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What is Subjective Global Assessment of Nutritional Status?

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ABSTRACT. Presented and described in detail is a clinical technique called subjective global assessment (SGA), which assesses nutritional status based on features of the history and physical examination. Illustrative cases are presented. To clarify further the nature of the SGA, the method was applied before gastrointestinal surgery to 202 hospitalized patients. The primary aim of the study was to determine the extent to which our clinicians' SGA ratings were influenced by the individual clinical variables on which the clinicians were taught to base their assessments. Virtually all of these variables were significantly related to SGA class. Multivariate analysis showed that ratings were most affected by loss of subcutaneous tissue, muscle wasting, and weight loss. A high degree of interobserver agreement was found (kappa = 0.78%, 95% confidence interval 0.624 to 0.944, $p < 0.001$). We conclude that SGA can easily be taught to a variety of clinicians (residents, nurses), and that this technique is reproducible. (*Journal of Parenteral and Enteral Nutrition* **11:**8-13, 1987)

The nutritional status of hospitalized patients can be assessed by a variety of methods. The widely applied traditional methods rely heavily on objective anthropometric measurements and laboratory tests results. Nutritional assessment can also be based on clinical criteria-that is, the findings of a routine history and physical examination. Previously we have reported the results of a study which compared clinical assessment of nutritional status with several objective measurements.[1-3] In that study , on the basis of the history and physical examination, two clinicians classified patients as either well nourished, moderately malnourished, or severely malnourished , a process which we now refer to as Subjective Global Assessment (SGA). We demonstrated that there were good correlation between the subjective and objective measurements (convergent validity). We also found that with SGA, postoperative infections could be predicted to a degree that was equal to or better than with objective measurements (predictive validity). Finally, we demonstrated a high degree of interrater reproducibility for SGA.

Other investigators have found SGA to be an appealing method of assessing nutritional status,[4-7] and have employed clinical assessments in a similar fashion in their own research.[8-9] Unfortunately, the features of the history and physical examination which our clinicians incorporated into their SGA ratings were outlined only briefly in our earlier reports. We have received many comments which suggest that the description contained in those papers was not detailed enough to allow widespread clinical use of this technique. In this paper, we describe the technique of SGA in considerable detail, provide some illustrative examples, and examine the effect of the individual patient characteristics incorporated in SGA on the ratings assigned to 202 patients assessed prior to major gastrointestinal surgery. The analysis is part of a larger study to confirm our previous demonstration of the validity of SGA as a technique of nutritional assessment. The version of SGA used in this study is modified from the version used in the previous study, in the light of our subsequent experience with this technique.

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DESCRIPTION OF THE MANEUVER

The specific features of the history and physical examination which are considered in the SGA method, are listed in Table I. Five features of the history are elicited. The first is weight loss in the previous 6 months, expressed as both kilograms and proportionate loss. We consider less that 5% as a "small" loss, between 5 and 10% as a "potentially significant" loss, and greater than 10% as a "definitely significant" loss. We also considered the rate of weight loss and its pattern. For example, if the patient has lost 10% of his weight in the period 6 months to 1 month prior to admission but has regained 3% of his weight in the subsequent month, resulting in a net loss of 7% for the entire period , he is considered to be better nourished than a patient who has lost 7% of his weight in the previous 6 months and continues to loss weight. Thus, it is possible for patients to suffer a net weight loss of significant proportions but still be considered well nourished if there has been a recent stabilization or increase in weight. The second feature of the history is dietary intake in relation to a patient's usual pattern. Patients are classified first as having normal or abnormal intake. The duration and degree of abnormal intake are also noted (starvation, hypocaloric liquids, full liquid diet, suboptimal solid diet). The third feature of the history is the presence of significant gastrointestinal symptoms (anorexia, nausea, vomiting, diarrhea). By

TABLE I
Features of subjective global assessment (SGA)

(Select appropriate category with a checkmark, or enter numerical value where indicated by "#.")

