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Validity of the Braden Nutrition Subscale in Predicting Pressure Ulcer Development

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■ ABSTRACT

PURPOSE: The purpose of this study was to analyze the validity of the nutrition subscale from the Braden Scale for Predicting Pressure Sore Risk in hospitalized patients.

DESIGN: A prospective, quasi-experimental, repeated-measures design guided data collection and analysis.

SUBJECTS AND SETTINGS: One hundred seventy adult patients from 2 private hospitals located in urban areas in Southeastern Brazil, with a Braden Scale score of 18 or less, and who agreed to participate in the study were assessed between January and August 2006. Participants were primarily male (57.0%) and had a mean age of 67.0 ± 15.4 years (mean ± SD).

METHODS: Objective assessment and subjective global assessment of nutritional status were performed on admission. Every 2 days, patients deemed at potential risk for pressure ulcer development underwent evaluation of protein-energy intake, skin assessment, and repeated risk assessment for pressure ulcer development via the Braden Scale. Univariate and multivariate logistic regression analyses were used to assess the predictive power of nutritional variables related to risk for pressure ulcer development.

RESULTS: The mean length of stay among patients was 17.8 ± 16.8 days. Multivariate regression analysis revealed that serum albumin levels (odds ratio = 5.226; $P < .001$) and subjective global nutritional assessment (odds ratio = 3.246; $P < .001$) were the best nutritional predictors of pressure ulcer development.

CONCLUSION: We did not find the Braden nutrition subscale score to be predictive for pressure ulcer development in hospitalized patients. Serum albumin levels and subjective global nutritional assessment were the best nutritional predictors of pressure ulcer development.

KEY WORDS: Malnutrition, Nutritional assessment, Predictive value of tests, Pressure ulcer, Risk factors.

■ Introduction

Pressure ulcers are an important public health problem associated with increased morbidity, reduced health-related quality of life, prolonged hospital length of stay, and high treatment costs.[1-3] The first instrument to assess pressure ulcer risk was developed by Norton in 1962. In a study of elderly patients, Norton identified various risk factors, including physical condition, mental condition, activity, mobility, and incontinence.[4] In 1973, Gosnell[5] adapted the Norton Scale and replaced "physical condition" with the "nutrition" parameter. The Waterlow scale was developed in 1985.[6] This instrument included nutritional indicators, such as appetite, body mass index (BMI), and a malnutrition screening tool.[6,7] Bergstrom and colleagues[8] established a conceptual schema for the study of the etiology of pressure ulcers; they defined 2 critical determinants for pressure ulcer risk: intensity and duration of pressure, and tolerance of the skin and supporting structures in response to these factors. The intensity and duration of pressure are related to sensory perception, mobility, and activity. Tolerance of the skin and supporting structures for pressure or the ability of the tissue to endure mechanical stress includes extrinsic factors, such as moisture, friction, and shear, as well as intrinsic factors, such as nutrition. These 6 constructs led to development of 6 subscales of the Braden Scale: sensory

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perception, mobility, activity, moisture, friction and shear, and nutrition. As a result of its predictive validity, reliability, and parsimony among other factors the Braden Scale has emerged as the most studied and one of the most widely used pressure ulcer risk assessment tools on a global basis.[9]

The Braden nutrition subscale measures typical food intake patterns based on daily intake of meals, with emphasis on protein intake, fluid consumption, need and intake of nutritional supplements, and use of tube feeding or total parenteral nutrition.[8] It is scored on a scale of 1 to 4, with higher scores indicating better nutritional status. We have observed that some health care professionals encounter problems scoring the Braden nutrition subscale in daily clinical practice. They describe difficulty assessing food intake, because it is based not only on direct observation but also on information reported by patients or family members. According to Pokrywka and colleagues,[10] patient food intake assessment by nurses may be overestimated in about 20%. The photography method of nutritional assessment described by Simmons and Reuben[11] showed the food intake levels of nursing homes residents to be significantly lower than the intake levels documented by nursing home staff.

