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BRIEF ARTICLES

Clinical application of subjective global assessment in Chinese patients with gastrointestinal cancer

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Abstract

AIM: To investigate the role of subjective global assessment (SGA) in nutritional assessment and outcome prediction of Chinese patients with gastrointestinal cancer.

METHODS: A total of 751 patients diagnosed with gastrointestinal cancer between August 2004 and August 2006 were enrolled in this study. Within 72 h after admission, SGA, anthropometric parameters, and laboratory tests were used to assess the nutritional status of each patient. The outcome variables including hospital stay, complications, and in-hospital medical expenditure were also obtained.

RESULTS: Based on the results of SGA, 389 (51.8%), 332 (44.2%), and 30 (4.0%) patients were classified into well nourished group (SGA-A), mildly to moderately malnourished group (SGA-B), and severely malnourished group (SGA-C), respectively. The prevalence of malnutrition classified by SGA, triceps skinfold thickness (TSF), mid-upper arm muscle circumference (MAMC), albumin (ALB), prealbumin (PA), and body mass index (BMI) was 48.2%, 39.4%, 37.7%, 31.3%, 21.7%, and 9.6%, respectively. In addition, ANOVA tests revealed significant differences in body mass index (BMI), TSF, PA, and ALB of patients in different SGA groups. The more severely malnourished the patient was, the lower the levels of BMI, TSF, PA, and ALB were (P < 0.05). χ^2 tests showed a significant difference in SGA classification between patients receiving different types of treatment (surgery *vs* chemotherapy/radiotherapy). As the nutritional status classified by SGA deteriorated, the patients stayed longer in hospital and their medical expenditures increased significantly. Furthermore, multiple regression analysis showed that SGA and serum ALB could help predict the medical expenditures and hospital stay of patients undergoing surgery. The occurrence of complications increased in parallel with the increasing grade of SGA, and was the highest in the SGA-C group (23.3%) and the lowest in the SGA-A group (16.8%).

CONCLUSION: SGA is a reliable assessment tool and helps to predict the hospital stay and medical expenditures of Chinese surgical gastrointestinal cancer patients.

Key words: Gastrointestinal cancer; Subjective global assessment; Surgery; Nutritional assessment; Hospital stay; Medical expenditures; Complication

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INTRODUCTION

Cancer, one of the serious global health problems today, is considered by the public as a frightening, painful, and untreatable disease that implies death. Approximately 10 million people get cancer and 5 million people face death every year throughout the world. It is estimated that the number of new cancer patients will reach 15 million in 2020[1,2]. It was reported about 20% cancer patients die of malnutrition or its relative complications rather than the malignant disease itself[3]. Many researchers have suggested that the nutritional status of cancer patients after diagnosis is associated with cancer recurrence and survival rate[4-6], and is generally accepted as an important prognostic factor that determines patients' outcomes including treatment response, survival, and hospital stay[7-13]. Furthermore, some studies showed that good nutrition in patients with cancer can improve their quality of life[14-16]. The objective of nutritional assessment is to accurately define the nutritional status of patients, diagnose clinically relevant malnutrition, and monitor changes in nutritional status. Comprehensive and accurate information on nutritional status of patients with gastrointestinal cancer helps decide whether surgery or chemotherapy can be delayed. A number of tools have been developed for the assessment of nutritional status[17].

Subjective global assessment (SGA) is an easy, noninvasive, and cost-effective method for the assessment of nutritional status by identifying whether the patients are malnourished or at a risk of becoming malnourished[18]. Although SGA has been originally developed to identify poor nutritional status in patients undergoing gastrointestinal surgery[19], it can be used to quantify the prevalence of malnutrition in patients with chronic and end-stage renal failure during hemodialysis or peritoneal dialysis[20-22]. In addition, SGA is a powerful predictor of postoperative complications in general surgery[23], liver transplantation[24], and in patients on dialysis[25]. Although SGA has been used widely for more than two decades all over the world, few studies are available on its clinical value in Chinese cancer patients. This study was to investigate whether SGA can reliably identify malnourished patients and predict the clinical outcomes of Chinese gastrointestinal cancer patients.

