nutrición clínica y Dietética Hospitalaria

Artículo Original

Nutr. clín. diet. hosp. 2018; 38(4):95-102
DOI: 10.12873/384valdete

Scored Patient-Generated Subjective Global Assessment: risk identification and need for nutritional intervention in cancer patients at hospital admission

Escore da Avaliação Subjetiva Global Produzida pelo Próprio Paciente: identificação do risco e necessidade de intervenção nutricional em pacientes com câncer na admissão hospitalar

Calazans Teixeira, Ariane[1]; Calixto Mariani, Maressa Gabriella[1]; Salgado Toniato, Tatiana[1]; Papera Valente, Katarina[1]; Blaser Petarli, Glenda[2]; Pereira, Taisa Sabrina Silva[1]; Guandalini, Valdete Regina[1]

1 Health Sciences Centre. Federal University of Espirito Santo. Vitoria, ES, Brazil.
2 Cassiano Antônio Moraes University Hospital. Vitória, ES, Brazil.

Recibido: 4/diciembre/2017. Aceptado: 16/mayo/2018.

ABSTRACT

Background: Malnutrition is one of the most common nutritional disorders in cancer patients, making early diagnosis and nutritional intervention necessary to minimize or prevent undesirable outcomes.

Objective: To identify nutritional status and the need for nutritional intervention in cancer patients according to Patient-Generated Subjective Global Assessment (PG-SGA) and the scored PG-SGA at hospital admission, and to verify the association of the scored PG-SGA with objective methods of nutritional assessment

Methods: A cross-sectional study was carried out in a university hospital with adult and elderly cancer patients of both sexes. Conventional anthropometric variables, body mass index, and PG-SGA within 48 hours of hospital admission were evaluated. The data were evaluated by Fisher's Exact test, ANOVA, Pearson's correlation, and multiple linear regression.

Results: Of the 70 patients evaluated, 64 (95.7%) presented some degree of malnutrition according to PG-SGA. The total scored PG-SGA showed that 60 (91.4%) of patients had nutritional intervention (≥ 4 points) and 43 (61.4%) had nutritional risk (≥ 9 points). The scored PG-SGA was associated with objective variables of nutritional status.

Conclusion: PG-SGA was able to efficiently identify malnutrition in its different stages, as well as the need for nutritional intervention at hospital admission. The PG-SGA score was associated with objective methods of nutritional assessment. PG-SGA and its score should be included in the initial evaluation of cancer patients, because they allow different evaluations in a single instrument.

KEY WORDS

Nutritional Assessment. Malnutrition. Cancer. Patient admission.

RESUMEN

Introducción:La desnutrición es uno de los trastornos nutricionales más comunes en pacientes con cáncer, lo que hace que el diagnóstico precoz y la intervención nutricional adecuada sean fundamentales para minimizar o prevenir resultados indeseables.

Objetivo: Identificar la presencia de desnutrición y la necesidad de intervención nutricional en pacientes con cáncer según Valoración Global Subjetiva Generada por el Paciente

Correspondencia:
Valdete Regina Guandalini
valdete.guandalini@ufes.br

(VGS-GP) y su puntuación en la admisión hospitalaria, y verificar la asociación del score de la VGS-GP con métodos objetivos de la evaluación nutricional.

Métodos: Estudio transversal, realizado en un hospital universitario, con pacientes oncológicos, adultos y ancianos, de ambos sexos. Se evaluaron las variables antropométricas convencionales y el índice de masa corporal aplicados a VGS-GP en hasta 48 horas de la admisión hospitalaria. Los datos se evaluaron por la prueba Exacta de Fisher, ANOVA, Correlación de Pearson y regresión lineal múltiple.

Resultados: De los 70 pacientes evaluados, 67 (el 95.7%), presentaron algún grado de desnutrición según la VGS-GP. La puntuación total de la VGS-GP mostró que el 91.4% (60 pacientes) presentó la necesidad de intervención nutricional (≥ 4 puntos) y que el 61.4% (43 pacientes) presentó el riesgo nutricional (≥ 9 puntos). La puntuación de la VGS-GP se asoció con variables objetivas del estado nutricional.

