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Patient Generated Subjective Global Assessment as a prognosis tool in women with gynecologic cancer

Camila Santos Rodrigues M.D., Marina Seraphim Lacerda M.Nutr., Gabriela Villaça Chaves Ph.D. *

National Cancer Institute, Rio de Janeiro, Brazil

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ABSTRACT

Objectives: The aim of this study was to assess the nutritional status (NS) of women hospitalized for gynecologic tumors and relate it to such outcomes as hospital length of stay and 1-y mortality.
Methods: We assessed 146 women diagnosed with gynecologic tumors who were admitted to a referral oncologic hospital in November 2012. Data collected included medical history, duration and reason for admission, and cases of death within 1 y.
Results: NS was assessed using Patient-Generated Subjective Global Assessment (PG-SGA). The receiver operating characteristic curve was used to define the best cutoff point for discriminating individuals who did or did not die. We used proportional hazards regression to assess associations between malnutrition and 1-y mortality. According to the PG-SGA, 62.4% of the women were classified as being at nutritional risk or having moderate or severe malnutrition. Sorting patients by stage of cancer, there was no statistical difference in NS classification according to the different cancer sites. The median hospital stay, in days, was statistically lower in patients classified as well nourished. Individuals with a score above the cutoff point of 10 were 30.7 times more likely (95% confidence interval, 11.8–79.4) to die. There was a 52.1% rate of mortality within 1 y. Patients classed as having some degree of malnutrition had a significantly lower median survival rate. A diagnosis of cervical cancer and severe malnourishment increases the likelihood of death.
Conclusions: Our findings suggest that the PG-SGA can be considered not just as an indicator of nutritional risk, but also as a major predictor of prognosis and mortality in this population.

Introduction

More than 190,000 women are diagnosed with gynecologic cancer in Brazil each year [1]. On a global scale, cervical cancer remains the second most common malignancy and the second highest cause of cancer-related death in women. Reports estimate that there are ~500,000 new cases of cervical cancer diagnosed each year. Most of these new cases occur in developing countries, and 70% are diagnosed at an advanced stage [2]. Although less incident, ovarian cancer is the most fatal gynecologic cancer, with a 44% 5-y survival rate despite efforts to improve early detection and treatment [3]. Conversely, most endometrial cancers are diagnosed at an early stage (75%), and the reported survival rate is 75% [4].

Compromised nutritional status (NS) is common among patients with cancer and is associated with hindered treatment response, greater need for hospitalization, lower quality of life, and less chance of survival. Such complications are responsible for ~20% of cancer-related deaths [5,6].

Nutritional assessment should be considered part of routine treatment as it is the first step in identifying and treating malnutrition [7]. The Patient-Generated Subjective Global Assessment (PG-SGA) is an easily applied method of nutritional assessment, which was adapted from Subjective Global Assessment (SGA) and developed specifically for patients with cancer. Additionally, it has been considered useful for detecting nutritional risk and malnutrition in patients with gynecologic cancer [6].

The authors have no conflicts of interest to declare.

CSR and MSL collected data and carried out statistical analysis. GVC conceived of and coordinated the study. All authors contributed to the writing and reviewing of the paper and approved the final version.

* Corresponding author. Tel./fax: +55 21 3207 2846.
E-mail address: Gabrielavc@gmail.com (G. V. Chaves).

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The PG-SGA is based on a combination of known prognostic indicators, such as weight loss and performance status, as well as clinical aspects of dietary intake and nutrition impact symptoms [8]. In addition to classifying NS, the form incorporates a numerical score, whereby the higher the score the greater the risk for malnutrition [6,9,10].

Several studies have been published addressing the subject of PG-SGA and cancer, but few have included the specific population of patients with gynecologic tumors, nor have they focused on such aspects as tumor sites, staging, or the effect NS has on patient survival. Thus, the aim of this study was to assess the NS of women hospitalized with gynecologic tumors and its relationship to such outcomes as hospital length of stay (LOS) and 1-y mortality.

Methods

Study cohort

The sample group took part in a multicenter study entitled Inquérito Nutricional de Câncer no Brasil (Nutritional Survey of Cancer In Brazil). The aim of the survey was to employ the PG-SGA at a national level to asses the NS of patients with cancer admitted to 45 participating institutions in November 2012. The study group was composed of women histopathologically shown to have gynecologic tumors who were hospitalized at Rio de Janeiro's foremost centers for the prevention and treatment of cancer. All the women were followed over 12 mo or until death.

Women without proven histopathologic diagnoses (n = 9), with past history of another kind of neoplasm (n = 18), or those shown to have benign tumors (n = 9) were excluded.