MATERIALS AND METHODS

Ethics

This study was approved by the relevant research board and the ethics committee in Shanghai, China. All patients gave their informed consent to participate in this study.

Patients

Adult patients diagnosed with gastrointestinal cancer (including stomach, colon, or rectal cancer) from August 2004 to August 2006 were enrolled in this study. Eligibility criteria included (a) patients diagnosed by pathology or cytology, (b) patients scheduled to undergo treatment modalities including radiotherapy or chemotherapy or surgery, (c) patients older than 18 years, (d) patients able to read and comprehend Chinese, and (e) patients giving their informed consent. Patients with cognitive impairment, mental disorder, or communication problems were excluded from this study. The final number of recruited subjects was 751 (including 591 newly diagnosed and 160 previously diagnosed cancer patients). Of them, 384 (51.1%) were gastric cancer patients, 367 (48.9%) were colorectal cancer patients. The male/female ratio was 455/296 with a median age of 69 years (range 23-92 years). Of the 591 newly diagnosed cancer patients, 505 underwent surgery and 86 underwent chemotherapy or radiotherapy due to tumor metastasis, while the 160 previously diagnosed cancer patients received radiotherapy or chemotherapy during their hospital stay.

Nutritional assessment

An initial assessment of nutritional status in all recruited patients was made within 72 h after admission. To avoid possible variance among observers, SGA was performed by trained researchers. Anthropometric data including body weight, height, triceps skinfold thickness (TSF), mid-upper arm circumference (MUAC), and laboratory data including albumin (ALB) and prealbumin (PA) were collected.

Subjective global assessment

SGA of nutritional status in patients was performed based on their medical history and physical examination. Changes in weight, dietary intake, functional capacity, gastrointestinal symptoms, metabolic stress, loss of subcutaneous fat, muscle wasting, and ankle/sacral edema of the patients were recorded. After careful assessment, the changes in medical history and physical examination were classified as grade A, B, or C (Table 1). Finally, the assessment results were accumulated. If the total number of grade C was more than 5, the nutritional status of patients was classified as severely malnourished. If the total number of grade B was more than 5, the nutritional status of patients was classified as mildly to moderately malnourished. If the total number of grade C and B was less than 5, the nutritional status of patients was classified as well nourished[26]. Therefore, based on the results of SGA, patients were assigned to one of the three categories: A (well nourished), B (mildly to moderately malnourished), or C (severely malnourished).

Anthropometric measurement

Body height and weight, and other anthropometric parameters were measured by SGA. Body mass index (BMI) was calculated based on body height and weight. BMI less than 18.5 was regarded as malnourished. MUAC and TSF were measured with intertape and adipometer. MAMC was calculated following the formula: MAMC = MUAC (mm) - 3.14 × TSF (mm). TSF $\leqslant$ 10.17 mm in males and $\leqslant$ 13.41 mm in females, or MAMC $\leqslant$ 20.52 cm in males and $\leqslant$ 18.81 cm in females was the diagnostic criterion for malnutrition. These standards of anthropometric parameters

Table 1 Parameters and diagnostic criteria for subjective global assessment (SGA)

Parameters	Grade A	Grade B	Grade C
Food intake	No deficiency	Definite decrease in intake or liquid diet	Severe deficiency in intake or starvation
Weight loss (during the past 6 mo)	No weight loss or weight loss > 10% during the past 6 mo but weight gain over the past month	Continuous weight loss of 5%-10%	Continuous weight loss > 10%
Gastrointestinal symptoms (nausea, vomit, diarrhea)	None	Mild or moderate GI symptoms for less than 2 wk	Continuous severe GI symptoms for more than 2 wk
Activities and function	No limitation	Not normal, but able to do fairly normal activities or do not know most things, but in bed or chair for less than half a day	Able to do little activity and spend most of the day in bed or chair; or much bed-ridden, rarely out of bed
Metabolic stress	No fever	Temperature > 37℃ and < 39℃ during the past 72 h	Continuous temperature ⩾ 39℃ during the past 72 h
Subcutaneous fat loss	No	Mild to moderate	Severe
Muscle wasting	No	Mild to moderate	Severe
Ankle edema/Ascites	No	Mild to moderate	Severe

Nutritional status: SGA-A (Normal); SGA-B (Mildly to moderately malnourished); SGA-C (Severely malnourished).