Conclusión: La VGS-GP y su puntuación fueron capaces de identificar de manera eficiente la desnutrición en sus diferentes etapas y la necesidad de intervención nutricional en la admisión hospitalaria. La puntuación de la VGS-GP se asoció a métodos objetivos de la evaluación nutricional. La VGS-GP y su puntuación deben ser incluidos en la evaluación inicial de los pacientes con cáncer al permitir diferentes evaluaciones en un único instrumento.

PALABRAS CLAVE

VGS-GP. Desnutrición. Riesgo nutricional. Cáncer. Admisión hospitalaria.

ABBREVIATIONS LIST

AC: Arm circumference.

AMC: Arm muscle circumference.

ASPEN: American Society for Parenteral and Enteral Nutrition.

BMI: Body mass index.

CAMA: Corrected arm muscle area.

CC: Calf circumference.

CI: Confidence interval.

ESPEN: European Society for Clinical Nutrition and Metabolism.

PG-SGA: Patient-Generated Subjective Global Assessment.

TSF: Triceps skinfold.

TAPM: Thickness of the adductor pollicis muscle.

WHO: World Health Organization.

WL: Weight loss.

INTRODUCTION

Malnutrition is one of the most frequent nutritional disorders in cancer patients, and its prevalence varies from 20% to 80% worldwide[1-3]. Cancer patients are more susceptible to malnutrition due to the innumerable metabolic changes caused by the tumor or by the cancer therapy altering the ability to utilize nutrients[4]. Rapid and marked weight loss promotes morphological and functional changes that reflect the patient's ability to respond to treatment and quality of life[5]. Malnutrition detection and early nutritional intervention minimize muscle loss and body weight, which contributes to better control of adverse symptoms and clinical outcomes[6].

In the search for early diagnosis, several objective and subjective instruments are used to assess the nutritional status of this population. Among them, the Patient-Generated Subjective Global Assessment (PG-SGA) has excelled in clinical practice and academic research as a reference method to assess the nutritional status of patients with chronic diseases, including cancer[7-8].

One of the implicit arguments for this broad acceptance is the fact that PG-SGA is an instrument that adequately addresses all dimensions of malnutrition as defined by the European Society for Clinical Nutrition and Metabolism (ESPEN) and the American Society for Parenteral and Enteral Nutrition (ASPEN)[7] for evaluating different aspects, such as weight loss, food intake, and symptoms of nutritional impact, besides allowing patient participation[7,8].

In addition to the classification of nutritional status in three categories, PG-SGA produces an individual score capable of pointing out those that require priority nutritional support[9,10]. The nutritional risk determined by the PG-SGA score can be considered a marker of the patient's health status and an indicator of the severity of the disease, and it indicates the need and intensity of the nutritional intervention[9,11].

The scored PG-SGA is a fast and reliable nutritional indicator tool and has been validated as an objective measure of nutritional status[11,12]. Its continuous scoring system is practical for the identification of patients requiring immediate intervention[9]. Studies have shown that the scored PG-SGA is needed to differentiate malnourished cancer patients from those who are well nourished[10,13,14]. Thus, when considering the various nutritional assessment proposals available, the PG-SGA, which has been validly translated into Brazilian Portuguese[11], is a standard nutritional assessment tool recommended by groups of experts, the Brazilian Consensus on Oncological Nutrition to evaluate the nutritional status and need for nutritional intervention in cancer patients in the Brazilian population[15].

Based on this recommendation, and because it deals with a population that presents an advanced diagnosis of the dis-

ease and thus requires risk identification and early nutritional intervention, this study aimed to (1) identify the nutritional status and need for nutritional intervention in cancer patients according to PG-SGA and its score at hospital admission, and (2) to verify the association of the scored PG-SGA with objective nutritional assessment methods.

