($p < 0.05$) and between the 3rd and 4th assessments ($p<0.001$). There was an increase in malnutrition based on albumin assessment < 3.5g/dL, from admission to the 4th ($p=0.003$) and 5th assessments ($p=0.047$) and from the 2nd to the 4th week ($p=0.032$). When lymphocyte count ≤1500U/µL was used, an increase in malnutrition was identified at 7 ($p=0.002$), 14 ($p=0.031$) and 21 ($p < 0.001$) days. In the 4th assessment (21 days), it increased in the prevalence in relation to the week before ($p=0.040$) but was reduced in relation to the subsequent week (28 days) ($p=0.043$). Most patients had BMI <18.5 kg/m². However, only the difference between weeks 3 (14 days) and 2 (7 days) was statistically significant ($p=0.031$). Increasing malnutrition in both years, despite the assessment method used, is shown in Figure 2.

Discussion

In the present study, malnutrition was similar in 2002 and 2006 patients, at the different stages of evaluation. There was a great variability in the prevalence of malnutrition, according to the method used. All methods found increase not statistically significant in malnutrition along the weeks of hospitalization.

Clinical differences among patients and the large number of methods available for the nutritional assessment contribute to the great variability observed in prevalence rates of hospital malnutrition. Nutrition diagnose based on the BMI[18] and albumin tend to underestimate the malnutrition prevalence[19], whereas it tends to overestimate it when based on SGA [20]. This method dependent variability was demonstrated previ-

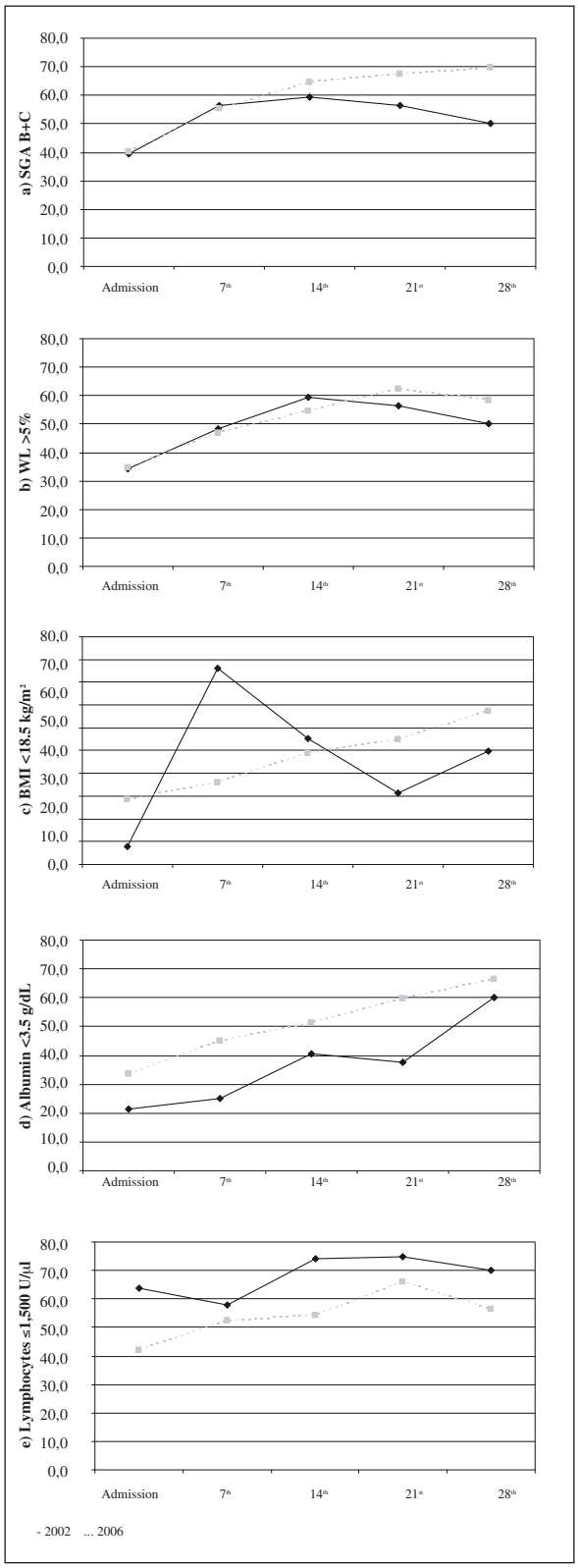

Fig. 2.—Comparison of the 2002 and 2006 assessments along the weeks of hospitalization. A continuous line refers to the year 2002 whereas the dotted line refers to the year of 2006. SGA B + C: Suspicion of malnutrition or moderate malnutrition (category B) and severe malnutrition (category C) of the Subjective Global Assessment; WL>5%: Weight Loss higher than 5% within 6 months; BMI: Body Mass Index.