To obtain a nutritional diagnosis of the sample group, we used the PG-SGA subjective method for nutritional assessment [8], previously validated for the Portuguese language [11]. The tool was employed during the first 24 h of hospitalization by two trained clinical nutritionists. The scored PG-SGA consisted of two sections. The first included questions on weight history, food intake, symptoms, and functional capacity; the second contained data on metabolic stress and physical assessment. On completion of the assessment, patients were subjectively categorized as well nourished (A), moderately malnourished or suspected malnourishment (B), or severely malnourished (C). We then recorded the PG-SGA score.

Data regarding past medical history, age, tumor site, stage and histologic type, duration of, and reason for hospital stay were collected at the time of hospital admission—retrieved from medical records—to create a current patient history. Confirmation of tumor site and tumor weight were obtained through histopathology reports. Cancer stage was classified per Federation of Gynecology and Obstetrics staging [12]. After 1 y, patient status (alive or dead) was checked in institutional databases.

We carried out our research in accordance with the Declaration of Helsinki ethical guidelines and with the approval of the Instituto Nacional de Câncer José de Alencar Gomes da Silva Research Ethics Committee (Research Protocol No. 246.824).

Statistical analysis

The measures of central tendency and dispersion of the continuous variables were calculated. To assess the symmetry of the distribution curve for the variables, a normal Kolmogorov-Smirnov curve was tested. A nonnormal distribution for these variables, except for age, was identified. In describing the sample, the data were expressed in percentages for the categorical variables and in mean or median for the numeric variables, in accordance with their distribution curve.

Multiple comparisons of the numerical variables between the three PG-SGA NS classification groups were carried out by performing Kruskal-Wallis analysis of variance. Bonferroni correction was used to identify which intervals were significantly different for each group. The Mann-Whitney test was used to compare numerical variables between two groups. The associations between categorical variables were analyzed by using either the χ^2 test or Fisher's exact test. Receiver operating characteristic (ROC) curve analysis was used to determine the predictive value of the PG-SGA score for mortality.

Overall survival (OS) was measured from the first day of hospitalization to the date of death, and those who remained alive after 1 y were censored. Kaplan-Meier method was used to estimate the probability of OS. Log-rank tests were used for the comparison of survival curves between the three NS classes generated using the PG-SGA. A Cox proportional hazard model was used to examine the association between each covariate and survival in univariate analysis. Hazard ratios between each group and the reference group for categorical variables, and for each unit of increase for continuous variables, were reported with 95% confidence intervals (CIs) and two-tailed P values. Covariates included in univariate analysis were age, cancer site and stage, NS categorized by PG-SGA as A (well nourished), B (moderately malnourished), or C (severely malnourished), scored PG-SGA (as a continuous variable), and reason for admission to hospital. Variables of interest were defined as $P < 0.25$ in univariate analysis and were included in multivariate analysis using Cox proportional hazard models. $P = 0.05$ was considered statistically significant in multivariate analysis.

All reported P values were two-tailed. Statistical significance was set at $P < 0.05$ and analyses were conducted using SPSS statistical software (version 20, SPSS, Chicago, IL, USA).

Results

The study population comprised 146 patients, with an average age of 55.3 ± 14.9 y. Regarding the nutritional diagnosis obtained using the PG-SGA tool, 62.4% of the women were classified with moderate or severe malnutrition, as shown in Table 1 along with their other clinical characteristics.

Patients with endometrial tumors were more often classified as being well nourished, and those with ovarian tumors were found to have the greatest degree of alteration in NS (PG-SGA B or C). Nevertheless, sorting patients by stage of cancer, there was no statistical difference in NS classification according to the different cancer sites, showing that the NS of the patients evaluated shared the same distribution pattern in different sites when the effect of stage of disease was not considered (Fig. 1).

The median hospital LOS, in days, was statistically lower (Kruskall-Wallis test; $P = 0.002$) in the patients classified as PG-SGA A (7 d; 2–17 d range) in relation to those who were PG-SGA

Table 1
Frequency of the general characteristics of the population (N = 146)

Character	N	%
Tumor site		
Cervix	85	58.2
Endometrium	35	24
Ovary	26	17.8
Histologic type		
Squamous cell carcinoma	67	45.9
Adenocarcinoma	63	43.2
Sarcoma	9	6.2
Others	7	4.8
Stage		
I	46	31.5
II	28	19.2
III	49	33.5
IV	23	15.8
Comorbidities		
None	80	54.8
DM	3	2.1
HTN	47	32.2
DM + HTN	11	7.5
Others	5	3.5
Reason for hospitalization		
Preoperative	46	31.5
Complications stemming from clinical or surgical treatment*	15	10.3
Illness-related complications†	83	56.8
PG-SGA		
A	55	37.7
B	68	46.6
C	23	15.8

DM, diabetes mellitus; HTN, hypertension; PG-SGA, Patient-Generated Subjective Global Assessment

* Fistulae, actinic cystitis, or febrile neutropenia.