METHODS

Study Design and Sample

A cross-sectional study was conducted in the period from March to September 2016 in a university hospital located in Vitoria, Espirito Santo, Brazil. Adult (<60 years) and elderly (≥60 years) patients of both sexes with confirmed clinical diagnosis of cancer were included in the study. Participants were assessed within 48 hours of hospital admission. Exclusion criteria were: precaution by aerosols, palliative care, and in the use of nutritional support.

Data collection was performed by two properly trained researchers and was accompanied by an experienced nutritionist from the nutrition service of the referred hospital. First, the clinical and biochemical data were collected from the information available in the medical records. Subsequently, anthropometric evaluation and application of the PG-SGA in the patient's bed were performed.

This study was approved by the Ethics and Research Committee of the Federal University of Espirito Santo (no. CAAE 27954014.0.0000.5060). All patients enrolled in the study signed the informed consent term.

Anthropometric Measurements

Body weight (Kg) was measured using a Tanita® scale with an accuracy of 100 g. Height (m) was measured using the portable AlturExata® stadiometer with bilateral scale and use capacity of 0.35 to 2.13 m. Arm circumference (AC) and calf circumference (CC), in centimeters, were measured with an inextensible measuring tape of the Sany® brand with a capacity of 2 m. The triceps skinfold (TSF) (mm) was measured using the Lange® Adipometer, with an accuracy of 1 mm, on a scale from 0 to 60 mm. All measures were performed as recommended by Lohman et al.[16].

Arm muscle circumference (AMC), corrected arm muscle area (CAMA), and body mass index (BMI) were calculated. The thickness of the adductor pollicis muscle (TAPM) was determined with the patient sitting, arm flexed, at approximately 90° with the forearm and the relaxed hand resting on the knee. The Lange® plicometer was also used, exerting continuous pressure of 10 g/mm2 to pinch the adductor muscle at the apex of an imaginary triangle formed by the extension of the thumb and index finger[17]. All measures were done in the non-dominant hand three times, using the average of the three measures to compose the data evaluated.

The BMI was calculated from the following formula: current weight (kg)/height (m). The adults were classified according to the World Health Organization (WHO), considering the following ranges: low weight, BMI <18.5 kg/m^2; eutrophy, BMI ≥18.5 to 24.9 kg/m^2; overweight, BMI ≥25 kg/m^2 to 29.9 kg/m^2; and obesity, BMI ≥30 kg/m^2 [18]. The elderly were classified according to the cut-off points of Lipschitz[19]: low weight, BMI ≤ 22 kg/m²; eutrophy, BMI between 22 kg/m² and 27 kg/m²; and overweight, BMI ≥ 27 kg/m².

Patient-Generated Subjective Global Assessment (PG-SGA)

The PG-SGA® is a subjective nutritional assessment tool used in oncology and other chronic catabolic conditions, and it differs from SGA by including questions about symptoms of nutritional impact and recent weight loss[8,9]. The PG-SGA allows to classify nutritional status into three categories: A= well nourished; B= suspected or moderate malnutrition; and C= severe malnutrition. In addition to the categorization of nutritional status, the total scored PG-SGA was also used in this study to identify patients at nutritional risk. Patients were classified without nutritional risk (score 0–8 points) and with nutritional risk (score ≥ 9)[9].

Patients in need of nutritional intervention were identified by means of a total numerical score. From 0 to 1 point, there is no need for nutritional intervention; from 2 to 3 points, the patient and his/her family require nutritional education; between 4 and 8 points, the patient requires nutritional intervention; and ≥ 9 points, the patient requires critical intervention and symptom control. This study used the Brazilian Portuguese version of the PG-SGA, translated and validated by Gonzalez[11]; its use was allowed by the PG-SGA/Pt-Global Platform (www.pt-global.org). All boxes were filled by the researchers, due to the characteristics of the study population.