The purpose of this study was to evaluate the validity of the Braden nutrition subscale for predicting pressure ulcer risk in hospitalized patients by comparing nutritional variables. We posed the following research questions: (1) Is the Braden nutrition subscale valid and sufficient to predict pressure ulcer development? (2) Are other parameters, such as the subjective global assessment (SGA) of nutritional status, anthropometric measures (BMI, triceps skinfold thickness, and arm circumference), and laboratory tests (serum albumin, lymphocyte, hemoglobin, urea, hematocrit, and creatinine levels) predictive of PU development? A secondary objective was to evaluate possible associations of Braden Scale scores with nonnutritional predictors of pressure ulcers, such as demographic and clinical variables.

Methods

Data were collected and analyzed using a prospective, quasi-experimental design with repeated measures. The main study outcome was the validity of the Braden nutrition subscale, used in isolation of other subscale scores or the cumulative score, for predicting pressure ulcer development in hospitalized adult patients. The research setting was 2 private hospitals located in urban areas in Southeastern Brazil. One was a 220-bed hospital with 17 inpatient units that primarily care for surgical patients. The other hospital was a 1700-bed facility that included 4 intensive care units with a total of 80 beds. Protocols for preventing and treating pressure ulcers, including the use of the Braden Scale, were present at the first hospital only. Data were collected between January and August 2006.

Inclusion criteria were patients without pressure ulcers, aged ≥ 18 years, admitted for less than 48 hours, and a cumulative Braden Scale score of 18 or less. Exclusion criteria included chronic renal failure and hemodialysis for more than 1 month. Persons with hepatic insufficiency or ascites were excluded because these conditions can affect nutritional assessment. Research procedures were approved by the Research Ethics Committees of both hospitals (Hospital Alemão Oswaldo Cruz and Beneficência Portuguesa Hospital in São Paulo). Written informed consent was obtained from all patients or their representatives prior to their inclusion in the study.

Study Procedures

Data were collected by 1 researcher and 6 collaborators (3 in each institution) who participated in a training program. Demographic and clinical data were collected during the physical examination from patients who met the eligibility criteria. The Braden Scale was administered by the data collectors to all patients who agreed to participate in the study. For those patients with an initial Braden Scale score of 18 or less, repeated clinical evaluation included general physical assessment, skin assessment, and Braden Scale scoring performed every 2 days. Data collection continued until the patient developed a pressure ulcer, was discharged from hospital, transferred to a unit not participating in the study, or death. If a pressure ulcer was detected, it was staged according to National Pressure Ulcer Advisory Panel Pressure Ulcer Staging System.[12] Based on acuity of the majority of patients in our study, analysis was limited to patients at risk for pressure ulcer development, who were followed for at least 7 days or until discharge, and who underwent at least 3 assessments. Nutritional status was assessed at hospital admission and every 7 days thereafter until discharge.

Instruments

The nutritional assessment included both objective and subjective measurements. Objective measurements included anthropometric measurements, biochemical evaluation, and dietary intake assessment. Anthropometric measures included BMI, triceps skinfold thickness, and arm circumference. Patients were classified according to the criteria described in Table 1.[13-15]

Biochemical evaluation included serum albumin, lymphocyte, hemoglobin, urea, hematocrit, and creatinine levels. Patients were classified into 2 categories (malnourished and well-nourished) according to the serum albumin levels due to the small number of patients in different categories.

Assessment of dietary intake included the amount of food ingested orally (oral intake) and the volume administered enterally and parenterally. Dietary intake was expressed as a percentage of the food offered and classified

TABLE 1.

Classification of Adult Underweight, Overweight and Obesity According to BMI, Triceps Skinfold Thickness, and Arm Circumference[a]

Classification	BMI, kg/m²	TST, %	AC, %
Underweight/ malnourished	<18.5	<60.0	<90.0
Normal range/ well nourished	18.5-24.99	60.0-109.99	90.0-109.99
Overweight	25.0-29.99	110.0-119.99	110.0-119.99
Obese	≥30.0	≥120	≥120

	TST (cm)		
Gender	Mean	Normal Range	AC, Mean, cm
Men	12.5	13.7-11.3	29.3
Women	16.5	18.1-14.9	28.5

Abbreviations: AC, arm circumference; BMI, body mass index; PEM, protein-energy malnutrition; TST, triceps skinfold thickness.