† Kidney failure, deep vein thrombosis, general decline in medical condition, disorientation, infection, bowel obstruction, bleeding, pain, shortness of breath, nausea, and vomiting.

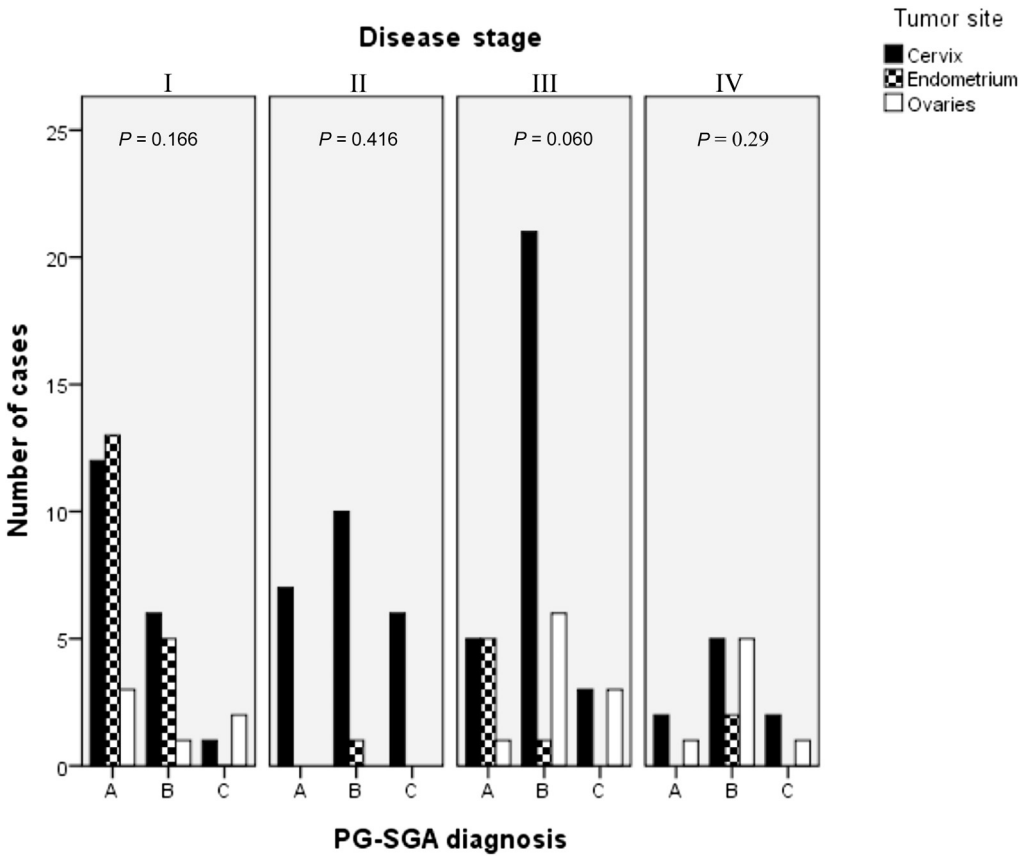

Fig. 1. Classification of nutritional status according to site and stage of cancer. PG-SGA, Patient-Generated Subjective Global Assessment.

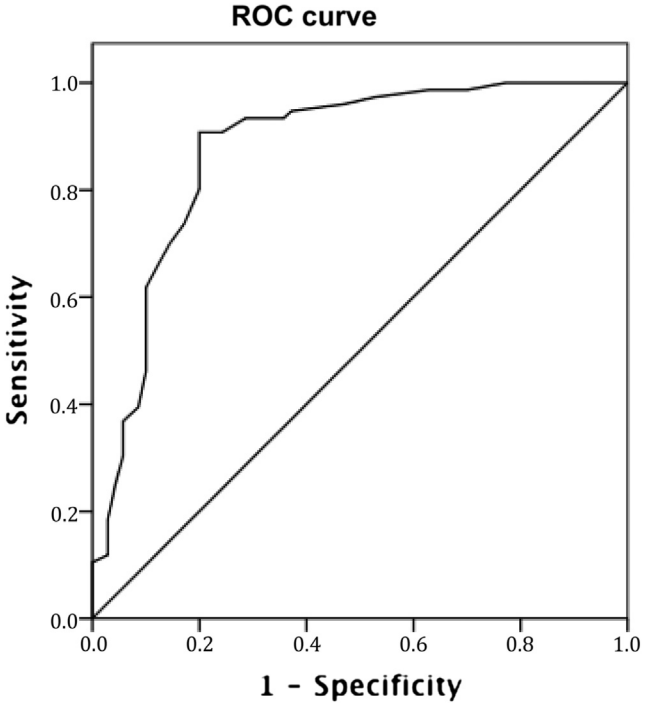

Fig. 2. Receiver-operator characteristic (ROC) curve for the score of PG-SGA as a predictor of mortality after 1-y of hospital admission. PG-SGA, Patient-Generated Subjective Global Assessment.