ously by Planas et al.[21], when the nutritional status of 400 patients was assessed in the 48 hours subsequent to hospital admission, using BMI (lower malnutrition) and SGA (higher malnutrition) as diagnostic methods. Moreover, in the study conducted by Ruxton et al.[22], lower prevalence of malnutrition was detected (14.3%) when the diagnostic criterion was the BMI <18.5kg/m^2. However, the World Health Organization (WHO) recommends the use of BMI for the measurement of WL and malnutrition in adults[12]. However, its use for hospitalized patients is limited. BMI evaluates all body compartments together and is influenced by factors such as ascites, dehydration, renal failure, cancer, and dyalisis[23], making it difficult to identify the stages of mild and moderate malnutrition.

In clinical practice, SGA is a simple method, applicable at the bedside and requiring only a few minutes. However, its accuracy is influenced by experience of the professional[11] and its predictive capacity is affected by characteristics of the population evaluated[24,25]. This might explain the similarities in the prevalence of malnutrition at hospital admission obtained in this study and by Fernandéz[26] and Conde[27] and the lower prevalence (27.4%) found by Pirlich et al.[28].

Yet, when Conde et al.[27] based the nutritional diagnosis on weight loss and hypoalbuminemia, they found higher malnutrition than in the present study (53% and 49%, respectively). In the presence of oncologic disease, such as in the case of the sample in the study of Conde et al.[28], weight loss is specially observed, having a negative impact on the patients' clinical outcomes[29]. The use of serum albumin as a nutritional method is widely widespread, mainly in surgical patients. Albumin synthesis varies significantly during physiological stress, affecting its serum concentration[30]. Its use as an indicator of disease and malnutrition has been defended, as it does not depend on weight loss as anthropometric methods[31]. Similarly, the proposal of the use of the total lymphocyte count as a marker of the nutritional status is not recent and is very criticized for being influenced by other factors, such as the disease severity, treatment, and age. A study with 235 non-acutely ill elderly lymphopenic patients did not show higher prevalence of malnutrition when assessed by other measures (anthropometry and serum albumin)[32]. The design of a proposed study does not evaluate the independent effect of the clinical variables and the nutritional status on lymphopenia. All the patients were acutely ill, which might justify the high prevalence of lymphopenia found.

The deterioration of the nutritional status during hospitalization was previously recorded by Braunschweig et al.[33], when they identified a worsening of the nutritional status (measured by SGA) in 31% of the patients. Padial et al.[34], analyzing the influence that hospitalization might have on the nutritional status of 134 clinical and surgical patients evidenced that inpatients who had a history of weight loss, hypoalbuminemia and low total lymphocyte count,

showed a worsening nutritional status during hospitalization.

In a recent literature review on the use of different methods to assess the body composition in clinical and populational studies[35], the authors questioned the adoption of methods which have not been validated and the cut-off points established for the nutritional diagnosis to the different populations in which they are employed. The importance of establishing the nutritional diagnosis in hospitalized patients is unquestionable. Once the instruments are developed and validated, each health institution, considering its patients' profiles, is responsible for choosing a method that includes feasibility, costs, prognosis, and clinical relevance.

Conclusion

Despite the limitations of the methods used for the nutritional assessment, malnutrition has remained a comorbidity of high prevalence in hospitals. It is necessary to establish valid mechanisms to evaluate the risk and evolution of the nutritional status in order to follow the effect of nutritional therapies instituted.

Acknowledgements

The authors would like to thank the *Grupo de Pesquisa e Pós-Graduação of the Hospital de Clínicas de Porto Alegre* for their logistic support and the Fund of Incentive to Research and Events (FIPE) from the Hospital de Clínicas de Porto Alegre for the financial support given to the present study.

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