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Original

Nutritional risk and status of surgical patients; the relevance of nutrition training of medical students

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Abstract

Background: **The prevalence of undernutrition among surgical patients is thought to be high, and negatively influencing outcomes. However, recent evidence shows the increase of overweight/obesity in hospitalised patients.**

Aims: **A pilot cross-sectional study was conducted in 50 patients of a Surgical Department of the University Hospital of Santa Maria (CHLN) that aimed: 1) to assess nutritional risk and status through validated methods; 2) to explore the presence of overweight/obesity; 3) to evaluate the prevalence of metabolic risk associated with obesity.**

Methods: **Nutritional risk was assessed by Malnutrition Universal Screening Tool (MUST), nutritional status by Body Mass Index (BMI), waist circumference (WC), & Subjective Global Assessment (SGA). Statistical significance was set for $p < 0.05$.**

Results: **58% of patients were overweight/obese and 54% had high cardio-metabolic risk, according to waist circumference; 30% of patients had significantly lost weight (≥ 5%), whereas 28% gained weight. By MUST, 46% of patients were at low risk and 34% at high risk. By SGA, 58% patients were well nourished and 40% had moderate/severe undernutrition. A longer length of stay was associated with moderate/high risk by MUST, and undernutrition by SGA ($p = 0.01$).**

Conclusions: **Undernutrition or obesity pose surgical risks. The lack of nutrition discipline in the medical curricula, limits the multiprofessional management and a better understanding of the more adequate approaches to these patients. Further, the change in the clinical scenario argues for more studies to clarify the prevalence and consequences of sarcopenic obesity in surgical patients.**

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Key words: *Surgery. Nutritional risk. Nutritional status. Nutrition education. Medical students.*

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RIESGO Y ESTADO NUTRICIONALES EN PACIENTES QUIRÚRGICOS; LA RELEVANCIA DEL ENTRENAMIENTO NUTRICIONAL EN ESTUDIANTES DE MEDICINA

Resumen

Antecedentes: **Se piensa que la prevalencia de la hiponutrición en los pacientes quirúrgicos es alta y afecta de forma negativa los resultados. Sin embargo, las pruebas recientes muestran el aumento del sobrepeso/obesidad en los pacientes hospitalizados.**

Objetivos: **Se realizó un estudio transversal piloto en 50 pacientes de un Departamento de Cirugía del Hospital Universitario de Santa María (CHLN) enfocado a: 1) evaluar el riesgo y el estado nutricionales a través de métodos validados; explorar la presencia de sobrepeso/obesidad; 3) evaluar la prevalencia del riesgo metabólico asociado con la obesidad.**

Métodos: **Se evaluó el riesgo nutricional mediante la Malnutrition Universal Screening Tool (MUST), el estado nutricional mediante el índice de masa corporal (IMC), la circunferencia de la cintura (CC), y la Subjective Global Assessment (SGA). Se fijó la significación estadística en $p < 0,05$.**

Resultados: **El 58% de los pacientes tenía sobrepeso/obesidad y el 54% tenía un riesgo cardiometabólico elevado, de acuerdo con la circunferencia de la cintura; el 30% de los pacientes tuvo una pérdida significativa de peso (> 5%), mientras que el 28% ganó peso. Mediante MUST, el 46% de los pacientes tenía un riesgo bajo y el 34% un riesgo elevado. Mediante el SGA, el 58% de los pacientes estaban bien nutridos y el 40% tenía hiponutrición moderada/grave. Una mayor estancia hospitalaria se asoció con un riesgo moderado/alto por MUST, e hiponutrición por SGA ($p = 0,01$).**

Conclusiones: **La hiponutrición o la obesidad plantean riesgos quirúrgicos. La falta de la disciplina de nutrición en los currículos médicos limita el manejo multiprofesional y una mejor compresión de los abordajes más adecuados de estos pacientes. Además, el cambio en el escenario clínico es un argumento para la necesidad de más estudios que aclaren la prevalencia y las consecuencias de la obesidad sarcopénica en los pacientes quirúrgicos.**