B (8.5 d; 1–51 d range) or PG-SGA C (12 d; 2–32 d range), with no difference in hospital LOS between the PG-SGA B and C patients ($P = 0.152$). Tumor site did not influence hospital LOS (Kruskal-Wallis test; $P = 0.892$). Whereas patients with stage III disease spent the most time in the hospital (9 d, range 2–51 d), compared with patients with stage I cancer (7 d, range 1–24 d; $P < 0.007$). No significant difference was found between the other stages.

There was a 52.1% rate of mortality within 1 y of admission to hospital. In the women who have died, the median PG-SGA score was 19 (2–32), whereas the median score for those who did not die was 5 (1–27; $P < 0.001$).

According to the ROC curve, a PG-SGA score of 10 is the best cutoff point for the classification of individuals who did or did not go on to die, with a sensitivity of 90.8% and specificity of 80%. The area under the ROC curve was 0.875 (95% CI, 0.816–0.935; $P < 0.001$; Fig. 2).

By analyzing the odds ratio (OR), we can determine that individuals with a score above the cutoff point of 10 were 30.7 times more likely (95% CI, 11.8–79.4) to die than individuals below this cutoff point.

The death rate was 12.7%, 73.5%, and 82.6% for patients classified as being PG-SGA A, B, and C, respectively.

According to the Kaplan-Meier method, survival functions and nutritional diagnosis have a statistically significant relationship (Fig. 3). Median survival for patients classified as PG-SGA A was 334.09 ± 11.20 (95% CI, 312.13–356.04); whereas patients classified as PG-SGA B or C had a significantly lower median survival rate: 137.94 ± 17.67 d (95% CI, 103.30–172.57)

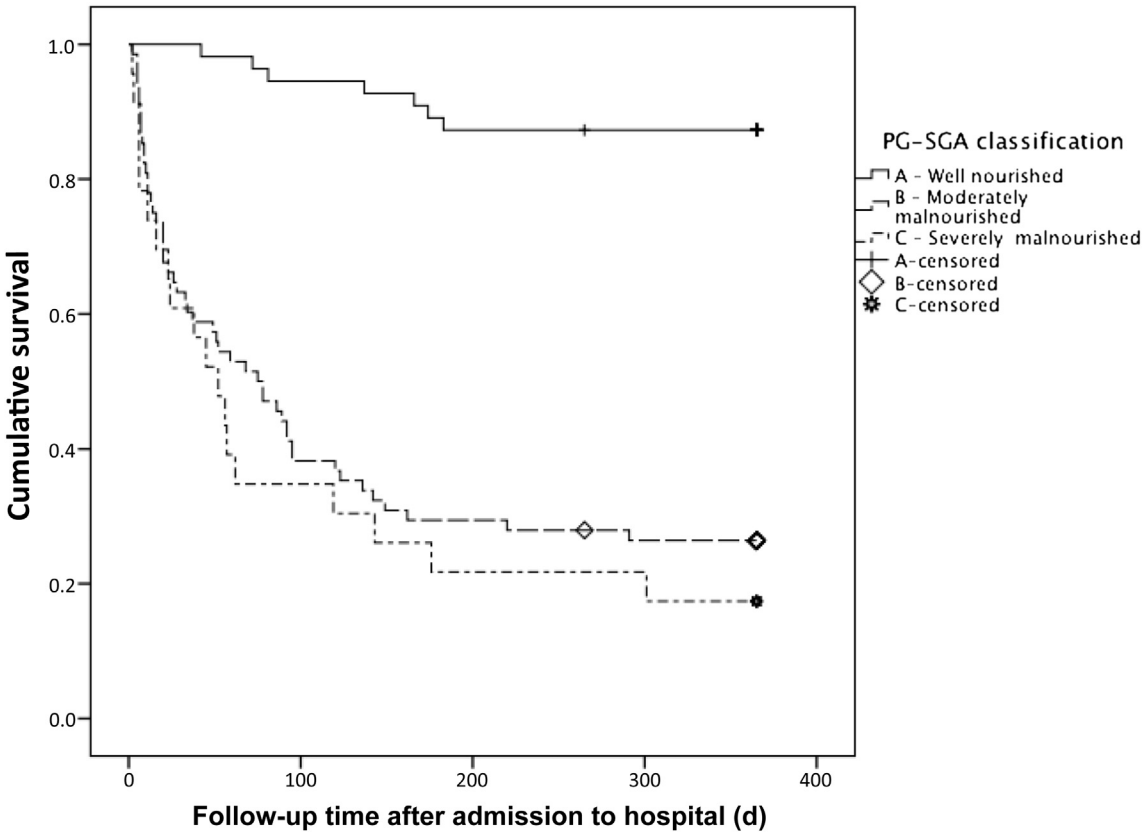

Fig. 3. This Kaplan-Meier plot illustrates overall survival according to the nutritional status obtained by PG-SGA, in women with gynecologic cancer. PG-SGA, Patient-Generated Subjective Global Assessment.