[a]In accordance with World Health Organization,[13] Mahan and Escott-Stump,[14] and Blackburn and Harvey.[15]

as high (80%-100%), moderate (60%-79%), and low (<60%). Daily volumes of parenteral nutrition and enteral feeding were recorded.

The SGA was developed and validated by Baker and coinvestigators[16] in gastrointestinal surgery patients and adapted by Detsky and associates[17] to surgical and nonsurgical patients. In this study, SGA was administered by the data collectors every 7 days and used to provide a more subjective measure of nutritional status. Subjective global assessment is a clinical technique that assesses nutritional status based on features of the medical history and physical examination. The SGA questionnaire includes elements of the patient's medical history (weight changes and presence of a disease and its relation to nutritional requirements), physical assessment (loss of subcutaneous fat, muscle wasting, and presence of ascites and ankle and sacral edema), dietary intake, presence of gastrointestinal symptoms, and functional capacity.[17] Details of the SGA have been described elsewhere.[18] Previous studies have reported a significant association of SGA with objective methods of nutritional assessment.[16–20] Besides contributing to the diagnosis of malnutrition, this instrument also provides prognostic indications of nutritional status, allowing the identification of patients at higher risk for nutrition-related complications during hospital stay. The prognostic value of SGA has been reported in various studies, in which patients classified by the SGA as severely malnourished had an increased number of infectious complications[16,17] and mortality rate.[21,22] The Brazilian National Survey of Hospital Malnutrition (IBRANUTRI) also found an association of malnutrition (assessed with SGA) with low BMI and serum albumin levels.[23]

Other nonnutritional variables assessed by the data collectors included pertinent clinical data (reason for hospitalization, length of stay, primary disease, and comorbidities, such as diabetes, systemic arterial hypertension, and smoking history) and demographic characteristics (gender and age). However, the relationship of these variables with nutritional parameters was not established or studied and is not discussed in this article.

The Braden Scale for Predicting Pressure Sore Risk comprises 6 subscales: sensory perception, activity, mobility, moisture, nutrition, and friction/shear. Each subscale is ranked on a scale of 1 to 4, except for the friction/shear subscale, which is scored in a scale of 1 to 3. Subscores are added to determine the cumulative score that varies from 6 to 23; lower scores indicate higher risk for pressure ulcer development. A cutoff score of 18 or less indicates an increased risk for pressure ulcer development.[8,24] A validated Brazilian version of the Braden Scale was used in this study.[25] Several studies have shown that the Braden Scale demonstrates reasonable accuracy for predicting pressure ulcer development, and reported sensitivity ranging from 43.5% to 89.0%[26,27] and specificity measurements from 43.5% to 83.1%.[26,27] In a study by Schoonhoven and colleagues,[26] the Braden Scale showed a positive predictive value of 8.1% and a negative predictive value of 94.9%, and Serpa and associates[28] reported a positive predictive value of 20.7% in the first evaluation and a negative predictive value of 96.4% in the third evaluation.

The Braden nutrition subscale measures the usual food intake pattern of a person by assessing the daily intake of meals, with emphasis on the protein intake, fluid consumption, need and intake of nutritional supplements, and the use of tube feeding or total parenteral nutrition.[8] Bergstrom and Braden[29] evaluated the percentage of nutrient intake by analyzing the composition of different types of diet, considering the nutritional values of foods. Data on nutrient intake were expressed as percentage of Recommended Dietary Allowances to allow comparisons of results by gender and age groups. Bergstrom and Braden[29] conducted a study of 200 elderly patients and found that hypoalbuminemia was not a significant risk factor for developing pressure ulcers. On the other hand, food intake and especially the quality of protein-energy intake were found to be important risk indicators for pressure ulcer development.