Table 2 Classification standards for nutritional parameters in assessing malnutrition

Nutritional parameter	Normal nutrition	Mildly malnourished	Moderately malnourished	Severely malnourished
TSF (mm)				
Male	> 10.17	9.04-10.17	6.78-9.03	< 6.78
Female	> 13.41	11.92-13.41	8.94-11.91	< 8.94
MAMC (cm)				
Male	> 20.52	18.24-20.52	13.68-18.23	< 13.68
Female	> 18.81	16.72-18.81	12.54-16.71	< 12.54
PA (mg/L)	⩾ 200	160-199	120-159	< 120
ALB (g/L)	⩾ 35	31-34	26-30	⩽ 25

TSF: Triceps skinfold thickness; MAMC: Mid-upper arm muscle circumference; PA: Prealbumin; ALB: Albumin.

for classifying nutritional status were formulated in accordance with the Chinese Anthropometric Reference Data (Table 2)[27].

Blood measurement

Blood samples were collected at anthropometric assessment, before initiation of Ⅳ fluids. ALB and PA were measured with a standard clinical analyzer. The cut-off value for PA and ALB was set at 200mg/L (measured by immune turbidimetry) and 35 g/L (measured by biuret method), respectively. The standards for classifying nutritional status in serum proteins were also formulated in accordance with the Chinese Anthropometric Reference Data (Table 2)[27].

Outcome variables related to health care

Outcome variables related to health care, such as hospital stay, medical expenditures, occurrence of complications, and pathological stage of cancer were also detected. Patients were discharged according to the hospital policy. Hospital stay (d) was recorded. All patients were followed up until discharge or death. Complications, including infectious complications (septicemia, incisional, respiratory, abdominal, pelvic, and urinary tract infection) and non-infectious complications (rupture of incision, intestinal obstruction, ascites, cerebrovascular accident, bleeding, and organ failure, *etc*), were monitored and recorded daily. Pathological stage of cancer was described by TNM staging according to Union International Contere Cancer (UICC) version 5.0.

Statistical analysis

Data analyses were carried out using StatView 6.12 (SAS Institute, Cary, NC, USA). Data were expressed as mean ± SD. Differences in mean values were tested with one-way analysis of variance and Student's *t*- test. χ^2 test was used to compare differences in categorical data. Bivariate correlation analysis (Pearson's R) was performed to show the correlation between SGA grades and other nutritional parameters. Multiple regression analyses were carried out to assess the relation between SGA, other nutritional parameters, and health care outcome variables. $P < 0.05$ was considered statistically significant.

RESULTS

Nutritional status and cancer stage of gastrointestinal cancer patients

Based on different nutritional parameters, the number of patients with malnutrition was 362 (48.2%), 296 (39.4%), 283 (37.7%), 230 (31.3%), 145 (21.7%), and 72 (9.6%) for SGA, TSF, MAMC, ALB, PA, and BMI, respectively.

In our study, 71.1% patients were at advanced cancer stage. The number of cancer patients was 142 (18.9%), 179 (23.8%), 205 (27.3%), 225 (30.0%) at stage Ⅰ, stage Ⅱ, stage Ⅲ, and stage Ⅳ, respectively.

