



Original / Valoración nutricional

# Scored patient-generated subjective global assessment, albumin and transferrin for nutritional assessment of gastrostomy fed head or neck cancer patients

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## Abstract

**Introduction:** Gastrostomy fed head or neck cancer patients frequently have impaired speech capacities. Enteral feeding teams frequently depend on laboratorial or anthropometrical parameters for nutritional assessment.

**Aims:** In these patients, this study aimed to evaluate: (1) the practicability of Scored - Patient-Generated Subjective Global Assessment (PG-SGA); (2) their nutritional status using the Scored-PG-SGA; (3) association of serum albumin and transferrin values to the nutritional status rating using PG-SGA.

**Methods:** On adult outpatients with head or neck cancer under prolonged (> 1 month) gastrostomy feeding, Scored-PG-SGA, albumin and transferrin were evaluated during the same appointment.

**Results:** Scored-PG-SGA was easily feasible in 42 patients, even in patients with speech difficulties. Twenty-five patients were moderately/severely undernourished (PG-SGA/B+C). Scored-PG-SGA rated 41 patients as  $\geq 2$ , thus needing nutritional/pharmacologic intervention. Albumin was low in 13 patients. Transferrin was low in 19 patients. Average albumin and transferrin in moderately/severely undernourished patients (PG-SGA/B+C) was significantly lower than in well-nourished (PG-SGA/A). There was association between Scored-PG-SGA rating, albumin and transferrin.

**Conclusions:** In PEG fed head or neck cancer patients, PG-SGA was practicable and useful, even in patients with impaired speaking skills. Most patients displayed moderate/severe malnutrition (PG-SGA/B+C). Scored-PG-SGA rated 41 patients as needing for nutritional/pharmacological intervention. Scored-PG-SGA should be systematically included in the evaluation of these patients. In these patients, albumin and transferrin levels showed relation with Scored-PG-SGA and should be considered as nutritional biomarkers.

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Key words: Nutrition assessment. PG-SGA. Head or neck cancer. Gastrostomy.

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## EVALUACIÓN GLOBAL SUBJETIVA DEL ESTADO DE NUTRICIÓN GENERADA POR EL PACIENTE, ALBÚMINA Y TRANSFERRINA EN PACIENTES CON CÁNCER DE CABEZA O CUELLO ALIMENTADOS POR GASTROSTOMÍA

### Resumen

**Introducción:** Los pacientes con cáncer de cabeza o cuello alimentados por gastrostomía tienen a menudo una deterioración en la capacidad de hablar. Con frecuencia para la evaluación nutricional se usan parámetros bioquímicos y antropométricos.

**Objetivos:** Evaluación Global Subjetiva - Generada por el Paciente (EGS-GP): (1) aplicabilidad; (2) el estado nutricional del paciente; (3) la asociación con los valores de albúmina y transferrina séricas.

**Métodos:** Evaluación nutricional (EGS-GP), albúmina y transferrina en pacientes ambulatorios adultos con cáncer, sometidos a alimentación prolongada (> 1 mes) por gastrostomía. Valoración realizada en la misma consulta.

**Resultados:** La EGS-GP fue fácilmente factible en 42 pacientes, incluso en pacientes con dificultades en hablar. Veinticinco estaban con desnutrición moderada/severa (EGS-GP/B+C). En 41 la EGS-GP fue  $\geq 2$ , demostrando la necesidad de intervención nutricional/farmacológica. La albúmina estaba por debajo de lo normal en 13 pacientes. La transferrina en 19 pacientes. La media de albúmina y transferrina de los pacientes moderadamente/severamente desnutridos (EGS-GP/B+C) fue significativamente más baja, en comparación con los bien nutridos (EGS-GP/A). Se ha hallado asociación entre la EGS-GP, la albúmina y transferrina.

**Conclusiones:** En los pacientes con cáncer de cabeza o cuello alimentados por gastrostomía, la EGS-GP fue viable y útil, incluso en los pacientes con dificultades de comunicación. La mayoría muestran desnutrición moderada/severa (EGS-GP/B+C). La EGS-GP ha calificado 41 pacientes como requiriendo de intervención nutricional/farmacológica. La EGS-GP debe incluirse sistemáticamente en la valoración de estos pacientes. En estos, la albúmina y transferrina mostraron una relación con la EGS-GP y deben ser consideradas como biomarcadores nutricionales.