Statistical Analysis

Means and standard deviations were used to describe the continuous and percentage variables for the categorical variables. The normality of the quantitative variables was tested using the Kolmogorov–Smirnov test. All variables presented normal distribution. The difference between the proportions was evaluated by the Fisher Exact test and for comparison of the means according to the PG-SGA categories. To verify the correlation between continuous variables, Pearson's correlation was used. The correlation coefficients may vary from -1 to +1 and be categorized as weak (r <0.3), moderate (r = 0.3–0.7), or strong (r> 0.7)[20]. Multiple linear regression analysis (stepwise method) was applied to determine which independent variables were associated with the PG-SGA score (dependent variable). The data were analyzed using SPSS 21.0 software. A significance level of 5.0% was adopted for all tests.

RESULTS

Seventy-six patients were admitted to the study. Of these, six patients were excluded because they presented data inconsistency. Thus, the sample consisted of 70 patients, with 51.4% (36) males and 55.7% (39) adults, with a mean age of 55.0 ± 16.6 years. Cancer of the gastrointestinal tract (GIT) was the most prevalent, affecting 48.6% (34) of patients. Other diagnoses (7.10%; n = 5) were thymus, mediastinal, and ocular neoplasms. According to the BMI classification, 57.1% (40) were diagnosed in eutrophy. No significant differences were found between the variables cited and the nutritional status according to PG-SGA. The percentage of weight loss and nutritional risk increased concomitantly with worsening nutritional status (p <0.001). The nutritional risk from the PG-SGA score (≥ 9 points) was identified in 61.4% (43) of patients (Table 1).

Figure 1 presents the nutritional status and the need for nutritional intervention obtained by PG-SGA. Among those evaluated, 95.7% (67) presented suspicion or some degree of malnutrition (B + C) according to the PG-SGA classification. According to the total score, the majority of patients, 91.4% (60), presented a need for nutritional intervention at hospital admission (≥ 4 points).

Correlations between PG-SGA score and anthropometric variables are described in Table 2. Significant, but weak, correlations were found between PG-SGA and BMI (p = 0.019); inverse, significant, and moderate correlations were found with the current weight (p = 0.011), AC (p = 0.002), CC (p = 0.019), TSF (p<0.001), and TAPM (p=0.012); and a significant and moderate correlation was found with % weight loss (%WL) at one month (p <0.001).

The results of the multiple linear regression are shown in Table 3. The %WL, TSF, and BMI variables remained in the final model, accounting for 51.4% of the PG-SGA score. The %WL was the variable that most influenced the score, indicating that the higher the weight loss, the higher the score.

DISCUSSION

PG-SGA and its PG-SGA score were able to identify malnutrition, nutritional risk, and the need for nutritional intervention in cancer patients at hospital admission. When evaluating the nutritional state in different dimensions, this instrument allows fast and accurate results and consequent early nutritional and clinical interventions by the multidisciplinary team.

The high prevalence of malnutrition, from the categories of PG-SGA; the nutritional risk; and the need for nutritional intervention obtained from their scores found in this study corroborate with different studies[9, 10, 14, 21, 22] and are possibly based on previous malnutrition, since they were evaluated in a public tertiary hospital.

Santos et al.[21] evaluated the elderly with different cancers and found 43.8% with some degree of malnutrition (B or C) in the PG-SGA categories, and 47.9% had a score ≥9 points. Bauer et al.[9], with a sensitivity of 98.0% and a specificity of 82.0%, compared to the Global Subjective Assessment (ASG), found a 53.0% risk of malnutrition (score ≥9 points) by PG-SGA in a population with different cancers. In women with gynecological cancer, malnutrition in different degrees (B + C) was present in 53.5% according to PG-SGA[14].

In the study by Silva et al.[22] 79.4% presented a score ≥9 points, required critical intervention and symptom control. All these studies reinforce the advantages, viability, and capacity of the PG-SGA, either by the use of its categories or by the use of the score, making possible, in addition to nutritional assessment, nutritional risk screening and indication and monitoring of an appropriate intervention for each patient[8].

In this context, the use of the PG-SGA score can be used as an objective and effective measure to demonstrate and monitor the outcome of the nutritional intervention weekly, which becomes more difficult with the use of categories

Figure 1. Nutritional diagnosis and indication of nutritional intervention obtained by the Patient-Generated Subjective Global Assessment.