Several studies have evaluated whether the Braden nutrition subscale, taken alone, was useful for prediction of pressure ulcer development.[27,30,31] For example, a study of elderly home-care patients found no significant association between Braden nutrition subscale scores and development of pressure ulcers.[30] Similarly, Halfens and associates[31] and Kwong and coinvestigators[27] found that Braden Scale subscales, especially the nutrition subscale, were not significant predictors of pressure ulcer development in hospitalized patients. These researchers questioned the validity of the Braden nutrition subscale. They

argue that this particular subscale was designed to measure the person's usual food intake pattern and not his or her nutritional status, and suggested that the usual food intake pattern and nutritional status are distinct factors. They further argued that a malnourished patient may have a good nutritional status and vice versa.

Data Analysis

Descriptive statistics, such as measures of central tendencies and variability, were used to describe demographic and clinical characteristics of the patients. Multivariate logistic regression analysis was performed to assess the predictive power of dependent variables (Braden total and nutrition scores) and other independent variables (SGA, anthropometric measures, and laboratory tests, including serum albumin) related to pressure ulcer development. All independent variables were initially assessed with univariate analysis to identify those statistically significant for pressure ulcer development. Next, 3 multivariate logistic regression models were constructed including the significant variables by univariate analysis. The final multivariate logistic regression model included the significant variables obtained from the previous 3 multivariate regression models. Forward stepwise multiple logistic regression analysis was used to obtain the most significant variables for pressure ulcer development. In all models, the goodness of fit was evaluated after each step, using the goodness-of-fit test, likelihood ratio, and Hosmer-Lemeshow test. Statistical significance was set at .05.

■ Results

Eight thousand two hundred fifty patients were admitted to the 2 hospitals during the data collection period. Two hundred sixty-nine patients met eligibility criteria; 9 refused to participate in the study, and 83 were discharged prior to completing the minimum length of stay of 7 days, 3 died, and 4 did not undergo a nutritional evaluation (Figure 1). Therefore, the final sample comprised 170 patients. Fifty-seven percent were men; subjects' mean age was 67.0 ± 15.4 years (mean ± SD), and their mean length of stay was 17.8 ± 16.8 days.

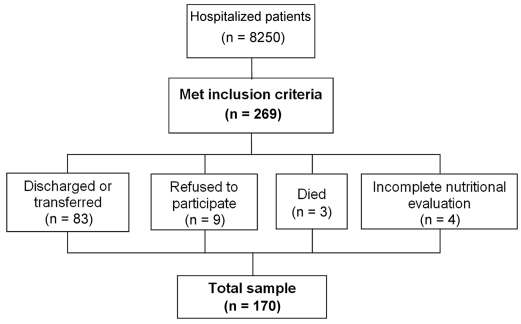

FIGURE 1. Flow chart showing inclusion and exclusion of patients in the final sample.

Three anthropometric variables, BMI, triceps skinfold thickness, and arm circumference, were measured. This assessment revealed that 18.8%, 12.9%, and 30.5% of the patients were malnourished. In addition, 26.4%, 18.8%, and 11.7%, respectively, were overweight, and that 0%, 26.4%, and 18.8% were obese.

Serum albumin data were available from 37% (n = 63) of the patients; 52.3% of these participants (n = 33) had a low serum albumin level (<3.5 g/dl). Many patients had moderate to severe changes in other parameters: elevated urea levels (n = 66; 38.8%), decreased hemoglobin (n = 71; 41.8%), hematocrit (n = 78; 45.9%), and lymphocyte (n = 63; 37.1%) levels. According to the SGA, 18% (n = 31) of patients were malnourished. At initial assessment, 51.1% (n = 87) of the patients reported low dietary intake. The percentage of patients reporting low dietary intake decreased over time without statistically significant difference among surgical and nonsurgical patients.

Fourteen patients developed pressure ulcers, corresponding to an incidence rate of 8.1%. None had experienced a previous pressure ulcer. The pressure ulcers were located mainly in the sacral region (42.8%) and heels (28.5%). Stage I pressure ulcers were observed in 64.2% of these patients and stage II in 35.7%. Nine patients (64%) who developed pressure ulcers were 65 years of age or older, with 3 of them being older than 80 years. The mean Braden Scale total risk scores were 12.2 and 15.0 for patients with and without pressure ulcers, respectively ($P < .001$).