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Palabras clave: Evaluación nutricional. EGS-GP. Cáncer de cabeza o cuello. Gastrostomía.

## Introduction

Malnutrition is a major issue in patients with head or neck cancer including cervical esophageal cancer, due to the direct effects of the disease, therapy side effects and poor food intake<sup>1-3</sup>. This condition affects the response to the cancer treatment and increases susceptibility to its side effects. Malnutrition is associated with an increase in number and severity of complications, impaired quality of life and decreased survival rate<sup>3-5</sup>. In these patients, chewing and swallowing may be affected by the cancer mass position, and by cancer therapy, reduced food intake thus contributing to weight loss and malnutrition<sup>6,7</sup>.

In dysphagic patients, the Percutaneous Endoscopic Gastrostomy (PEG) is the preferred nutritional access method for prolonged enteral nutrition, to prevent weight loss and maintain or improve patients' nutritional status<sup>1,5,8</sup>. In this setting, it's essential to use nutritional assessment tools that prove to be practical and trustworthy. Gastrostomy fed head or neck cancer patients frequently have speech difficulties and are difficult to assess. Often, enteral feeding teams rely on objective data, as anthropometric and laboratory data, to evaluate the nutritional status of gastrostomy fed patients<sup>1,9,10</sup>.

Lab tools commonly used (albumin, transthyretin and transferrin) are known as prognosis, inflammatory and nutritional status biomarkers, even though they are influenced by several factors<sup>11-14</sup>. These biomarkers are frequently used to assess patients' nutritional status as they are widespread, easy to obtain and have a low cost<sup>11-15</sup>. These proteins can be used as malnutrition biomarkers in patients with no inflammatory condition or with a known mild chronic inflammatory condition<sup>12</sup>. Serum proteins are neither specific nor sensitive nutritional status indicators but they can be used with other nutritional assessment tools in cancer patients<sup>12</sup>.

The Patient-Generated Subjective Global Assessment (PG-SGA) is a specific method to assess the nutritional status of both cancer inpatients and outpatients<sup>16-18</sup>. This tool puts the patient in one of three categories: A) Well-nourished or anabolic, B) Suspected or moderate undernutrition, C) Severely undernourished<sup>3,16</sup>. Using the Scored-PG-SGA, besides getting those three nutritional status categories, the healthcare professional obtains an individual score for each patient. These score results allow the healthcare professional to select priority patients for nutritional support<sup>2,3,16,18</sup>. The Scored PG-SGA is the standard method to assess cancer patients' nutritional status, as recommended by the Oncology Nutrition Dietetic Practice Group, of the American Dietetic Association<sup>18,19</sup>.

Several studies have shown that the PG-SGA score and the serum albumin are accurate for predicting the global result of the Subjective Global Assessment (SGA), being useful to differentiate between undernourished and well-nourished cancer patients. Patients rated as undernourished (PG-SGA B+C) showed lower serum albumin levels and a higher average PG-SGA score

when compared to those rated as well-nourished (PG-SGA A)<sup>20-22</sup>. Other authors who used PG-SGA have concluded that cancer patients diagnosed as moderately or severely undernourished (PG-SGA B+C) presented significantly lower body weight, Body Mass Index (BMI), total lymphocyte count, transferrin, transthyretin (pre-albumin) and albumin, proving that the nutritional status assessment using PG-SGA was associated with laboratorial/anthropometric data from these patients<sup>23-25</sup>.

Gastrostomy fed patients suffering from head or neck cancer frequently have speaking difficulties, as the same lesions that cause dysphagia also disturb speaking abilities<sup>1</sup>. To the best of our knowledge, there are no previous systematic studies evaluating PEG-patients using PG-SGA. The present study aimed to assess the nutritional status of head or neck cancer patients subjected to PEG-feeding, by using the Scored PG-SGA. The specific goals were: (1) to evaluate the practicability of the Scored PG-SGA in these patients; (2) to test the hypothesis that the nutritional status rating using the PG-SGA tool was associated with the serum albumin and transferrin values in these patients.

## Patients and Methods

### Study Design

A descriptive-correlational observational study was designed, to be undertaken in a hospital setting. This project was approved by the Ethic Committee of our Hospital.