and 113.31 ± 27.90 d (95% CI, 58.61–167.99), respectively (log-rank test; $P < 0.001$). There was no statistical difference between the median survival rates of PG-SGA B and PG-SGA C patients.

By stratifying the Kaplan-Meier curve by cancer site (cervix, endometrium, or ovaries), survival function has not changed (Fig. 4), even when stratified by cancer stage (initial, stage I or II; and advanced, stages III and IV; Fig. 5). Thus, NS was shown to be capable of determining mortality in all the strata evaluated separately—cancer site and stage—that is, regardless of cancer staging or the site of tumor, NS influences mortality.

To assess the independent determinants of 1-y survival, we performed the Cox multivariate regression test, after selection of variables that had a statistically significant association with death ($P < 0.25$) by univariate analysis. The variables found to be independent predictors of death are listed in Table 2. We found that a diagnosis of cervical cancer independently implies 4.07 times more likelihood of death than endometrial cancer (reference), and an NS classification of PG-SGA C independently increases the likelihood of death by 2.04 times. Furthermore, for each additional point in the PG-SGA score, the risk for death increased by 10%.

Discussion

To our knowledge, few studies have identified the NS of patients with gynecologic cancer. There are conflicting findings relating to the PG-SGA as a tool for diagnosis: One study reported a significantly greater prevalence of malnutrition in women with cancer of the endometrium as opposed to other sites and did not find cancer staging to influence NS [7]. However, another study found that women with ovarian cancer were more susceptible to NS alterations, whereas those with endometrial and uterine cancer comprise a group that is less predisposed to such alterations, which parallels our findings [13]. More recently, Das et al. [14] reported 88.3% to be at nutritional risk or some degree of malnutrition, with no difference in NS classification when comparing different gynecologic tumor sites.

Indeed, the rate of malnutrition in patients with cancer seems to depend not only on tumor location, but also on histologic type, staging, and treatment [15–18]. By analyzing the effect cancer site and stage have on NS, we found no significant difference; that is, NS shared the same distribution pattern across different sites and stages of cancer. Thus, we suggest that other factors may have a major effect on NS, especially the type of cancer treatment and the complications arising from it, as described in findings recently published, that demonstrated that patients admitted to the hospital for disease or oncologic treatment–related complications had an increase in the frequency of malnutrition and sintomatology, regardless of gynecologic tumor site [18].

NS depletion has been associated with negative outcomes in patients with cancer for altering immunologic response and increasing the risk for infection, while decreasing functional capacity, tolerance to treatment, and chances of survival [19,20]. Furthermore, malnourished patients tend to remain in the hospital for longer, negatively affecting their prognosis [6,15,21,22].

In our study, the hospital LOS of patients classified with some degree of malnutrition (PG-SGA B and C) was statistically