Comparison of nutritional status classified by SGA and other nutritional parameters

Based on the results of SGA, 389 (51.8%), 332 (44.2%), and 30 (4.0%) patients were classified into well nourished group (SGA-A), mildly to moderately malnourished group (SGA-B), and severely malnourished group (SGA-C), respectively. One-way analysis of variance revealed that SGA grade was closely related with other nutritional parameters (Table 3). Further analyses of *Post Hoc* least significant difference comparisons (LSD tests) identified that there were differences in percentage of weight loss, BMI, PA, and ALB between each two

Table 3 Comparison of nutritional parameters in different SGA grades

Nutritional parameters	The grade of SGA			*F*	*P*	Correlation coeffient (*r*)	*P*
	SGA-A	SGA-B	SGA-C				
Weight loss (%)	2.2 ± 2.9	9.7 ± 7.0	23.2 ± 12.6	296.0	0.000	0.65	0.00
BMI	23.4 ± 3.0	21.2 ± 2.8	19.0 ± 3.3	70.8	0.000	0.40	0.00
TSF (mm)							
Male	16.0 ± 8.5	10.5 ± 6.2	9.2 ± 6.5	31.9	0.000	0.34	0.00
Female	25.0 ± 10.2	17.4 ± 8.3	14.4 ± 10.0	26.6	0.000	0.38	0.00
MAMC (cm)							
Male	21.8 ± 2.3	21.9 ± 2.1	20.6 ± 2.5	2.4	0.095	0.03	0.50
Female	18.2 ± 2.5	18.6 ± 2.4	16.8 ± 2.5	4.1	0.018	0.02	0.71
ALB (g/L)	37.7 ± 4.2	35.7 ± 5.7	30.5 ± 6.6	36.9	0.000	0.29	0.00
PA (mg/L)	246.7 ± 41.5	221.7 ± 49.2	159.6 ± 52.9	59.5	0.000	0.37	0.00

Table 4 Comparison of SGA grades between patients before surgery and chemotherapy/radiotherapy

Treatment	*n*	Grade of SGA (%)			χ^2	*P*
		SGA-A	SGA-B	SGA-C		
Surgery	505	275 (70.7)	214 (64.5)	16 (53.3)	5.91	0.05
Chemotherapy and radiotherapy	246	114 (29.3)	118 (35.5)	14 (46.7)		
Total	751	389	332	30		

of the three SGA groups ($P < 0.05$). Therefore, in general, when the patients were classified by the SGA grade as more severely malnourished, the value of the other nutritional parameters, such as levels of BMI, ALB, and PA was lower. Bivariate correlation analysis showed that SGA grade was significantly correlated with the percentage of weight loss, BMI, TSF, ALB, and PA (Table 3), even though the correlation coefficient was less than 0.3 between SGA grade and ALB level.

χ^2 tests showed that SGA grade was significantly different between patients receiving surgery and chemotherapy/radiotherapy (Table 4). In addition, the percentage of weight loss (5.4% ± 6.7% *vs* 8.4% ± 8.8%, $P = 0.000$) and the serum of PA (235.3 ± 46.5 *vs* 223.8 ± 55.6, $P = 0.013$) existed obviously differences between the patients receiving surgery and chemotherapy/radiotherapy.

Could SGA and other nutritional parameters predict hospital stay?

One-way analysis of variance revealed that the hospital stay of 751 gastrointestinal cancer patients was not statistically different in different SGA groups ($F = 2.46$, $P = 0.086$). Preliminary multiple regression analysis using hospital stay as an outcome variable showed that the type of treatment was the biggest predictor for hospital stay in our study (Table 5). In general, patients receiving surgery stayed in the hospital much longer than those receiving chemotherapy/radiotherapy. Further ANOVA analysis revealed that the hospital stay was significantly longer in accordance with the increasing grade of SGA, both in patients receiving surgery and in patients receiving chemotherapy/radiotherapy (Table 6). Subgroup multiple regression analysis using hospital stay as an outcome variable, showed that SGA and serum ALB could help explain the length of hospital stay only in surgical gastrointestinal (GI) cancer patients (Table 7), but not in patients receiving chemotherapy/radiotherapy ($F = 1.22$, $P = 0.27$).

Could SGA and other nutritional parameters predict in-hospital medical expenditures?

One-way analysis of variance revealed that the in-hospital medical expenditures of different SGA groups of patients were significantly different ($P < 0.01$) (Table 6). SGA-C group had the highest expenditures, SGA-A group the lowest expenditures, and SGA-B group the medium expenditures. Multiple regression analysis using medical expenditures as an outcome variable showed that the type of treatment was the biggest predictor of medical expenditures for GI cancer patients in our study (Table 5). The multiple regression analysis revealed that SGA, serum ALB, and cancer stages (TNM) could independently influence the medical expenditures of surgical GI cancer patients (Table 7). On the contrary, no significant predictors could be found for those not undergone surgery.