### Patients

The sample consists of adult outpatients with head or neck cancer subject to prolonged enteral feeding by gastrostomy, who attended a medical appointment at the Artificial Feeding Team of our hospital.

Adult outpatients (age  $\geq 18$ ), from both genders, who were diagnosed with head or neck cancer (including cervical esophagus cancer) under enteral feeding by gastrostomy for over a month were recruited for the study, from December 2012 to May 2013. Exclusion criteria were:

1. Refusal to participate the study
2. PEG-feeding during less than one month
3. Terminal cancer
4. Other cachexia-inducing diseases
5. Mental or neurological illness
6. Kidney or liver disorders

### Nutritional Assessment Tool

We used the Portuguese version of the *Scored Patient-Generated Subjective Global Assessment*

(Scored PG-SGA) survey, validated specifically for cancer inpatients and outpatients<sup>16,17</sup>.

The first section of the survey, that covers the data related to their medical history, was filled by the patient, or, if they were illiterate, by the researcher. This first section includes the register of 1) weight change; 2) dietary intake change; 3) cancer-related nutrition impact symptoms; 4) functional capacity<sup>4,16</sup>. Their current body weight (in Kg) was obtained using a calibrated digital KERN® MPS (200 ± 0,1 kg) scale. Most patients were weighed in the upright position, using only underclothes. Patients with poor functional capacity were weighed sitting down in a digital SECA® (200 ± 0,1 kg) scale-chair. Weight was measured in kilograms, rounded to one decimal place, with an observational error of 0,05 kg. The patient's weight from a month ago was obtained from his medical file. Body height was measured in the orthostatic position, in meters and rounded to the centimeter, with an observational error of 0,05 cm.

The remaining questions, in the second section, were filled in by the main researcher, based on the patient's medical file and a physical examination. This section incorporated data pertaining to the patient's age, type of cancer, disease stage, metabolic stress increase-related components and physical examination<sup>4,16</sup>. Each of the survey's questions is scored, and, at the end, a total PG-SGA score is obtained<sup>16</sup>. Scoring 9 or above indicates a critical need for nutritional intervention and/or symptom management.

At the end of the survey, the patient is rated nutritionally in one of three categories: "Well-nourished or anabolic" (PG-SGA - A), "Moderately or suspected of being undernourished" (PG-SGA B) and "Severely undernourished" (PG-SGA C)<sup>16</sup>.

### *Research Method*

Each patient was nutritionally assessed in a single moment, using the Scored PG-SGA survey. In the same assessment day, a blood sample was collected for serum albumin and transferrin evaluation. According to the reference normal values used by the hospital laboratory (albumin: 3,5-5,0 g/dl; transferrin: 200-360 mg/dl)<sup>26</sup>, serum albumin values were considered "normal" when above or equal to 3,5 g/dl, and "low" when under 3,5 g/dl<sup>27,28</sup>. Serum transferrin values were considered "normal" when above or equal to 200 mg/dl and "low" when under 200 mg/dl<sup>28</sup>.

### *Statistical analysis*

All data was analyzed with the SPSS® software (version 17.0). Descriptive and inferential statistics were used. Nominal measurement scales were used for PG-SGA, to rate patients in one of the two desired nutritional status categories (PG-SGA-A or PG-SGA

B+C). Serum albumin and transferrin values were considered as either "normal" or "low", according to the reference values for normality. A chi-square test was used to test the hypothesis of the nutritional status rating using PG-SGA being related with the serum albumin and transferrin values. The independent sample t-test was used to determine if there were statistically significant differences in the means of the continuous quantitative variables of the patients rated as PG-SGA A and PG-SGA B+C. Statistical significance was reported at the conventional  $\alpha = 0,05$  level.

## **Results**

### *Patient Characteristics*

We evaluated 42 head or neck cancer patients, 38 men (90,5%) and 4 women (9,5%), with ages ranging between 47 and 87 years (average: 63,12 ± 8,8 years; median: 63 years). Overall, 14 patients were diagnosed with pharynx cancer (33,3%), 11 with mouth cancer (26,2%), 8 with larynx cancer (19%), 6 with cervical metastases that compromise swallowing (14,3%) and 3 with upper esophageal cancer (7,1%). All patients had advanced cancer, 12 patients (28,6%) had stage III and 30 (71,4%) had stage IV cancer. Looking at the cancer treatment each patient underwent before the study, 21 (50%) underwent surgery, 22 (52,4%) underwent radiotherapy, and all patients underwent chemotherapy. PEG procedure was performed one month before the study in 21 patients (50%), 3 months before in 11 (26,2%) and 6 months before in 10 patients (23,8%) (Table I).