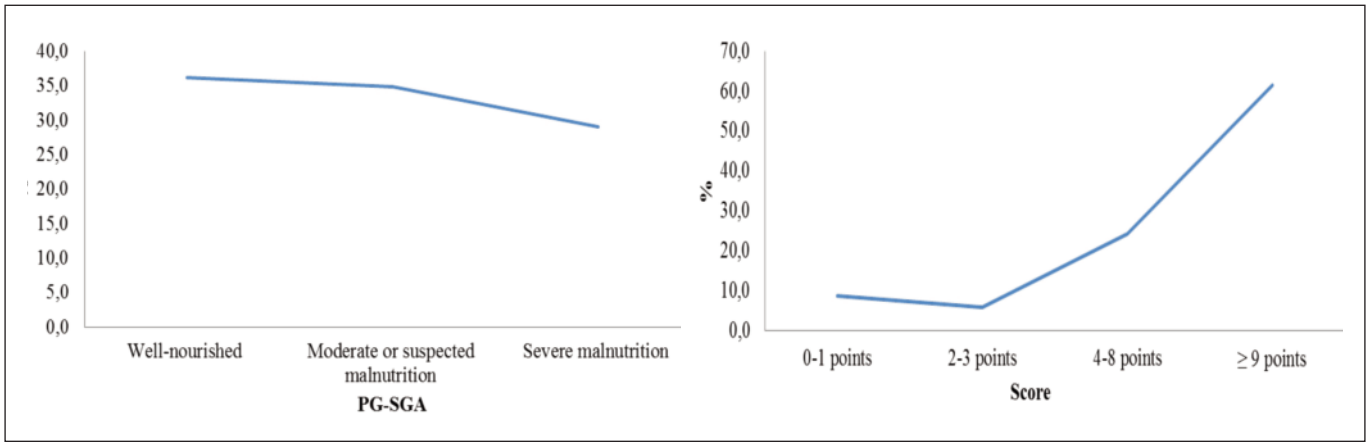

Table 1. Characteristics of the sample according to nutritional status obtained by Patient-Generated Subjective Global Assessment.

Variable	PG-SGA				
	Total	**A**	**B**	**C**	**p value**
Age (years)					
Mean (SD)	55.0 ± 16.6	48.0 ± 15.0	55.5 ± 17.0	53.0 ± 16.5	0.669
Sex	**n (%)**	**n (%)**	**n (%)**	**n (%)**	
Male	36 (51.4)	1 (2.8)	14 (38.9)	21 (58.3)	0.380
Female	34 (48.6)	2 (5.9)	18 (52.9)	14 (41.2)	
Life Stage					
Adult	39 (55.7)	2 (5.1)	17 (43.6)	20 (51.3)	0.920
Elderly	31 (44.3)	1 (3.2)	15 (48.4)	15 (48.4)	
Location of the tumor					
Gastrointestinal tract	34 (48.6)	-	17 (50.0)	17 (50.0)	0.385
Hematological	12 (17.1)	1 (8.3)	4 (33.3)	7 (58.3)	
Pancreas	9 (12.9)	-	4 (44.4)	5 (55.6)	
Lung	6 (8.60)	1 (16.7)	3 (50.0)	2 (33.3)	
Hepatobiliary	4 (5.70)	1 (25.0)	1 (25.0)	2 (50.0)	
Others*	5 (7.10)	-	3 (60.0)	2 (40.0)	
Body Mass Index					
Low weight	8 (11.4)	1 (12.5)	3 (37.5)	4 (50.0)	0.158
Eutrophy	40 (57.1)	13 (32.5)	14 (35.0)	13 (32.5)	
Overweight	22 (31.4)	12 (54.5)	7 (31.8)	3 (13.6)	
%Weight loss					
Without loss	10 (14.3)	2 (20.0)	8 (80.0)	-	< 0.001*
< 10.0%	37 (52.8)	1 (2.7)	19 (51.4)	17 (45.9)	
≥ 10.0%	23 (32.9)	-	5 (21.7)	18 (78.3)	
Scored PG-SGA					
Without nutritional risk (< 8 points)	27 (38.6)	3 (11.1)	19 (70.4)	5 (18.5)	< 0.001**
With nutritional risk (≥ 9 points)	43 (61.4)	-	13 (30.2)	30 (69.8)	

ANOVA*; Fisher Exact test**; PG-SGA: Patient-Generated Subjective Global Assessment.