Could SGA and other nutritional parameters predict occurrence of complications?

The occurrence of complications increased with the increasing SGA grade. SGA-C group had the highest occurrence of complications (23.3%), SGA-A group the lowest occurrence of complications (16.8%), and SGA-B group the medium occurrence of complications (19.1%) ($\chi^2 = 1.21$, $P = 0.546$). In addition, hospital stay of patients with complications was significantly longer than that of those without complications (26.1 ± 12.1 *vs* 15.5 ± 7.8, $t = -9.67$, $P = 0.00$).

During hospital stay, 8 patients died of various

Table 5 Factors influencing hospital stay and in-hospital costs of GI cancer patients (multiple regression analysis)

Factors	Factors influencing hospital stay			Factors influencing in-hospital costs		
	Standardized coefficients β	*t*	*P*	Standardized coefficients β	*t*	*P*
Age	0.02	0.64	0.52	-0.06	-1.37	0.17
Sex	-0.07	-1.64	0.10	-0.04	-0.90	0.37
Education background	-0.04	-1.04	0.30	-0.01	-0.25	0.80
Weight loss (%)	0.03	0.67	0.50	0.07	1.26	0.21
BMI	-0.03	-0.51	0.61	0.05	0.73	0.47
MAMC	-0.04	-0.69	0.49	-0.06	-0.82	0.41
TSF	0.03	0.42	0.68	0.01	0.18	0.86
ALB	-0.04	-1.04	0.30	-0.06	-1.43	0.15
SGA-A/SGA-C	0.18	1.68	0.09	0.18	1.45	0.15
SGA-B/SGA-C	0.17	1.80	0.07	0.09	0.86	0.39
TNM	-0.05	-1.54	0.12	0.06	1.49	0.14
Tumor site	-0.02	0.59	0.56	-0.07	-1.76	0.08
Type of treatment	-0.49	-13.99	0.00	-0.25	-6.30	0.00

Factors influencing hospital stay model F = 19.20, $P < 0.05$; Factors influencing in-hospital costs model F = 5.62, $P < 0.01$.

Table 6 Comparison of hospital stay and medical expenditures of patients with different SGA grades

	Grade of SGA (%)			*F*	*P*
	SGA-A	SGA-B	SGA-C		
Hospital stay (d)	17.1 ± 9.7	17.3 ± 9.0	21.1 ± 14.6	2.46	0.086
Surgery	20.8 ± 8.6	21.2 ± 7.8	29.1 ± 15.1	7.07	0.001
Chemotherapy and radiotherapy	8.2 ± 5.1	10.3 ± 6.4	12.1 ± 6.8	5.02	0.007
Medical expenditure (RMB)	6522.4 ± 6670.9	8353.7 ± 9575.9	12550.0 ± 10579.7	9.85	0.000
Surgery	7987.9 ± 6963.9	10025.8 ± 10009.6	17654.2 ± 11678.5	11.51	0.000
Chemotherapy and radiotherapy	3033.5 ± 3430.5	5358.0 ± 7945.0	6268.0 ± 3632.5	4.58	0.011

Table 7 Factors influencing hospital stay and in-hospital costs of surgical GI cancer patients (multiple regression analysis)

Factors	Factors influencing hospital stay			Factors influencing in-hospital costs		
	Standardized coefficient β	*t*	*P*	Standardized coefficient β	*t*	*P*
Age	0.05	1.01	0.32	-0.06	-1.22	0.22
Sex	-0.11	-1.80	0.07	-0.07	-1.17	0.24
Education background	-0.04	-0.89	0.37	-0.04	-0.88	0.38
weight loss (%)	0.02	0.26	0.80	-0.01	-0.05	0.96
BMI	-0.05	-0.62	0.54	0.06	0.81	0.42
MAMC	-0.05	-0.66	0.51	-0.07	-0.86	0.39
TSF	0.12	1.35	0.18	0.06	0.66	0.51
ALB	-0.10	-2.11	0.04	-0.16	-3.17	0.002
SGA-A/SGA-C	0.41	2.36	0.02	0.43	2.51	0.01
SGA-B/SGA-C	0.39	2.52	0.01	0.31	2.06	0.04
TNM	-0.01	-0.26	0.08	0.10	2.11	0.04
Tumor site	-0.06	1.21	0.23	-0.09	-1.90	0.06