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Palabras clave: *Educación en nutrición. Estudiantes de medicina. Riesgo nutricional. Estado nutricional. Cirugía.*

Introduction

Despite the recognized clinical significance of preoperative weight loss, disease-related undernutrition continues to be a common finding in 20% to 50% of hospitalized patients.[1,2,3] The prevalence of undernutrition is apparently higher among surgical patients, ranging from 35% to nearly 60%.[4-8] Undernutrition has been consistently associated with poorer clinical outcomes, e.g. impaired wound healing, increased infection rates and mortality, longer length of stay, and consequently higher health costs;[6,7] plus, the evidence shows that undernutrition is potentially reversible with appropriate nutritional support.[8] Hence, the implementation of systematic assessment of nutritional risk and status in clinical practice is essential for a quality patient-centered care. In hospital, the methods used for nutritional assessment must have content validity (comprehensiveness), face validity (including relevant issues) and internal consistency, to detect undernutrition or the risk of developing it, with evidence based criteria, and ideally provide guidelines for decisions on nutritional management.[10] Nonetheless, it is noteworthy that the prevalence of obesity is increasing worldwide (WHO, 2000)[11] and as well in the clinical practice. This fact explains the recent findings drawing our attention to the increase of overweight/obesity in hospitalized patients.

Within this framework, the major aim of this cross sectional study was to assess nutritional risk and status in a cohort of hospitalized patients in a Surgery Department. We specifically aimed: 1) to assess the prevalence of overweight and obesity; 2) to evaluate the prevalence of metabolic risk; and 3) to assess nutritional risk and status through validated methods.

Methods

Study design and patient sample

This cross sectional study, approved by the Hospital Ethics Committee, was conducted in accordance with the Helsinki Declaration, adopted by the World Medical Association in 1964, amended in 1975 and updated in 2002; all participants gave their informed consent. The study was conducted the Surgery Department of the University Hospital of Santa Maria - *Centro Hospitalar Lisboa Norte*, EPE, Lisbon, Portugal. Exclusion criteria comprised terminal illness, patients unable to answer questions or those bedridden; 50 patients of both genders were primarily included. Data were recorded on individual forms pre-constructed for statistical analysis.

Study parameters

Demographic and clinical data were obtained by reviewing patients' records; length of stay was confirmed through the admission date on the patient file. Data collection and evaluations were always performed by trained medical students (CL and LF). Intensive and comprehensive teaching and training in nutritional evaluations was carried out with the 2 medical students, before the study took place.

Assessment of nutritional risk

Nutritional Risk was determined by using the Malnutrition Universal Screening Tool (MUST);[10,14] this method, initially designed as a screening tool for ambulatory patients, was later adapted and validated in adults for all health care settings. MUST comprises and combines three independent criteria: a) BMI with cut-offs in line with international recommendations;[13] b) unintentional weight loss, using the evidence based cut-offs: ≥ 5-10% in the previous 3-6 months that can produce physiologically relevant changes in body function;[14,15] and c) the acute disease effect producing or likely to produce no nutritional intake for more than 5 days.[10] These three components can reflect the patient's 'journey' from the past (weight loss), to the present (current BMI) and into the future (effect of disease). A score is given to each component and patients are categorized as in low, moderate or high risk of undernutrition; the score is used to guide health professionals to implement the appropriate nutritional care plan.