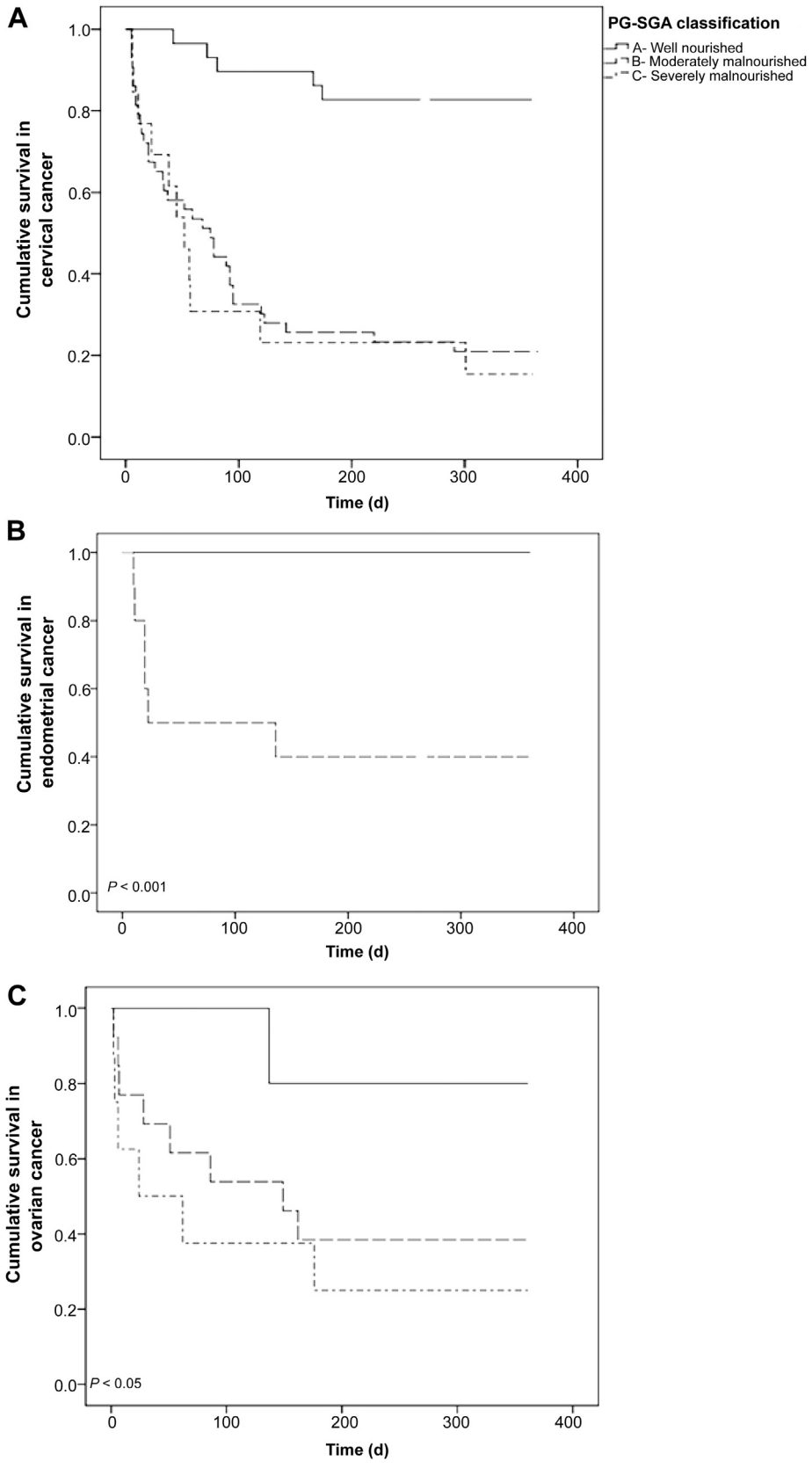

Fig. 4. Cumulative overall survival in (A) cervical cancer, (B) endometrial cancer, and (C) ovarian cancer. Data were analyzed with 146 women with gynecologic cancer classified into three groups according the PG-SGA: A: well nourished; B: moderately malnourished; and C: severely malnourished. PG-SGA, Patient-Generated Subjective Global Assessment.

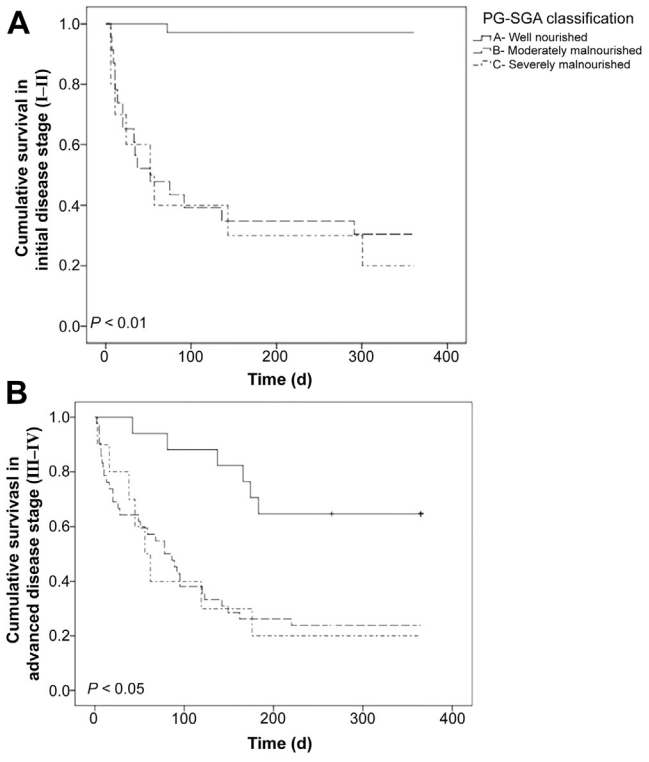

Fig. 5. Overall survival in (A) initial disease stage (I–II) and (B) advanced stage (III–IV). Data were analyzed with 146 women with gynecologic cancer classified into three groups according the PG-SGA: A, well nourished; B, moderately malnourished; and C, severely malnourished. PG-SGA, Patient-Generated Subjective Global Assessment.

higher than for well-nourished women (PG-SGA A), with no difference between those classified as PG-SGA B and C. This finding suggests that even a slight alteration in NS can result in a longer hospital LOS, which leads to a further decline in NS. However, tumor site did not influence hospital LOS, and stage III cancer was determinant of a longer hospital LOS than stage I. There have been similar findings that late-stage cancer (stages III and IV) is an independent risk factor for prolonged hospital LOS, as well as a longer hospital LOS for women with ovarian cancer [6].