### **Scored Patient - Generated Subjective Global Assessment survey in nutritional evaluation**

#### *PG-SGA feasibility*

The PG-SGA was easily feasible, with all items being evaluated even in patients with speech difficulties.

#### *Nutritional status rating*

Using the Scored PG-SGA, 25 patients (59,5%) were shown to be moderately or severely undernourished (PG-SGA B+C) and 17 were well-nourished (PG-SGA A) (Table I; Table II).

#### *Body weight changes during one month*

When looking at unintentional body weight loss, 21 (50%) out of the 42 assessed patients had lost weight in the month earlier to the survey filling, 13 (31%) had gained weight and 8 (19%) had maintained their body weight.

**Table I**  
*Characteristics of cancer patients undergoing enteral nutrition by gastrostomy*

| Sample  | N = 42          |
|---|-----------------|
| <b>Gender</b> (men/women) <sup>b</sup>        | 38/4 (90,5/9,5) |
| <b>Age</b> (years) <sup>a</sup>               | 63,12 ± 8,8     |
| <b>Diagnosis</b> <sup>b</sup>                 |                 |
| Pharynx cancers                               | 14 (33,3)       |
| Mouth cancers                                 | 11 (26,2)       |
| Larynx cancers                                | 8 (19)          |
| Cervical metastasis                           | 6 (14,3)        |
| Cervical oesophagus cancers                   | 3 (7,1)         |
| <b>Tumour stage</b> <sup>b</sup>              |                 |
| III   | 12 (28,6)       |
| IV  | 30 (71,4)       |
| <b>Treatment method</b> <sup>b</sup>          |                 |
| Surgery                                       | 21 (50)         |
| Radiotherapy                                  | 22 (52,4)       |
| Quimiotherapy                                 | 42 (100)        |
| <b>Gastrostomy time</b> <sup>b</sup>          |                 |
| 1 month                                       | 21 (50)         |
| 3 months                                      | 11 (26,2)       |
| 6 months                                      | 10 (23,8)       |
| <b>PG-SGA rating</b> <sup>c</sup>             |                 |
| A: Well-nourished                             | 17 (40,5)       |
| B: Moderately undernourished                  | 19 (45,2)       |
| C: Severely undernourished                    | 6 (14,3)        |
| <b>Body weight change</b> <sup>b</sup>        |                 |
| Lost  | 21 (50)         |
| Increased                                     | 13 (31)         |
| Maintained                                    | 8 (19)          |
| <b>Percentage of weight loss</b> <sup>b</sup> |                 |
| ≤ 5%  | 11 (26,2)       |
| > 5%  | 10 (23,8)       |

<sup>a</sup>average ± SD.

<sup>b</sup>Frequency (percentage).

<sup>c</sup>Patient – Generated Subjective Global Assessment.

By analyzing the patient's weight loss percentage in the previous month, 26,2% had a weight loss of ≤ 5%, suggesting risk of or moderate undernourishment, and 23,8% had lost > 5% of their total body weight, which suggests severe undernourishment (Table I).

The weight loss percentage in the month that preceded the assessment varied between 0% and 10%

of lost weight, with an average  $2,5 \pm 3,1\%$ . Well-nourished patients (PG-SGA A) had an average lost weight percentage of  $0,4 \pm 0,9\%$ , while those with suspected or moderate undernourishment (PG-SGA B) lost, in average,  $3,5 \pm 3,1\%$  and those severely undernourished (PG-SGA C) had a weight loss average of  $5,3 \pm 3,6\%$  (Table II).

#### *Food Intake during the past month*

In the "Food Intake" section, all patients confirmed they were PEG-fed. Three of them (7,1%) claimed to also ingest some food orally. Nevertheless, most of their feeding was through the PEG tube and the oral intake only "for pleasure". Oral ingestion was not taken into account when providing for the patients' nutritional needs. Even so, 11 patients (26,2%) displayed psychological resistance to this method of feeding, even though they were unable to eat through any other method.