Factors influencing hospital stay model F = 2.35, $P < 0.01$; Factors influencing in-hospital costs model F = 3.92, $P < 0.01$.

complications (5 in SGA-B group, 2 in SGA-A group, and 1 in SGA-C group). SGA grade was not related with the number of deaths in our study.

DISCUSSION

Severe malnutrition is associated with increased morbidity and mortality of gastrointestinal cancer, decreased treatment efficacy, and increased hospital stay[28]. Nutritional status is conventionally assessed by anthropometric measurement and laboratory assessment[29]. In this study, the prevalence of malnutrition for the same group of subjects ranged 9.6%-48.2%. The highest prevalence of malnutrition was detected by SGA, the lowest by BMI. The purpose of nutritional assessment in cancer patients is to discover mild or moderate malnutrition before the patients become overtly wasted in order to prevent further deterioration and improve their quality of care. In clinical settings, some of the anthropometric measurements and laboratory assessments are not ideal because they are neither accurate nor convenient.

Although the British Association for Parenteral and Enteral Nutrition (BAPEN) has recommended that the measurements used for screening malnutrition should be based upon the changes in BMI and the percentage of weight loss, our study demonstrated that only a small number of patients were diagnosed with malnutrition by BMI, suggesting that BMI cannot precisely assess malnutrition in Chinese cancer patients. The established cut-off point of malnutrition for BMI largely depends on studies in younger patients[30], and therefore, cannot be directly applied to the elderly population, which may explain why only a small number of patients were diagnosed with malnutrition by BMI in this study. It has been shown that a BMI value of 20 should alert clinicians to suspect malnutrition in the elderly[29]. It was reported that the optimal range of BMI in elderly people should be increased from 20 kg/m^2 to 25 kg/m^2 in order to identify the elderly at a risk of malnutrition[31]. On the other hand, some elderly patients spend most of their day time in bed or totally bedridden, so it is not always easy or sometimes even impossible to measure their weight or height changes.

In addition, SGA was not significantly correlated with ALB level compared to other anthropometric parameters. The ALB level alone is not a good representative marker of nutritional status of cancer patients as shown in our study. It has been shown that ALB level may be considered as an indicator of illness or as a prognostic factor for complications and mortality, but not as a major indicator of nutritional status[32]. Our study showed that ALB level was an important factor for prolong hospital stay and medical expenditures of surgical cancer patients. In patients with malignancy diseases, the ALB level can be affected by nutritional status and the malignant disease itself, or by inflammatory reactions due to any causes, such as severe liver disease, dehydration, and edema[29]. In fact, serum ALB, a negative acute phase protein[33], is decreased in response to acute or chronic inflammation by altering the normal hepatic protein metabolism and inducing capillary leak[34-36]. Irrespective of the value of biochemical indicators, ALB level measurement is more time consuming and expensive than SGA.

SGA, one of the better available tools, can assess nutritional status, not only because it is patient centered by combining clinical history and physical examination, but also because it is associated with patient outcomes[37-39]. This is why SGA has been used widely in Western countries yielding trustworthy results. In the present study, the values of BMI, TSF, PA, and ALB were lower in more severely malnourished patients, which is consistent with previous findings[23,29]. It has been shown that SGA grade is closely correlated with TSF, MAMC, and ALB[29]. SGA can be used as a benchmark to validate new assessment methods, such as bioelectrical impedance analysis[40] and mid-upper arm anthropometry[41].

