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Original article

Subjective global assessment: A reliable nutritional assessment tool to predict outcomes in critically ill patients

Daniel Fontes [a], Simone de Vasconcelos Generoso [b], Maria Isabel Toulson Davisson Correia [c,*]

[a] Critical Care Unit, Hospital Felício Rocho, Belo Horizonte, MG, Brazil
[b] Nursing School, Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil
[c] Medical School, Universidade Federal de Minas Gerais, Av. Carandaí 246 Apt. 902, 30130-060 Belo Horizonte, MG, Brazil

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SUMMARY

Background & aims: Nutritional assessment of critically ill patients has created controversy. However, it is well established that malnourished patients who are severely ill have worse outcomes than well-nourished patients. Therefore, assessing patients' nutritional status may be useful in predicting which patients may experience increased morbidity and mortality.
Method: One hundred eighty-five consecutively admitted patients were followed until discharge or death, and their nutritional status was evaluated using Subjective Global Assessment (SGA) as well as anthropometric and laboratory methods. Agreement between the methods was measured using the Kappa coefficient.
Results: Malnutrition was highly prevalent (54%), according to SGA. Malnourished patients had significantly higher rates of readmission to the intensive care unit (ICU) (OR 2.27; CI 1.08–4.80) and mortality (OR 8.12; CI 2.94–22.42). The comparison of SGA with other tests used to assess nutritional status showed that the correlation between the methods ranged from poor to superficial.
Conclusion: SGA, an inexpensive and quick nutritional assessment method conducted at the bedside, is a reliable tool for predicting outcomes in critically ill patients.

1. Introduction

Critically ill patients deserve special attention because the particular characteristics of serious metabolic conditions impact on nutritional status.[1,2] Consequently, they are a group at high risk for developing malnutrition,[3] which has an impact on patient outcomes, length of hospital stay, costs and mortality.[4–6] Thus, nutritional assessment should be routinely performed in the hospital setting, including in the intensive care unit (ICU). However, much controversy has arisen over the best tools to use, especially in the latter setting,[3,7] due to the metabolic changes that occur in ICU patients. These patients require special attention when using and interpreting common methods of nutritional assessment.[2,8,9] There are many nutritional assessment tools, ranging from anthropometric data to biochemical and body composition instruments, as well as clinical methods. Each method has particular strengths and limitations. However, most of the objective parameters that are available are less sensitive in critically ill patients.[10] Thus, a rapid, low-cost, non-invasive and validated method for performing a nutritional assessment would be desirable. Subjective global assessment (SGA) is based on the features of the medical history and the physical examination. Due to its characteristics, it has become the most commonly used tool for hospitalized patients in various clinical situations.[11] In the current study, we used SGA as the standard tool to assess nutritional status. Additionally, we assessed its potential capacity to predict outcomes in the ICU setting, comparing it with other routinely available methods (anthropometric and laboratory measurements).

2. Patients and methods

2.1. Study population and assessment of clinical characteristics

This prospective study was carried out in the intensive care unit at Felício Rocho Hospital, Belo Horizonte, MG, Brazil. One hundred eighty-five consecutively admitted patients over 18 years of age underwent a nutritional assessment within 48 h of admission into the intensive care unit (ICU) and were included in the study. Patients were classified by the severity of their disease, using the

* Corresponding author. Tel.: +55 31 91688239.
E-mail address: isabel_correia@uol.com.br (M.I. Toulson Davisson Correia).

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Acute Physiology and Chronic Health Enquiry II (APACHE II) classification system, and a physical examination was conducted to collect vital data. In addition, data were collected from medical records on the day of hospitalization and onward. All patients included in this study were followed throughout the entire period of hospitalization until the moment of discharge or death. The study was approved by the Hospital Ethics Committee in accordance with the Helsinki Declaration, and all patients or their guardian provided written confirmation of informed consent.

2.2. Assessment of the nutritional status

The nutritional status of the patients was determined using subjective global assessment (SGA), anthropometry, and biochemical tests. SGA was carried out as proposed by Detsky et al.[11] by a single investigator (DF). SGA comprises evaluation of the following: current weight, weight before illness and weight change in the previous six months and in the last 15 days; nutritional history (appetite, diet intake, gastrointestinal symptoms); gastrointestinal derangements (diarrhea, vomiting, nausea); functional physical capacity; and finally, physical assessment (fat loss, edema, muscle wasting and ascites). The information necessary to fulfill the SGA was collected directly from the patients, or if this was not possible, the data were provided by accompanying family members. Patients were classified as well-nourished, suspected or moderately malnourished or severely malnourished.

The anthropometric evaluation included weight, height, body mass index (BMI), triceps fold thickness (TSF), mid-arm circumference (MAC), arm muscle circumference (MAMC) and calf circumference (CC).