#### *Prevalence of nutrition impact symptoms*

Evaluating the presence of typical cancer patients' symptoms that affect food ingestion or nutrient absorption, 16 patients (38,1%) presented nutritionally significant symptoms (Table III). The remaining 26 patients (61,9%) didn't present symptoms that prevented tube feeding.

#### *Functional capacity during the past month*

Evaluating the functional capacity during the last month before the study, 6 patients (14,3%) said they had normal activities with no limitations, 11 (26,2%) said they did not have normal activities, but were able to stand up and perform mild normal activities, 8 (19%), said they were not able to perform most activities, although they were in bed or sitting less than half the day, 11 (26,2%) claimed to be able to do little activity and to spend most of the day in bed or on a chair and 6 (14,3%) were mostly bedridden, rarely

**Table II**  
*Patient - Generated Subjective Global Assessment (PG-SGA), total PG-SGA score and weight loss percentage in the previous month in gastrostomy-fed cancer patients*

| Sample                     | Well-nourished <sup>c</sup> |                       | Undernourished <sup>c</sup> |                       |
|----------------------------|-----------------------------|-----------------------|-----------------------------|-----------------------|
|                            | PG-SGA A <sup>b</sup>       | PG-SGA B <sup>b</sup> | PG-SGA C <sup>b</sup>       | PG-SGA C <sup>b</sup> |
| Patients (%)               | 42 (100)                    | 17 (40,5)             | 19 (45,2)                   | 6 (14,3)              |
| % Weight loss <sup>a</sup> | 2,5 (±3,1)                  | 0,4 (±0,9)            | 3,5 (±3,1)                  | 5,3 (±3,6)            |
| PG-SGA score <sup>a</sup>  | 7,4 (± 4,0)                 | 3,9 (±2,1)            | 8,7(±2,5)                   | 12,8 (±3,8)           |

<sup>a</sup>average ± SD.

<sup>b</sup>Patient-Generated Subjective Global Assessment.

<sup>c</sup>PG-SGA rating in A (Well-nourished) and B+C (moderately/severely undernourished).

**Table III**  
Nutrition impact symptoms showed by  
gastrostomy-fed cancer patients

| Symptoms          | n = 16 (100) <sup>a</sup> |
|-------------------|---------------------------|
| Constipation      | 9 (56,3)                  |
| No appetite       | 7 (43,8)                  |
| Feel full quickly | 3 (18,8)                  |
| Nausea            | 2 (12,5)                  |
| Vomiting          | 2 (12,5)                  |
| Diarrhea          | 1 (6,3)                   |
| Smells bother me  | 1 (6,3)                   |

<sup>a</sup>Frequency (percentage).

being out of bed. Most patients showed some mild functional deficit during the month before the study, 8 (19%) showed a moderate functional deficit and 17 (40,5%) a severe functional deficit.

#### Total PG-SGA Score

The average total PG-SGA score was  $7,4 \pm 4,0$  points (median: 7 points), ranging between 1 and 17 points. Well-nourished patients (PG-SGA A) had an average PG-SGA total score of  $3,9 \pm 2,1$  points, those suspected of or moderately undernourished (PG-SGA B),  $8,7 \pm 2,5$  points and those severely undernourished had an average score of  $12,8 \pm 3,8$  points (Table II). According to the total PG-SGA score, 41 patients needed an appropriate nutritional or pharmacologic intervention.

#### Nutritional assessment rating, albumin and transferrin: how they're related

The range of serum albumin levels was 2,5-5,0 g/dl (normal 3,5-5,0 g/dl). The average serum albumin levels were  $3,9 \pm 0,7$  g/dl (Table IV). The serum albumin levels were low ( $< 3,5$  g/dl) in 13 patients (31%) and within the reference range for normality in 29 patients (69%). Out of the 17 patients rated as well-nourished, 16 (94,1%) presented normal serum albumin

levels and 1 (5,9%) a low serum albumin level. Out of the 25 patients rated as moderately or severely undernourished, 13 (52%) presented normal serum albumin levels and 12 (48%) low serum albumin levels.