A. History
1. Weight change
Overall loss in past 6 months: amount = # _____ kg; % loss = # _____
Change in past 2 weeks: _____ increase,
_____ no change,
_____ decrease.
2. Dietary intake change (relative to normal)
_____No change,
_____Change _____duration = # _____ weeks
_____type: _____ suboptimal liquid diet, _____ full liquid diet
_____ hypocaloric liquids, _____ starvation.
3. Gastrointestinal symptoms (that persisted for >2 weeks)
_____none, _____nausea, _____vomiting, _____diarrhea, _____anorexia.
4. Functional capacity
_____ No dysfunction (e.g., full capacity),
_____ Dysfunction _____ duration = # _____ weeks.
_____ type: _____working suboptimally,
_____ambulatory,
_____bedridden.
5. Disease and its relation to nutritional requirements
Primary diagnosis (specify) _____
Metabolic demand (stress) : _____ no stress, _____low stress,
_____moderate stress, _____high stress.

B. Physical (for each trait specify: 0 = normal, 1+ = mild, 2+ = moderate, 3+ = severe).
_____loss of subcutaneous fat (triceps, chest)
_____muscle wasting (quadriceps, deltoids)
_____ankle edema
_____sacral edema
_____ascites

C. SGA rating (select one)
_____A = Well nourished
_____B = Moderately (or suspected of being) malnourished
_____C = Severely malnourished

significant, we mean that these symptoms have persisted on virtually a daily basis for a period longer than 2 weeks. Short-duration diarrhea or intermittent vomiting is not considered significant. Daily or twice daily vomiting secondary to obstruction is considered significant. The fourth feature of the history is the patient's functional capacity or energy level (bedridden to full capacity). The last feature of the history concerns the metabolic demands of the patient's underlying disease state. An example of a high-stress disease is a bad flare of ulcerative colitis where the patient has suffered a large volume of bloody diarrhea on a daily basis. A low-stress disease might be a smoldering infection or malignancy.

There are four features of the physical examination which are noted as either normal (0), mild (1 +), moderate (2+), or severe (3+). The first is the loss of subcutaneous fat measured in the triceps region and the mid-axillary line at the level of the lower ribs. These measurements are not precise, but are merely a subjective impression of the degree of subcutaneous tissue loss. The second feature is muscle wasting in the quadriceps and deltoids as determined by loss of bulk and tone that is detectable by palpation. Obviously, a neurological deficit will interfere with this assessment. The presence of edema in both the ankles and the sacral region and the presence of ascites are noted. Again, a co-existing disease such as congestive heart failure will modify the weight placed on the finding of edema.

On the basis of these features of the history and physical examination, clinicians identify a SGA rank which indicates the patient's nutritional status. These categories are: (1) well nourished, (2) moderate or suspected malnutrition, and (3) severe malnutrition. In order to arrive at a SGA rank, we do not use an explicit numerical weighting scheme. Rather, a rank is assigned on the basis of subjective weighting. In this study, we instructed our clinical raters to place most of their judgement on the variables weight loss, poor dietary intake, loss of subcutaneous tissue, and muscle wasting. The raters were told that patients could be assigned a B rank if there was at least a 5% weight loss in the few weeks prior to admission without stabilization or weight gain, definite reduction in dietary intake, and mild subcutaneous tissue loss. If the patient had considerable edema, ascites, or tumor mass, the raters were told to be less influenced by the amount of weight loss. The other historical features are meant to help the rater confirm the patient's self report of weight loss and dietary change, but are given less weight. If the patient had a recent weight gain that did not appear to be merely fluid retention, the raters were instructed to assign an A rank, even if the net loss was between 5% and 10%, and the patient had mild loss of subcutaneous tissue, especially if the patient noted an improvement in the other historical features of the SGA (e.g., improvement in appetite). In order to receive a C rank, the patient had to demonstrate obvious physical signs of malnutrition (severe loss of subcutaneous tissue, muscle wasting, and often some

edema) in the presence of a clear and convincing pattern of ongoing weight loss. These patients usually had a net loss of at least 10% of their normal weight, and also had many of the other historical features. The raters were instructed to be less sensitive and more specific in their assignment of rankings. That is, if the features which might influence the rater to assign a B rank (as opposed to an A rank) are equivocal or doubtful, an A rank is appropriate. Similarly, a C rank implied definite findings of severe malnutrition.