Table 2. Mean and correlation between the scored Patient-Generated Subjective Global Assessment and anthropometric variables.

Variable (n=70)	Mean (SD)	CI 95%	r	p value
Actual weight	62.3 ± 1.90	61.45 – 69.10	- 0.303	0.011*
% WL (1 mês)	9.0 ± 0.90	10.88 – 8.40	0.650	<0.001**
BMI (kg/m2)	24.40 ± 0.52	23.40 – 25.50	- 0.280	0.019*
AC (cm)	27.94 ± 0.58	26.77 - 29.10	- 0.371	0.002**
CC (cm)	34.40 ± 0.35	33.49 -35.30	-0.300	0.013*
TSF (mm)	14.38 ± 0.76	12.85 - 15.91	-0.424	<0.001**
TAPM (mm)	16.06 ± 0.64	14.77 - 17.35	- 0.300	0.012*
AMC (cm)	23.42 ± 0.48	22.46 - 24.40	- 0.223	0.064
CAMA (cm^2)	36.61± 1.75	33.10 - 40.11	- 0.185	0.125

%WL: % weight loss; BMI: Body Mass Index (kg/m^2); AC: Arm Circumference (cm); CC: Calf Circumference (cm); CI: Confidence interval; TSF: Triceps Skin Fold (mm); AMC: Arm Muscle Circumference (cm); CAMA: Corrected Arm Muscle Area (cm^2); TAPM: thickness of the adductor pollicis muscle. * Pearson's correlation, *p<0.05; ** p<0,001.

Table 3. Multiple linear regression for the dependent variable Scored Patient-Generated Subjective Global Assessment.

	Scored PG-SGA		
	β	Standard error	P
%WL	0.650	0.081	<0.001
TSF (mm)	-0.434	0.128	0.001
BMI (kg/m^2)	0.335	0.192	0.016

R^2= 0,514; WL: Weight loss; TSF: Triceps Skin Fold; BMI: Body Mass Index.

only[13,23,24]. Early identification of nutritional risk and malnutrition in cancer patients, especially at hospital admission, has the important purpose of reversing or improving the clinical nutritional prognosis through individualized intervention, with the possibility of reducing hospitalization time and morbidity and mortality, as well as improving tolerance to treatment and quality of life in this group[8,13,25].

In addition, PG-SGA specifically addresses symptoms of nutritional impact that are routinely present in cancer patients and detects small variations in nutritional status through the percentage of weight loss by affect food intake[26]. Weight loss has been associated with reduced survival and worsening of nutritional status in this group of patients[23]. Our findings showed that weight loss was the variable that most influenced the PG-SGA score and, therefore, reinforced the validity of this method at hospital admission.

Pinho et al.[26] showed that the presence of more than 3 nutrition impact symptoms were independent factors associated with the malnutrition, and almost half of the patients (45.8%) required critical nutritional intervention/symptom management (score ≥9 points).

It was also observed that the great majority of the patients presented eutrophy and overweight by BMI, even though they were classified as malnourished by PG-SGA, a condition that also influenced the results of multiple regression. Other studies have already pointed out the fragility of BMI in identifying malnutrition and loss of muscle mass in cancer patients, most of whom remain eutrophic despite high weight loss[22,23,27].

The correlation between the score obtained by PG-SGA and the anthropometric variables shows the reduction of muscle mass and the presence of common malnutrition in cancer patients[22,27]. The PG-SGA score has been adopted as a nutritional evaluation parameter because it presents a high degree of inter-rater reproducibility and high sensitivity and specificity when compared to other validated instruments in nutritional status evaluation[2,14,26].