In well-nourished patients (PG-SGA A) the average serum albumin level was  $4,4 \pm 0,4$  g/dl (range: 3,3-5,0 g/dl), in patients with suspected or moderate undernutrition (PG-SGA B)  $3,7 \pm 0,5$  mg/dl (range: 2,8-4,3 g/dl) and in severely undernourished patients (PG-SGA C)  $3,1 \pm 0,6$  mg/dl (range: 2,5-3,8 g/dl). Statistically significant differences were found between the average serum albumin level in well-nourished patients (PG-SGA - A) and moderately or severely undernourished patients (PG-SGA B+C) ( $p < 0,001$ ) (Table IV).

An association was found between the nutritional status rating using the PG-SGA tool and the serum albumin levels in these cancer patients subject to prolonged PEG-feeding ( $p = 0,011$ ).

The range of serum transferrin levels was 95-325 mg/dl (normal: 200-360 mg/dl). The average serum transferrin levels were  $204,95 \pm 54,5$  mg/dl (Table IV). The serum transferrin levels were low ( $< 200$  mg/dl) in 19 patients (45,2%) and within the reference range for normality in 23 patients (54,8%). Out of the 17 patients rated as well-nourished, 14 (82,4%) presented normal serum transferrin levels and 3 (17,6%) low serum transferrin levels. Out of the 25 patients rated as moderately or severely undernourished, 9 (36%) presented normal serum transferrin levels and 16 (64%) low serum transferrin levels.

In well-nourished patients (PG-SGA A) the average serum transferrin level was  $241,2 \pm 46,5$  mg/dl (range: 140-325 mg/dl) in patients with suspected or moderate undernutrition (PG-SGA B)  $185,6 \pm 46,7$  mg/dl (range: 95-266 mg/dl) and in severely undernourished patients (PG-SGA C) was  $163,3 \pm 39,9$  mg/dl (range: 100-222 mg/dl). Statistically significant differences were found between the average serum transferrin levels in well-nourished patients (PG-SGA A) and in moderately or severely undernourished patients (PG-SGA B+C) ( $p < 0,001$ ) (Table IV).

An association was found between the nutritional status rating using the PG-SGA tool and the serum transferrin of cancer patients subject to prolonged enteral feeding by gastrostomy ( $p = 0,008$ ).

**Table IV**  
Nutritional status PG-SGA<sup>b</sup> rating, average serum albumin and transferrin in gastrostomy cancer patients

| Serum proteins                   | Sample (n = 42)       | Well-nourished <sup>c</sup> |                       |                       | p value <sup>d</sup> |
|----------------------------------|-----------------------|-----------------------------|-----------------------|-----------------------|----------------------|
|                                  |                       | PG-SGA A <sup>b</sup>       | PG-SGA B <sup>b</sup> | PG-SGA C <sup>b</sup> |                      |
| Albumin (g/dl) <sup>a</sup>      | 3,9 ( $\pm 0,7$ )     | 4,4 ( $\pm 0,4$ )           | 3,7 ( $\pm 0,5$ )     | 3,1 ( $\pm 0,6$ )     | $p < 0,001$          |
| Transferrin (mg/dl) <sup>a</sup> | 204,95 ( $\pm 54,5$ ) | 241,2 ( $\pm 46,5$ )        | 185,6 ( $\pm 46,7$ )  | 163,3 ( $\pm 39,9$ )  | $p < 0,001$          |

<sup>a</sup>average  $\pm$  SD.

<sup>b</sup>Patient - Generated Subjective Global Assessment.

<sup>c</sup>PG-SGA rating in A (Well-nourished) and B+C (moderately/severely undernourished).

<sup>d</sup>Student T test to test differences between average serum albumin and transferrin in well-nourished (PG-SGA A) and moderately/severely undernourished patients (PG-SGA B+C) ( $p \leq 0,05$ ).

## Discussion

The PG-SGA tool had already been used on patients with different types of cancer, but no other studies evaluated the use of the PG-SGA in head or neck cancer patients needing a gastrostomy for enteral feeding<sup>16,18,29,24</sup>. Our study proved that PG-SGA is a feasible and easily usable tool to assess the nutritional status of head or neck gastrostomized cancer patients, even in those whose tumor location or treatments caused speech difficulties<sup>16,24,25</sup>.

Using the PG-SGA nutritional assessment, it is clear that undernutrition had very high prevalence in our patients, with 59,5% of the patients being moderately or severely undernourished (PG-SGA B+C). This result is in accordance with the undernutrition prevalence mentioned by other authors (40-80%) found in cancer patients<sup>2-4,16</sup>. The moderately or severely undernourished patient's prevalence was higher than the one found by other authors (43,8%) in patients with head or neck cancers but not subject to PEG-feeding<sup>29</sup>.