A deterioration in NS, as already mentioned, also reduces chances of survival [23–25]. More than half the women in our study died within 1 y, and most of them were malnourished. A considerable number of studies in recent years have described the association between body composition—sarcopenia in particular—and loss of functional capacity and mortality [26], although there is still a dearth of research using subjective methods (PG-SGA) to correlate NS classification with survival of patients with cancer.

One recent study assessing 74 patients with gastrointestinal or lung cancer being treated at a chemotherapy service found a 66.2% death rate and a statistically significant association with higher mortality in patients classified with some degree of malnutrition according to the SGA (B and C; $P < 0.001$); findings also pointed to a classification of severe malnutrition (SGA C) as being an independent predictor of mortality, whereas no association was found between body mass index and survival over a 3.5-y span [27].

In our group, the women who died had a significantly higher PG-SGA score, with a cutoff point of 10, implying 30 times the risk for death. A separate study identified the PG-SGA score as a negative prognostic factor for the increased risk for toxicity from oncologic treatment in women undergoing chemotherapy for gynecologic cancer, whereas those with a score >7.5 presented a significantly greater risk for developing hematologic toxicity and febrile neutropenia [10]. Moreover, PG-SGA C was found to be an independent predictor for mortality. As previously reported [22], severe malnutrition, not moderate malnutrition, was another independent predictor of mortality. Furthermore, in our study, mortality was influenced by NS regardless of site and stage of the tumor, which is an important warning pertaining to the nutritional care of patients with gynecologic cancer.

Still regarding the independent survival factors found in this study, tumor site (uterus) also had an influence on mortality. In Brazil, uterine cancer often is only diagnosed at advanced stages, due to difficulty in accessing the public health care network or because the population tends to neglect having

Table 2
Multivariate adjusted analysis for predictors for In-hospital 1 y mortality

Clinical variables	Univariate analysis			Multivariate analysis		
	HR	95% CI	*P* value	HR	95% CI	*P* value
Age (per year increase)	1.00	0.98–1.01	0.738	*	*	*
Tumor site						
Endometrium	Ref			Ref		
Cervix	0.98	0.55–1.75	0.963	4.07	1.32–12.54	0.014
Ovary	0.28	0.11–0.73	0.010	1.48	0.77–2.84	0.237
Cancer stage	1.59	1.26–1.99	0.000	1.29	0.97–1.70	0.072
Reason for hospital admission						
Elective surgery	Ref			Ref		
Complications stemming from clinical or surgical treatment	0.016	0.002–0.113	0.000	0.140	0.03–0.68	0.150
Illness-related complications	0.402	0.17–0.93	0.033	0.628	0.27–1.42	0.265
LOS	1.00	0.99–1.00	0.386	*	*	*
ASG PPP score per additional point	1.12	1.09–1.15	0.000	1.10	1.03–1.14	0.002
Nutritional diagnosis						
PG-SGA A	Ref			Ref		
PG-SGA B	0.07	0.02–0.18	0.000	0.90	0.25–3.20	0.882
PG-SGA C	0.78	0.44–1.36	0.385	2.04	1.03–4.05	0.041

ASG PPP, Avaliação Subjetiva Global Produzida Pelo Próprio Paciente; HR, hazard ratio; LOS, length of stay; PG-SGA, Patient-Generated Subjective Global Assessment;
* Variables with $P > 0.25$ in univariable analysis were not entered in multivariable analysis.

preventive medical exams, which may hinder the prognosis and survival.

Conclusions

To our knowledge, this is the first study to investigate the association between NS classification according to PG-SGA score and survival in women with gynecologic cancer. Our findings suggest that the PG-SGA can be considered not just as a nutritional assessment tool, but also as a major predictor of prognosis and mortality in this group of patients, and also should be used to carry out early nutritional intervention.

We hope that further prospective research in the field be able to identify how effective intervention is in reducing hospital LOS and increasing quality of life and survival rates in women afflicted with gynecologic cancer.