The PG-SGA and its score were efficient in identifying malnutrition and nutritional risk, indicating the need for nutritional intervention, having been considered the preferred method in the diagnosis of malnutrition in cancer patients[7,10,14,26,28].

Among the limitations of this study is the non-evaluation of tumor staging and the presence of metastasis, situations associated with worsening nutritional status. However, as a

strong point, this study indicated evaluation within 48 hours of hospital admission, which allows the early intervention of these patients and meets one of the objectives of this instrument.

CONCLUSION

PG-SGA and its score were able to efficiently identify malnutrition at its different stages, as well as the need for nutritional intervention at hospital admission. The PG-SGA score correlated well with objective measures of nutritional status. The use of PG-SGA should be encouraged in clinical practice and at hospital admission, as it allows for different evaluations in a single instrument, besides analyzing characteristic alterations of the cancer patient. The numerical score allows the rapid screening of patients with nutritional intervention for reducing complications and malnutrition during hospital stay.

ACKNOWLEDGMENTS

Special thank you goes to the University Hospital Cassiano Antônio Moraes for all support and assistance throughout the research and the Health Sciences Centre/ Federal University of Espirito Santo.

REFERENCES

1. Sharma D, Kannan R, Tapkire R, Nath S. Evaluation of nutritional status of cancer patients during treatment by patient-generated subjective global assessment: a hospital-based study. Asian Pac J Cancer Prevention 2015;16(18): 8173- 8176.

2. Cunha CM, Sampaio EJ, Varjão ML, Factum CS, Ramos LB, Barreto-Medeiros JM. Nutritional assessment in surgical oncology patients: a comparative analysis between methods. Nutr Hosp 2015; 31(2): 916-21.

3. Tan CS, Read JA, Phan VH, Beale PJ, Peat JK, Clarke SJ. The relationship between nutritionalstatus, inflammatory markers and survival in patients with advanced cancer: a prospective cohort study. Support Care Cancer 2015; 23(2): 385-91.

4. Baracos, VE. Cancer-associated malnutrition. European Journal of Clinical Nutrition, 2018: 72:1255–1259.

5. Fearon K, Strasser F, Anker SD, Bosaeus I, Bruera E, Fainsinger RL, et al. Definition and classification of cancer cachexia: an international consensus. Lancet Oncol 2011; 12(5): 489-95.

6. Rodrigues CS, Chaves GV. Patient-generated Subjective Global Assessment in relation to site, stage of the illness, reason for hospital admission, and mortality in patients with gynecological tumors. Support Care Cancer. 2015; 23(3): 871-9.

7. Sealy MJ, Nijholt W, Stuiver MM, van der Berg MM, Roodenburg JL, van der Schans CP et al. Content validity across methods of malnutrition assessment in patients with cancer is limited. J Clin Epidemiol. 2016; 76: 125-36.

8. Jager-Wittenaar H, Ottery FD. Assessing nutritional status in cancer: role of the Patient-Generated Subjective Global Assessment. Curr Opin Clin Nutr Metab Care. 2017; 20(5): 322-9.

9. Bauer J, Capra S, Ferguson M. Use of the scored Patient-Generated Subjective Global Assessment (PG-SGA) as a nutrition assessment tool in patients with cancer. Eur J Clin Nutr 2002; 56(8): 779-85.

10. Correira Pereira MA, Santos CA, Almeida Brito J, Fonseca J. Scored patient-generated subjective global assessment, albumin and transferrin for nutritional assessment of gastrostomy fed head or neck cancer patients. Nutr Hosp 2014; 29(2): 420-6.

11. Gonzalez MC, Borges LR, Silveira DH, Assunção MCF, Orlandi SP. Validation of a Portuguese version of patient-generated subjective global assessment. Rev Bras Nutr Clin 2010; 25(2): 102-8.

12. Guerra RS, Sousa AS, Fonseca I, Pichel F, Resto MT, Ferreira S, et al. Análise comparativa do rastreamento de desnutrição e ferramentas diagnósticas como preditores de custos de internação. J Hum Nutr Diet, 2016;29 (2):165-173.