Although SGA is now considered a clinical method for assessing nutritional status, it was originally developed to identify patients with poorer outcomes following surgery. Baker *et al*[23] showed that patients classified as 'malnutrition' suffer more infections, use more antibiotics, and have a longer hospital stay. We hypothesized that SGA grade of patients at admission could help to predict the occurrence of complications, hospital stay, and in-hospital medical expenditures of Chinese gastrointestinal cancer patients, and found that the more severely malnourished patients had a longer hospital stay, a higher occurrence of complications, and higher in-hospitalization costs. Multiple regression analysis displayed that SGA grade could only predict hospital stay and medical expenditures of surgical cancer patients, but not those of chemotherapy/radiotherapy patients, indicating that type of treatment may influence the predictive value of SGA. Wakahara *et al*[42] reported that although SGA can be used to predict the hospital stay of patients with digestive diseases, cancer staging is a better prognostic index of cancer patients. However, the results of our study do not support the fact that advanced cancer would lead to worse nutritional status, longer hospital stay, and higher incidence of postoperative complications. In addition, patients with complications had a longer hospital stay than those with no complications. Since cancer patients are more prone to develop complications when their nutritional status deteriorates, more treatment modalities are needed to help them recover.

Although SGA could provide useful information for predicting certain outcome variables in our study, SGA was not related with death of patients. Eight patients (5 in SGA-B group, 2 in SGA-A group and 1 in SGA-C group) died of complications during hospital stay. The reason why only one patient died in the most severely malnourished SGA-C group was due to the small subgroup sample size. Whether SGA can predict the risk of in-hospital death remains unclear.

This study had some limitations. For example, the small sample size in SGA-C group resulted in a quite unbalanced distribution of nutritional status in different SGA classification groups, which may limit the power of data analysis. As an assessment tool, SGA consists of both history taking and physical examination of the patients[40,43]. Thus, reliable SGA grading depends on collection of correct history and physical examination. During our study, since some patients could not remember their exact body weight and detail dietary intake when information was collected to assess the nutritional status, the relevant information was obtained from the recall of patients and their relatives. Recently, quantification of SGA has been advocated as a way to improve the sensitivity and specificity of SGA in diagnosing malnutrition[44,45].

In conclusion, SGA is a safe, inexpensive and reliable method for assessing nutritional status of Chinese gastrointestinal cancer patients and only can predict their hospital stay and medical expenditures in surgical GI patients. Further study is needed on the role of SGA in predicting the occurrence of in-hospital deaths.

COMMENTS

Background

Cancer is one of the serious health problems worldwide. A large number of cancer patients die of malnutrition or its relative complications rather than the disease itself. Malnutrition has a negative impact on the well-being of patients and evolution of the disease. A timely efficient nutritional assessment would provide a better basis for deciding whether nutritional support is given. Many nutritional assessment methods are now available. Each method has its own advantages and disadvantages. An accurate, convenient, and inexpensive method should be available for clinicians.

Research frontiers

Subjective global assessment (SGA) has been originally developed to identify poor nutritional status in subjects undergoing gastrointestinal surgery, it can be used to quantify the prevalence of malnutrition in patients at the end-stage of renal failure, and is a powerful predictor of postoperative complications in general surgery, liver transplantation, and in patients on dialysis. In addition, a recent study revealed that although SGA can predict hospital stay of patients with benign digestive disease, its predictive power is limited in patients with malignant diseases.

Innovations and breakthroughs

Although SGA has been used widely for more than two decades all over the world, few studies are available on SGA in Chinese gastrointestinal cancer patients. In this study, SGA was used to assess the nutritional status of Chinese patients with gastrointestinal cancer. The results show that SGA helps predict certain outcomes such as hospital stay and medical expenditures of surgical gastrointestinal (GI) cancer patients.

Applications

As a convenient and reliable method, SGA can be used to assess the nutritional status of cancer patients since it helps predict certain outcomes of surgical GI cancer patients.

Peer review

This manuscript is valuable and offers important data for the clinical management of GI cancer patients. The results of this study demonstrate that SGA is superior over other nutritional parameters in the assessment of nutritional status of GI cancer patients.

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