Assessment of nutritional status: anthropometry and SGA

Anthropometry

Body Mass Index (BMI). Height was measured in the standing position using a stadiometer and weight was determined with a calibrated floor SECA® scale, with the patients shoeless, only wearing light pyjamas. BMI was then calculated with the formula [BMI = weight (kg)/height (m)^2] and classified as undernutrition if < 18.5 kg/m^2, adequate if ≥ 18.5-< 25 kg/m^2, overweight if ≥ 25 kg/m^2-< 30 kg/m^2 and obese if ≥ 30 kg/m^2 (12). *Waist Circumference* (WC) was determined with the patient in expiration, measured at the midpoint between the iliac crest and the last floating rib, in a horizontal plane using a flexible non stretchable tape. The values were categorized according to sex and taking into account the international cut-offs for evaluating cardio-metabolic risk.[11] *Weight loss* was calculated by comparing patients' usual weight in the previous 6-3 months, with their current weight. Changes, expressed as percentage of usual weight, were valued according to the criteria of significantly recent weight loss, e.g. ≥ 5% in the previous 3 months or ≥ 10% in the previous 6 months.[10,13]

Subjective Global Assessment (SGA) addresses a) percentage of weight loss in the previous 6 months and

2 weeks, gastrointestinal symptoms (anorexia, nausea, vomiting and diarrhoea), changes in food intake and functional capacity; b) disease and its relation to nutritional requirements and components of metabolic stress (sepsis, fever and the use of corticosteroids); c) physical examination: depletion of subcutaneous fat (triceps and chest), muscle mass loss (quadriceps, deltoids), ankle, sacral edema and ascites. A value is given to each parameter, the scores are summed, and the total value provides the category of nutritional status and basic guidelines for individualized nutritional intervention. SGA classifies the patients' nutritional status in three degrees: well nourished, moderate (or suspected of being undernourished) or severe undernutrition.[16]

Statistical analysis

Statistical analyzes were performed using SPSS 16.0 for Windows (SPSS Inc, Chicago, USA 2003). Descriptive statistics expressed in number and percentage was used for categorical variables (sex, BMI, weight loss, MUST and SGA); the prevalence/frequency were further evaluated by the Chi-square test. Age was expressed as mean ± standard deviation (limits). Associations between numerical and categorical variables were explored by the non parametric Mann-Whitney U and Kruskall-Wallis K tests. Length of stay was the dependent variable and ≥ 5% weight loss, BMI, MUST scores and SGA were evaluated as predictive factors. Concordance analysis between methods (BMI, % weight loss, MUST and SGA) was carried out by using Kappa coefficient and the non parametric Spearman correlation; for this analysis there was a re-categorization into 2 categories (regular/undernourished) to allow comparability. *P* values were always two-sided and statistical significance was set for a p value < 0.05.

Results

Patients

This pilot study assessed 50 surgical patients with a mean age of 53.6 ± 17.5 (16-87) years; 24% were elderly patients (age ≥ 65 years), 54% were men and 46% women. The median length of stay was 4.1 ± 3.8 (2-15) days. Diagnoses are not discriminated due to their wide variety, thus table I shows patients' distribution by sex and type of surgery.

We also found that there were 30% of patients with metabolic co-morbidities, such as type 2 diabetes *mellitus* and/or dyslipidaemia; and 34% of patients had high blood pressure. The prevalence of symptoms likely to compromise nutritional intake (nausea, vomiting, anorexia, diarrhoea) was analyzed and overall, at least one of those symptoms were reported by 24% of patients.

Table I
Patients distributed by sex and type of surgery

Sex	*Type of surgery*	
	Gastrointestinal	*Cancer*
Male	23 (46%)	4 (8%)
Female	17 (34%)	6 (12%)
Total	40 (80%)	10 (20%)

Results expressed as number (%) of patients.

Nutritional risk and nutritional status

Nutritional risk

Table II shows the distribution of nutritional risk and status by type of surgery. Oedema was always evaluated prior to weight measurement to determine the patients' "dry weight"; discrete lower limbs oedema was observed in 12 (24%) patients, and 10% of patients had very light ascites; their dry weight was then determined. Nutritional risk assessment with MUST showed that 46% of patients were at low nutritional risk and 34% were at moderate/high risk of undernutrition (table II).