Considering the entire sample was made up of bedridden patients who were unable to stand upright, weight and height were obtained from the data in the patient's medical record if the patient had been weighed and measured at hospital admission. Otherwise, we used the values reported by the patient or family members. Weight and height were used to calculate BMI (kg/m^2), and the values obtained were evaluated according to WHO[12] standards. TSF was measured with the Lange Skinfold Caliper (Cambridge Scientific Industries Inc., Cambridge, MD, USA) midway between the acromion and olecranon process of the non-dominant arm. MAC was measured with non-stretch measuring tape in the same region. Both parameters were used to compute MAMC (cm), according to the formula reported by Frisancho[13] (mid-arm circumference (cm)-[triceps skin fold thickness (mm) $\times$ 0.3412]), to estimate muscle mass or lean tissue stores. To minimize practical variability, the average of three consecutive measurements was recorded. The values obtained were classified according to Blackburn et al.,[14] standardized to the 50th percentile (P50) for age and sex. Percentages were calculated and classified as shown in Table 1. Calf circumference was measured with non-stretch measuring tape. The tape was placed around the calf (with the knee flexed at 90°) and moved up and down until the circumference of greatest diameter was found. The cutoff point of 30.5 cm was used for both sexes, in accordance with Bonnefoy et al.[15] All measurements were taken by the same trained investigator to reduce measurement error.

The laboratory values for serum albumin and total lymphocyte count (TLC) were obtained from data present in the patients' records at the time the nutritional assessment was conducted, and they were compared to the reference values used by the laboratory. A serum albumin value less than 3.5 g/dL or a TLC value less than 2000 units/mm^3 was considered an indicator of malnutrition.

Table 1
Blackburn's classifications of nutritional status.

Criteria	Blackburn's categorization
Overweight	TSF, MAC, MAMC >130%
Normal	TSF, MAC, MAMC >90%
Malnourished	TSF, MAC, MAMC < 90%

2.3. Statistical analysis

The data were organized using Excel software, and the statistical analyses for all phases of the study were performed using SPSS 13.0 (SPSS Inc., Chicago IL, USA). The statistical analysis began with the characterization of patients. Continuous variables were expressed as the mean $\pm$ the standard deviation when normally distributed, and non-normal variables were expressed as the median $\pm$ the interquartile range. Normality was assessed with the Shapiro–Wilk test. The SGA classification of nutritional status was further categorized as nourished or malnourished. Univariate and multivariate logistic models were used to assess the associations between nutritional status and clinical characteristics, length of hospital stay and death. The kappa test was used to evaluate the agreement between the subjective global assessment and the objective nutritional assessment tests (23). The significance level was set at $p \leq 0.05$.

3. Results

3.1. Clinical characteristics

A total of 185 patients, 98 men and 87 women, with a mean age of 61.9 (18–97) years were enrolled in the study. Sepsis and infection (25.4%), cardiovascular diseases (20.5%) and neoplasms (18.4%) were the most prevalent diagnoses. Diagnoses of a clinical nature (62.7%) were more common than surgical diagnoses (37.3%). The median APACHE II score was 14 (interquartile range = $\pm$ 9); 99 patients (53.5%) had an APACHE II score <15, and 86 (46.5%) had an APACHE II score >15. Fifty-six patients (30.3%) required mechanical ventilation, and 106 (57.3%) had some degree of peripheral edema. One hundred twenty-eight patients (69.2%) remained in the ICU for more than three days, 53 patients (28.6%) were readmitted to the ICU, and 124 patients were discharged from the hospital (67.0%). The overall mortality was 33%. The clinical characteristics of the 185 patients are shown in Table 2.

3.2. Nutritional status

The prevalence of malnutrition, according to the SGA, was 54%, with 77 patients (41.6%) categorized as moderately malnourished and 23 patients (12.4%) categorized as severely malnourished. According to their BMI values, only 10 patients (5.4%) were classified as malnourished, and 65 (35.1%) were classified as overweight or obese. By assessing the circumference of the arm, 85 patients (46.0%) were considered nourished, 10.9% were obese or overweight, and 100 patients (54.0%) were malnourished (mildly, moderately or severely). The TSF revealed that 83 patients (44.9%) were severely malnourished, while 102 patients (55.1%) were nourished. According to the measurement of arm muscle circumference, 120 patients (64.8%) were classified as nourished, and 65 patients (35.2%) were malnourished, with only 4 patients (2.2%) who were severely malnourished. The measurement of arm muscle area classified 114 patients (61.6%) as nourished; similarly, most of the patients (75.1%) were considered nourished according to the circumference of the calf.

The overall prevalence of malnutrition according to the albumin values was 81.1%, with 11.4% severely malnourished. The total lymphocyte count showed that 84.3% of the patients were malnourished, with 37.3% of them severely malnourished. Notably,