The percentage of patients that lost body weight involuntarily in the month before the nutritional assessment was very high. Twenty-one patients were shown to have lost weight, with 10 of them having lost more than 5% of their body weight, which is considered a significant unintentional weight loss in a month<sup>30</sup>. This pronounced weight loss in some patients was possibly due to the joined effect of the cancer's aggression, the cancer treatments and emotional factors, such as depression and unwillingness to be PEG-fed<sup>31,32</sup>. In spite of being gastrostomized, and thus having a backup feeding supply, some patients were reluctant to being tube fed, and went on having a food intake below their needs.

Weight loss prevalence in our sample was lower to the one detected by other groups of patients with head or neck cancer (70%) due to the fact of our patients being gastrostomized, to have an alternate feeding system<sup>24,33,34</sup>. Severely undernourished patients (PG-SGA C) had a higher average weight loss percentage, followed by those who were moderately undernourished (PG-SGA B) and those who were well-nourished (PG-SGA A). Likewise, due to being at an advanced stage of nutritional status deterioration, the benefits of nutritional intervention in severely undernourished patients are, as mentioned by other authors, limited<sup>35</sup>. So, it is important to identify symptoms related to a pre-cachexia phase and to initiate tube feeding sooner on patients with higher risk of undernutrition, before the treatment, to prevent weight loss and the patient's nutritional status decay<sup>5,35</sup>. Tube feeding has allowed for appropriate food intake, and thus the maintenance or body weight gain in 21 patients (50%), fulfilling the intended purpose of maintaining or increasing body weight<sup>5,8</sup>.

In our study, the reasons pointed out by the patients that were relevant for decreased food intake or nutrient absorption were constipation, anorexia, early satiation, nausea, vomiting and diarrhea, all symptoms common

in cancer patients, as pointed out by other authors<sup>6,34</sup>. In another study with patients with head or neck cancer, the most frequent symptoms were dysphagia, due to the harmful location of the tumors, and pain, which affected food intake, which were not relevant complaints from our patients, due to the PEG feeding option<sup>29</sup>.

Most patients presented some degree of functional deficit in the month before the PG-SGA study, with 25 patients (59,5%) presenting moderate or severe functional deficit.

As expected, severely undernourished patients (PG-SGA C) were the ones that had a higher average total PG-SGA score, followed by those moderately undernourished (PG-SGA B) and those well-nourished (PG-SGA A). In our sample, like in other studies, patients with PG-SGA scores of 0-1 (no need for treatment or nutritional intervention) were rare<sup>25</sup>.

Looking at the laboratory data, severely undernourished patients (PG-SGA C) were the ones that presented lower average serum albumin and transferrin levels, followed by those moderately undernourished (PG-SGA B) and those well-nourished (PG-SGA A). Statistically significant differences were found in our study between the average serum albumin and transferrin levels in well-nourished (PG-SGA A) and moderately and severely undernourished patients (PG-SGA B+C)<sup>20,21,24</sup>. An association was found, in our study, between the nutritional status assessment using the PG-SGA and the serum albumin and transferrin levels in cancer patients subject to prolonged tube feeding. Although in many clinical settings serum albumin and transferrin levels may reflect inflammatory status, the close relation between the PG-SGA and the serum proteins suggests that low albumin and transferrin are biomarkers of malnutrition in our head or neck cancer patients<sup>2,11,12,14</sup>.

## Conclusions

In our experience with PEG fed head or neck cancer patients, PG-SGA was a practicable tool for nutritional status evaluation, even in patients with impaired speaking skills. PG-SGA was a useful tool in classifying most (25/42) of the patients as PG-SGA B or C, with moderate/severe malnutrition. Scored-PG-SGA rated 41 out of 42 with scores  $\geq 2$ , thus identifying the need for nutritional or pharmacological intervention. Scored-PG-SGA should be systematically included in the evaluation of head or neck cancer PEG fed patients, even in those with speech difficulties. Although cancer patients may have low grade systemic inflammation, in our patients, serum albumin and transferrin showed a relation with PG-SGA and should be considered as nutritional biomarkers.

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