Cumulative Braden Scale scores showed that 50% of the patients at the first and second assessments and 57.1% at the third assessment were deemed at moderate to high risk of developing pressure ulcers. Analysis of Braden nutrition subscale scores revealed that 50% of the patients at the first assessment, 35.7% at the second assessment, and 14.2% at the third assessment had poor dietary intake.

There were no significant differences in mean calorie intake between patients with (1194 ± 962.0 cal/day) with and without (1498 ± 600.1 cal/day) pressure ulcers (P = .170), except on the fifth day when subjects with pressure ulcers were found to have a significantly higher (P = .018) dietary intake when compared to patients without pressure ulcers (Figure 2).

Results of the multivariate logistic regression analysis are summarized in Tables 2–5. The most statistically significant demographic and clinical variables in model 1 were the total Braden Scale score, male gender, age, and Braden nutrition score (Table 2). In model 2, the most statistically significant nutritional variables for pressure ulcer development were the total Braden Scale score, Braden nutrition score, and SGA (Table 3), while in model 3, the most statistically significant biochemical variables were malnutrition, low serum albumin levels, high urea concentration, and low hemoglobin levels (Table 4). The final logistic regression model showed that the most powerful nutritional predictors of pressure ulcer development

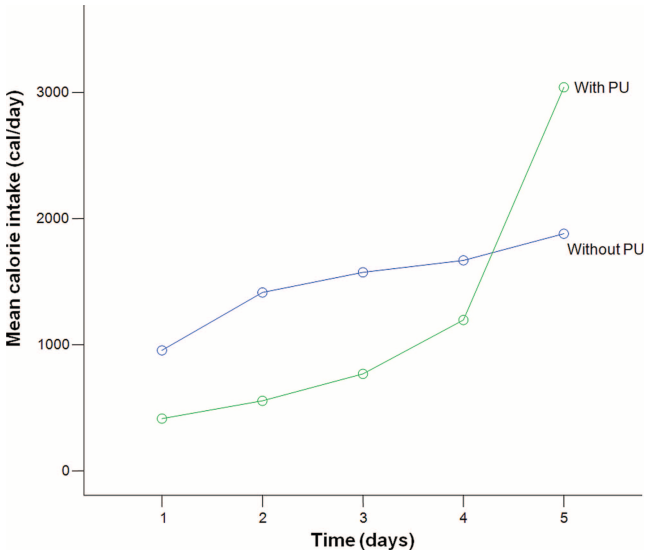

FIGURE 2. Estimated marginal means of dietary intake (cal/day) for patients with and without pressure ulcers.

were serum albumin level (odds ratio = 5.226; $P < .001$), SGA (odds ratio = 3.246; $P < .001$), and age (odds ratio = 1.594; $P < .001$). Although age emerged as a predictor of PU development, the relationship between age and nutritional status was not evaluated. The Braden nutrition score did not remain in the final multivariate logistic regression model (Table 4).

Discussion

Findings from this study reveal that serum albumin levels and SGA score were the most powerful predictors of pressure ulcer development. Multivariate analysis also revealed that the Braden nutrition subscale score, when taken alone, did not emerge as a significant predictor of pressure ulcer development.

Despite the perceived importance of serum albumin for assessing pressure ulcer risk,[32-34] only 37% (n = 63) of our patients underwent serum albumin level measurement. However, with an odds ratio greater than 5 in the final regression model, serum albumin levels emerged as a significant predictor for pressure ulcer development. These results are consistent with the findings of another study using logistic regression analysis conducted with 68 hospitalized patients. Fife and colleagues[35] found that 21.4% of patients with serum albumin levels less than 3.5 g/dl (35 g/l) had pressure ulcers, as compared with 7.7% of those with normal levels. However, there is a lack of controlled studies with comparable designs and large sample sizes. Paggiaro and coinvestigators[36] found that hypoalbuminemia less than 3 is associated with cerebral edema, which contributes to wound-healing delay by reducing angiogenesis, fibroblast proliferation, and collagen synthesis and remodeling.

TABLE 2.