Nutritional status

According to BMI, 36% of patients were well nourished and 58% were overweight/obese. Only a small minority of patients (6%) had reduced weight for their height (table II). About 54% of patients had a WC that expressed a high cardio-metabolic risk: ≥ 102 cm for men and ≥ 88 cm for women. In 92% of patients (n = 46), there was a variation in their current weight in comparison with the usual weight: the majority (64%) had lost weight and in 30% of patients, weight loss was significant (≥ 5%). Conversely, 28% of patients gained weight in the hospital (table II). In what concerns nutritional status evaluated by SGA, 58% of patients were classified as well nourished and 40% had moderate undernutrition. There was only 1 patient with severe undernutrition (table II).

In what concerns length of stay, we found that a longer hospitalisation was associated with moderate/high risk of undernutrition according to MUST ($p = 0.01$), and with undernutrition classified by SGA ($p = 0.01$). BMI was not associated with length of stay.

We did find a higher prevalence of overweight/obesity, significant %weight loss, moderate/high risk of undernutrition and moderately undernourished patients by SGA, in those admitted for GI surgery, in comparison with patients admitted for cancer surgery ($p < 0.05$). However, there were only 10 patients submitted to cancer surgery while 40 were submitted to GI surgery; this difference between group sizes may contribute to a type 2 error and influence results. Nevertheless the differences were significant.

Table II
Nutritional risk and status according to the type of surgery

	GI surgery	*Cancer surgery*	*p*
BMI			
Undernutrition (< 18.5 kg/m²)	3 (6%)	0	NS
Normal weight (18.5-24.9 kg/m²)	15 (30%)	3 (6%)	0.05
Overweight/obesity (≥ 25 kg/m²)	22 (44%)	7 (14%)	0.009
Waist circumference			
Low cardio-metabolic risk (♂< 102 cm; ♀< 88 cm)	18 (36%)	4 (8%)	0.004
High cardio-metabolic risk (♂≥ 102 cm; ♀≥ 88 cm)	22 (44%)	6 (12%)	0.003
%weight loss			
Not significant (< 5%)	27 (54%)	8 (16%)	0.005
Significant (≥ 5%)	6 (12%)	1 (2%)	0.06
Very significant (≥ 10%)	7 (14%)	1 (2%)	0.05
MUST			
Low risk	23 (46%)	4 (8%)	0.002
Moderate risk	6 (12%)	0	0.05
High risk	11 (22%)	6 (12%)	0.04
SGA			
Well nourished	22 (44%)	7 (14%)	0.003
Moderate undernutrition	17 (34%)	3 (6%)	0.004
Severe undernutrition	1 (2%)	0	NS

Results expressed as number (%) of patients; GI: gastrointestinal; BMI: Body Mass Index; MUST: Malnutrition Universal Screening Tool; SGA: Subjective Global Assessment.

For purposes of understanding the inter-consistency between the 4 methods used, a concordance analysis was performed by calculating the Kappa coefficient and the Spearman's correlation. These analyses showed a greater concordance between %weight loss and MUST; the lowest concordance although significant, was found between BMI and all the other methods (%weight loss, MUST and SGA) (table III).

Table III
Concordance between methods

	% weight loss	*MUST*	*SGA*
BMI	-0.065*	-0.121	-0.122
%weight loss	–	0.669	0.316
MUST	–	–	0.352

BMI: Body Mass Index; MUST: Malnutrition Universal Screening Tool; SGA: Subjective Global Assessment. *Not Significant; **p < 0.05; ***p < 0.01; ****p = 0.0001.