13. Isenring E, Bauer J, Capra S. The scored Patient-generated Subjective Global Assessment (PG-SGA) and its association with quality of life in ambulatory patients receiving radiotherapy. Eur J Clin Nutr 2003; 57(2): 305-9.

14. Chantragawee C, Achariyapota V. Utilization of a Scored Patient-Generated Subjective Global Assessment in Detecting a Malnourished Status in Gynecologic Cancer Patients. Asian Pac J Cancer Prev 2016; 17 (9): 4401-4.

15. National Cancer Institute José Alencar Gomes da Silva (INCA). National Consensus Nutrition Oncology. 2nd ed. Rio de Janeiro, Brazil: INCA; 2015.

16. Lohman TG, Roche AF, Martorell R. Anthropometric standardization reference manual. Champaign: Human Kinetics. 1988.

17. Lameu EB, Gerude MF, Corrêa RC, Lima KA. Adductor pollicis muscle: a new anthropometric parameter. Rev Hosp Clin Fac Med Univ São Paulo 2004; 59(2): 57-62

18. World Health Organization (WHO). Obesity: preventing and managing the global epidemic: report of a WHO consultation. Geneva: WHO; 2000. [WHO technical report series; 894].

19. Lipschitz DA. Screening for nutritional status in the elderly. Prim Care 1994; 21(1):55-67.

20. Willet W. Nutritional Epidemiology. 2nd ed. New York: Oxford University Press; 1998.

21. Santos CA, Rosa COB, Ribeiro AQ, Ribeiro RCL. Patient-generated subjective global assessment and classic anthropometry: comparison between the methods in detection of malnutrition among elderly with câncer. Nutr Hosp 2015; 31(1): 384-92.

22. Silva TO, Peixoto MI, Santos C M, Andrade MIS, Vasconcelos AA, Melo, L S. Evaluation of the strength, performance and muscle mass of cancer patients and its relationship with subjective and anthropometric parameters. Nutr. Clin. Diet. Hosp. 2018; 38 (2): 92-98

23. Kim HS, Lee JY, Lim SH, Cho J, Kim SJ, Jang JH, Kim WS, Jung CW, Kim K. Patient-Generated Subjective Global Assessment as a prognosis tool in patients with multiple myeloma. Nutrition 2017; 36: 67-71.

24. Castilho-Martinez L, Castro-Eguiluz D, Copca-Mendoza ET, Pérez-Camargo,DA, Reyes-Torres CA, Ávila EAD, López-Córdova G, Fuentes-Hernández MR, Cetina_-Pérez L, Milke-Garcia MP. Nutritional assessement tools for the identification of malnutrition and nutritional risk associated with cancer treatment. Rev Inves Clin. 2018: 70: 121-125

25. Marshall KM, Loeliger J, Nolte L, Kelaart A, Kiss NK. Prevalence of malnutrition and impact on clinical outcomes in cancer services: A comparison of two time points. Clinical Nutrition, 2018: may, 1-8 (in press).

26. Pinho NB, Martucci RB, Rodrigues VD, D'Almeida CA, Thuler LCS, Saunders C, Jager-Wittenaar H, Peres WAF. Malnutrition associated with nutritional impact symptoms and localization of the disease: Results of a multicentric research on oncological nutrition. Clinical Nutrition, 2018 may: 1-6 (in press).

27. Silva NMF, Barcelos ACL; Passamani EN, Tintore JC, Valente K.P, Hortêncio TDR, Moraes RAG, Guandalini VR. Association between nutritional status and Score Glasgow Prognostic Score patients with the cancer. Nutr. Clín. Diet. Hosp. 2017; 37(3):131-137

28. Wiegert EVM, Padilha PC, Peres WAF. Performance of Patient-Generated Subjective Global Assessment (PG-SGA) in Patients with Advanced Cancer in Palliative Care. Nutrition in Clinical Practice, 2017: 32 (5): 675 –681.