Association Among Total Braden Scale Score, Braden Nutrition Score, Sociodemographic and Clinical Characteristics, and Pressure Ulcer Development (Model 1: Multivariate Logistic Regression)[a]

Variables	Odds Ratio	95% CI	*P*
Total Braden Scale score			
Low risk	1.00		
Moderate risk	**2.726**	1.422-3.205	<.001[b]
High risk	1.868	1.222-2.850	<.001[b]
Braden nutrition score			
Adequate/excellent	1.00		
Probably inadequate	0.563	0.151-1.614	.377
Very poor	**1.941**	0.340-5.103	.78
Male gender	**2.107**	1.786-2.486	<.001[b]
Age, y			
<40	0.135	0.096-1.022	.991
41-50	0.342	0.237-0.493	<.001[b]
51-60	**1.539**	1.202-1.970	.001[b]
61-70	0.223	0.169-0.293	<.001[b]
71-80	0.306	0.248-0.378	<.001[b]
>80	1.00	0.653-1.024	.080
Institution (medium-sized hospital)	0.818	0.653-1.024	.080
Length of stay, d			
6-7	0.185	0.142-0.240	<.001[b]
8-12	0.464	0.362-0.595	<.001[b]
13-20	1.695	1.353-2.123	<.001[b]
21-30	0.689	0.556-0.855	.001[b]
≥31	1.00		
Type of treatment (surgical)	0.347	0.288-0.418	<.001[b]

[a]Bold numbers indicate the most important predictors.
[b]Statistical significance.

The SGA score also emerged as significant for predicting pressure ulcer development. The SGA is a low-cost and noninvasive tool that can be administered at the bedside by different members of a multidisciplinary team trained in the management of nutritional care.[37] These results are consistent with a previous Brazilian study that found that hospitalized patients with severe malnutrition, according to the SGA, had a higher incidence of pressure ulcers (48.3%) than those with moderate malnutrition or at nutritional risk (35.25%).[38]

The Braden nutrition subscale score did not emerge as a significant predictor of PU development. Although there

TABLE 3.

Association Among Total Braden Scale Score, Braden Nutrition Subscale Score, Dietary Intake, Objective Measures, SGA, and Pressure Ulcer Development (Model 2: Multivariate Logistic Regression)[a]

Variables	Odds Ratio	95% CI	*P*
Total Braden Scale score			
Low risk	1.00		
Moderate risk	**2.552**	1.556-3.339	<.001[b]
High risk	**2.776**	1.138-3.574	<.001[b]
Braden nutrition score			
Adequate/excellent	1.00		
Probably inadequate	1.054	0.843-1.319	.645
Very poor	**2.937**	2.189-3.942	<.001[b]
Dietary intake			
Low	1.00		
Regular	0.869	0.700-0.979	.015[b]
Good	0.740	0.650-0.905	.034[b]
BMI			
Malnourished	1.00		
Normal	0.179	0.111-0.289	<.001[b]
Overweight	0.613	0.424-0.887	.009[b]
Obese	0.868	0.606-1.244	.442
Triceps skinfold thickness			
Malnourished	1.00		
Normal	0.112	0.080-0.157	<.001[b]
Overweight	0.782	0.001-1.345	.987
Obese	0.207	0.144-0.297	<.001[b]
Arm circumference			
Malnourished	1.00		
Normal	0.892	0.704-1.130	.345
Overweight	0.569	0.395-0.820	.002[b]
Obese	0.999	0.662-1.509	.997
SGA			
Well nourished	1.00		
Moderately malnourished	1.164	0.905-1.498	.236
Malnourished	**1.515**	1.136-2.021	.005[b]

Abbreviations: BMI, body mass index; CI, confidence interval; SGA, Subjective Global Assessment (well-nourished < 17; moderately malnourished 17-22; malnourished > 22).

[a]Bold numbers indicate the most important predictors.

[b]Statistical significance.

TABLE 4.