References

[1] Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2014: Incidência de Câncer no Brasil, Coordenação de Prevenção e Vigilância. Brazil: Rio de Janeiro; 2014.
[2] Tewari KS, Sill MW, Long HJ, Penson RT, Huang H, Ramondetta LM, et al. Improved survival with bevacizumab in advanced cervical cancer. N Engl J Med 2014;370:734–43.
[3] American Cancer Society. Cancer facts & figures 2012. Atlanta, GA: American Cancer Society; 2012:366–7.
[4] Siegel R, Naishadham D, Jemal A. Cancer statistics, 2013. CA Cancer J Clin 2013;63:11–30.
[5] Barbosa-Silva MC. Subjective and objective nutritional assessment methods: what do they really assess? Curr Opin Clin Nutr Metab Care 2008;11:248–54.
[6] Laky B, Janda M, Kondalsamy-Channakesavan S, Cleghorn G, Obermair A. Pretreatment malnutrition and quality of life-association with prolonged length of hospital stay among patients with gynecological cancer: a cohort study. BMC Cancer 2010;10:232.
[7] Zorlini AR, Cairo AA, Gurgel MS. Nutritional status of patients with gynecologic and breast cancer. Nutr Hosp 2008;23:577–83.
[8] Ottery FD. Definition of standardized nutritional assessment and interventional pathways in oncology. Nutrition 1996;12:15–9.
[9] Ottery FD. Patient-Generated Subjective Global Assessment. In: McCallum PD, Polisena CG, editors. The clinical guide to oncology nutrition. Chicago, IL: American Dietetic Association; 2010. p. 11–23.
[10] Phippen NT, Lowery WJ, Barnett CJ, Hall LA, Landt C, Leath CA. Evaluation of the Patient-Generated Subjective Global Assessment (PG-SGA) as a predictor of febrile neutropenia in gynecologic cancer patients receiving combination chemotherapy: a pilot study. Gynecol Oncol 2011;123:360–4.
[11] Gonzalez MC, Borges LR, Silveira DH, Assunção MCF, Orlandi SP. Validação da versão em português da avaliação subjetiva global produzida pelo paciente. Rev Bras Nutr Clin 2010;25:102–8.
[12] Pecotelli S. Revised FIGO staging for carcinoma of the vulva, cervix, and endometrium. Int J Gynecol Obstet 2009;105:103–4.
[13] Laky B, Janda M, Bauer J, Vavra C, Cleghorn G, Obermair A. Malnutrition among gynaecological cancer patients. Eur J Clin Nutr 2007;61:642–6.
[14] Das U, Patel S, Dave K, Bhansali R. Assessment of nutritional status of gynecological cancer cases in India and comparison of subjective and objective nutrition assessment parameters. South Asian J Cancer 2014;3:38–42.
[15] 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;56:779–85.
[16] Bozzetti F, Migliavacca S, Scotti A, Bonalumi MG, Scarpa D, Baticci F, et al. Impact of cancer, type, site, stage and treatment on the nutritional status of patients. Ann Surg 1982;196:170–9.
[17] Tunca JC. Nutritional evaluation of gynecologic cancer patients during initial diagnosis of their disease. Am J Obstet Gynecol 1983;147:893–6.
[18] 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;23:871–9.
[19] Caro MM, Laviano A, Pichard C. Nutritional intervention and quality of life in adult oncology patients. Clin Nutr 2007;26:289–301.
[20] Tisdale MJ. Mechanisms of cancer cachexia. Physiol Rev 2009;89:381–410.
[21] Santoso JT, Canada T, Latson B, Alladi K, Lucci JA, Coleman RL. Prognostic nutritional index in relation to hospital stay in women with gynecologic cancer. Obstet Gynecol 2000;95:844–6.
[22] Pressoir M, Desné S, Berchery D, Rossignol G, Poiree B, Meslier M, et al. Prevalence, risk factors and clinical implications of malnutrition in French Comprehensive Cancer Centres. Br J Cancer 2010;102:966–71.
[23] Gupta D, Lammersfeld CA, Vashi PG, Dahlk SL, Lis CG. Can subjective global assessment of nutritional status predict survival in ovarian cancer? J Ovarian 2008;1:1–7.
[24] Barbosa-Silva MC, Barros AJ. Indications and limitations of the use of subjective global assessment in clinical practice: an update. Curr Opin Clin Nutr Metab Care 2006;9:263–9.
[25] Norman K, Pichard C, Lochs H, Pirlich M. Prognostic impact of disease-related malnutrition. Clin Nutr 2008;27:5–15.
[26] Prado CM, Lieffers JR, McCargar LJ, Reiman T, sawyer MB, Martin L, et al. Prevalence and clinical implications of sarcopenic obesity in patients with solid tumours of the respiratory and gastrointestinal tracts: a population-based study. Lancet Oncol 2008;9:629–35.
[27] Pastore CA, Orlandi SP, Gonzalez MC. The inflammatory-nutritional index: assessing nutritional status and prognosis in gastrointestinal and lung cancer patients. Nutr Hosp 2014;29:629–34.