Case Presentations

Case 1. A 52-yr-old man who was previously in good health was admitted to the hospital for elective resection of his transverse colon for suspected carcinoma. The patient came to medical attention because of a change in bowel habits. He had suffered from alternating constipation and diarrhea. He had lost 8% of his usual body weight (70 kg) in the period between 6 and 2 months prior to admission; however, his weight had been stable for the past 2 months and he had gained 2 kg in the 2 weeks prior to admission after placement on oral nutritional supplementation. He reported no other significant gastrointestinal symptoms, and he had been working with his usual energy up to the time of admission. Although his dietary intake was below normal a few months previous, it had been normal for 2 months prior to admission. On physical examination, there was no evidence of loss of subcutaneous tissue, muscle wasting, edema, or ascites. This patient was classified as "A," well nourished. Although his net weight loss was 5% in the 6 months prior to admission, his weight had stabilized and even increased, recently.

Case 2. A 47-yr-old man with a history of heavy alcoholism was transferred to our hospital for suspected pancreatic pseudocyst. He had developed acute pancreatitis 2 weeks prior to transfer and was admitted to another hospital. He was well, prior to that admission. Since that time, he had been maintained on intravenous fluids for most of the period, with nasogastric suction much of the time. He had lost 8% of his usual body weight. He was continuing to lose weight. His abdominal pain and nausea had resolved considerably. The patient felt slightly weak but was able to ambulate. There was no fever. On physical examination, he was a robust-appearing man with a small amount of loss of subcutaneous fat in the chest. His shoulders had a "squared-off appearance" in the deltoid region which was evidence of muscle wasting. There was trace edema in the sacral region and ankles. There was no ascites. This patient was classified as "B," moderately malnourished. The ranking was most influenced by the continuing loss of weight, limitation of nutritional intake to hypocaloric fluids for 2 weeks, and mild loss of subcutaneous tissue and muscle.

Case 3. A 75-yr-old man was admitted to hospital for resection of a suspected esophageal carcinoma. He had been well until 4 months prior to admission, when he began to notice the onset of dysphagia. The dysphagia progressed rapidly to the point where he could no longer swallow. He had lost 12% of his body weight in the previous 4 months, and was continuing to lose weight. He was ambulatory but felt weak, and was no longer able to continue some of his usual daily activities. There was no fever, significant nausea, vomiting, or diarrhea. On physical examination, the man appeared to be wasted. There was obvious subcutaneous tissue loss in the triceps and thoracic regions. There was clear muscle wasting in the deltoids and quadriceps. There was trace edema in the ankles and no ascites. This man was classified as "C," severe malnutrition. The ranking was influenced most by the continuing large weight loss, change in dietary intake, and severe physical findings.

METHODS

Patient Sample and SGA Rates

Two hundred two consecutive patients scheduled for major gastrointestinal surgery from the practices of a selected group of 10 general surgeons at two teaching hospitals in Toronto were included in the study. These patients were entered into the study by the research nurse if they met the entry criteria (planned major gastrointestinal surgery). Patients were excluded if they were senile or comatose, had been on the study before, did not speak English, were on continuous ambulatory peritoneal dialysis, had undergone surgery before the earliest time they could be seen by the research nurse, had a psychiatric disorder, or if the study quota had been filled (only six patients could be followed at one time). Patients were not excluded because of comorbid conditions, such as liver disease or congestive heart failure. The average age of the patients was 52.7 yr (SD 17.7). These patients were derived from local referrals in the Toronto area as well as distant referrals throughout Ontario and Canada.