Association Among Total Braden Scale Score, Braden Nutrition Score, Biochemical Variables, and Pressure Ulcer Development (Model 3: Multivariate Logistic Regression)[a]

Variables	Odds Ratio	95% CI	*P*
Total Braden Scale score			
Low risk	1.00		
Moderate risk	0.005	0.002-2.366	.982
High risk	0.008	0.006-3.456	.981
Braden nutrition score			
Adequate/excellent	1.00		
Probably inadequate	0,913	0,682-1220	.540
Very poor	0.003	0.001-1326	.984
Serum albumin levels			
Normal	1.00		
Low	**3.408**	2599-4469	<.001[b]
Creatinine levels			
Normal	1.00		
High	1.330	0.977-1.812	.070
Urea concentration			
Normal	1.00		
High	0.487	0.341-0.694	<.001[b]
Hemoglobin levels			
Normal	1.00		
Moderate reduction	**2.269**	1.652-3.116	<.001[b]
Severe reduction	0.008	0.005-1.456	0.990

[a]Serum albumin levels (normal, 3.5-5.5; low, < 3.5 g/dl); creatinine levels (normal, 1.2; high, > 1.2 mg/dl); urea concentration (normal, 45.0; high, > 45.0 mg/dl); hemoglobin levels (normal, > 12.0; moderate reduction, 12.0-10.0; severe reduction, < 10.0 g/dl). Bold numbers indicate the most important predictors.

[b]Statistical significance.

is strong evidence provided by several studies on the importance of the Braden Scale in predicting risk of pressure ulcer development, this instrument was designed to generate a cumulative score. The significance of SGA as a predictor of pressure ulcer development may be attributed to the fact that this instrument evaluates not only dietary intake but also physical changes through a specific physical examination, presence of gastrointestinal symptoms, and changes in functional capacity.[37,39]

Although risk of pressure ulcer development has been reported to be higher among the elderly than among younger age groups,[30,32,40,41] and age has emerged as a predictor of PU development in this study, the relationship between age and nutritional status was not specifically evaluated.

TABLE 5.

Association Among the Statistically Significant Variables From the Models 1, 2 and 3 and Pressure Ulcer Development (Final Model: Multivariate Logistic Regression)[a]

Variables	Odds Ratio	95% CI	*P*
SGA			
Well nourished	1.000		
Moderately malnourished	**1.579**	1.221-2.042	<.001[b]
Malnourished	**3.246**	2.331-4.520	<.001[b]
Serum albumin levels			
Normal	1.000		
Low	**5.226**	4.030-6.776	<.001[b]
Urea concentration			
Normal	1.000		
High	**1.926**	1.542-2.406	<.001[b]
Age	**1.594**	1.405-1.808	<.001[b]
Institution (medium-size hospital)	0.354	0.281-0.446	<.001[b]

Abbreviations: CI, confidence interval; SGA, Subjective Global Assessment.

[a]Bold numbers indicate the most important predictors.

[b]Statistical significance.

Clinical Recommendations

The SGA can be administered by nurses, but training is needed to detect significant nutritional alterations.[37,41] The SGA scores should be determined weekly. As an important biochemical marker for nutrition, serum albumin should also be tested before beginning any therapy and every 21 days during treatment, because of its half-life time. A complete dietary assessment should also be performed for a planned and individualized treatment.[42]

Study Limitations

Despite the identified importance of serum albumin, these data were available just from 37% (n = 63) of the patients and may not be representative of the entire sample. Serum albumin is not routinely used as a nutritional marker, probably due to its high cost and because it is considered a poor indicator of visceral protein status. In addition to a relatively long half-life of 21 days, serum albumin may be affected by hydration status, changes in metabolism, acute stress, and infection.[43] Because of these limitations, recent studies have suggested the use of prealbumin, which has a half-life of 2 to 3 days and has shown to be a more accurate indicator.[40] However, pre-albumin is even more expensive than serum albumin.[44] Additional study limitations included the limited sample size generated from 2 acute care facilities.

Conclusions

Study findings suggest that the Braden nutrition subscale score, taken alone, is not a predictor of pressure ulcer development. In contrast, serum albumin levels and SGA were found to be the most significant predictors. Based on its low cost and possibility to be administered at the bedside, SGA may serve as a useful complementary tool to the Braden Scale.

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