Discussion

With this pilot study in surgical patients, the majority of patients were overweight/obese, had a significant weight loss in previous 6-3 months and were at risk of undernutrition, according to MUST. Malnutrition, whether by deficit or excess, is a risk factor for adverse post-surgical outcomes and has a negative impact on patients' Quality of Life. Indeed, the present results reflect some epidemiological data concerning the pattern of nutritional status that does characterize the Portuguese population[17,18] and the population worldwide,[19] in more recent years. As the prevalence of obesity continues to rise globally, an increasing number of patients in the hospital and those admitted for surgeries, may be found to be overweight/obese. Studies have reported that 46%-54% of hospital patients are overweight, e.g. BMI ≥ 25 kg/m², and that 32% are obese (BMI ≥ 30 kg/m²).[20-23] The results of the present study in hospitalised surgical patients were similar: the majority was overweight/obese (58%) and had an increased cardio-metabolic risk (54%). Furthermore, metabolic co-morbidities (type 2 diabetes *mellitus*, dyslipidaemia and high blood pressure) were found in ≈ 30% of patients.

Obesity is known to increase morbidity and mortality in the general population and thus it is a condition perceived as a risk factor for adverse post-surgical outcomes.[22] This association is however not clear; there is a lack of consensus in the literature on the risks of obesity in increasing complications' rates, in particular related to infection, wound healing, respiratory and venous thromboembolism.[22] It is hypothesised that the state of chronic inflammation and metabolic

alterations observed obese patients, negatively influences post-operative outcomes.[22] The need for further research, targeting the influence of visceral adiposity on post-surgery immune function and its impact on post-operative morbidity and mortality is mandatory given the increasing prevalence of obese patients.[23] Clinicians have to be aware of this pattern and on the potential consequences. The lack of teaching and training in nutrition of medical students, limits a multidisciplinary management and a better understanding of the more adequate approaches to these patients.

Even with the high prevalence of overweight/obesity found in this pilot study, we registered significant (≥ 5%) weight loss in 30% of patients. In this field, there is evidence that an unintentional weight loss of 5%-10% in previous 3-6 months produces relevant changes in physiological functions.[24] When it occurs previously to admission, it is recognised as the most discriminating criteria to assess disease-related undernutrition.[24] In addition, in the clinical setting it may be necessary to evaluate patients' body composition, because emerging evidence suggests that sarcopenic obesity (obesity with depleted muscle mass), is predictive of higher morbidity and eventually mortality in cancer.[25,26] These results may be found in other clinical scenarios. Moreover, patients may have obesity-related morbidity a concomitant impairment in their functional capacity due to muscle mass depletion. Hence, more studies on the prevalence and consequences of sarcopenic obesity in surgical patients are necessary.

Regarding the methods used in this study to assess nutritional risk and status, BMI was the only one able to detect overweight/obesity, showing a low prevalence of undernourished patients: 6% had a low BMI *vs* 42% of patients moderately/severely undernourished by SGA. However, BMI determination is mandatory; it is required for MUST and recommended as a minimum by the Council of Europe.[27] MUST includes how the disease may compromise food intake and provides guidance for adequate nutrition management.[13-15] In our study, patients were assigned 3 risk categories: high (34%), moderate (12%) and low (54%), resulting from % of weight loss and the acute disease effect and/or to fasting for diagnostic tests or therapy. In agreement with these results, SGA identified 40% of patients as moderately/severely undernourished. In the same line as other studies,[28-31] we found that a moderate/high risk of undernutrition and undernourished patients were significantly associated with longer length of stay ($p = 0.01$).

Although conscious of the somewhat limited statistical significance of this study due to the sample size, it served as an alert and a staring point for future studies on the assessment and valorisation of nutritional risk and status of surgical patients by physicians. Indeed, clinicians need to be aware and more conscious of the changing clinical reality, which is the growing prevalence of overweight/obesity in hospitalised patients. Validated methods of assessment of nutritional risk and status should be implemented in clinical practice. Only by bearing these issues in mind, an adequate nutritional intervention can be prescribed, an appropriate nutritional care plan can be implemented, and both are mandatory for a globally effective management that might positively influence outcomes and prognosis.

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