Five clinicians were involved in performing the subjective global assessments: three residents in clinical nutrition, one research nurse, and one nurse practitioner. Each was taught to perform SGA in a similar fashion by one individual (ASD) during a "training period" before the study. The training period consisted of a didactic session reviewing the technique, review of one patient of each nutritional class (if available) with ASD, and a review of at least three further patients by the clinician with a subsequent check of the findings by one of the previously trained raters. In addition, a test of interobserver agreement was performed for all new raters by duplicate ratings of several patients (at least 10).

SGA was performed on all patients before surgery. During the first year of the study (at Toronto General Hospital), 101 patients were assessed. All patients were seen by the research nurse; 81 were independently assessed by both the nurse and one of the residents. During the second year of the study (at Toronto Western Hospital), 101 patients were assessed, all by the research nurse or nurse practitioner and 29 by both a resident and a nurse. All duplicate assessments were performed at separate times on the same day; neither had knowledge of the other rater's findings.

The main purpose of this paper is to report the influence of the individual patient characteristics on the

clinicians' SGA ratings. For this analysis, only one SGA rating provided by either the resident (where the patient was seen by both a nurse and resident) or the nurse (if not seen by the resident) was used. The second aim of this report is to examine the interobserver variation of SGA ratings. For this analysis, both the resident's and nurse's ratings were used. Objective measurements of nutritional status were also performed. The relationships between SGA, these objective measurements, and clinical outcomes will be the subject of a forthcoming report.

Statistical Techniques

SGA class is an ordered categorical (ordinal) variable. Some of our patient characteristics are continuous variables (eg, percent weight loss), some are categorical variables (eg, presence of significant gastrointestinal symptoms), whereas still others are ordinal variables (eg, edema as 0, 1+, 2+). Thus, in addition to describing means and proportions across the three SGA classes, rank correlation coefficients (Kendall's tau) were calculated and tested for statistical significance[10] using the Statistical Analysis System.[11] Percentage weight loss was analyzed as both a continuous and a categorical variable. A multivariate analysis relating all of the patient characteristics to SGA class assigned by the clinicians was performed by fitting a logistic regression model for a three-level ordinal outcome variable[12] using the Generalized Linear Interactive Modeling software package.[13] Agreement between two observers (where two ratings were performed) was measured by the Kappa statistic.[10]

RESULTS

Relative Importance of SGA Components

Of the 202 patients assessed, 139 (69%) were classified as A, 44 patients (21%) were classified as B, and 19 patients (10%) were classified as C. Ten percent of the patients developed major complications during their hospitalization (wound dehiscence, intraabdominal or wound abscess, major sepsis, death).

Although the weighting scheme was subjective rather than explicit, we found that our raters had no difficulty assigning ranks after the training sessions. We did find it difficult to define the variable "disease and its relation to nutritional requirements," and found that most raters seemed uninfluenced by this variable. Nevertheless, because we had instructed the raters to consider this variable, we left it in our description of the maneuver for this paper.

The results of the univariate analysis which demonstrates the distribution of values of clinical features in the SGA classes are presented for continuous variables in Table II and for categorical variables in Table III. In Table II**,** the mean values of weight loss, percent weight loss, and duration of dietary change can be seen to increase consistently across the SGA classes, with the highest values of each occurring in class C. Each variable was significantly correlated with SGA class, as shown by the values of Kendall's tau.

Table III shows the relationship between the categorical or ordinal variables included in the SGA analysis and the SGA class assigned by the clinicians. For each characteristic, a large proportion of the patients with "normal" levels are classified as A, fewer are classified as B, and fewer again as C. A trend in the opposite direction can be seen for the most "severe" levels of the categorical variables. Kendall's tau, which summarizes the nature of these relationships, shows that the degree of abnormality for all variables is clearly correlated with the SGA class. The characteristics with the largest correlation coefficients are loss of subcutaneous fat, muscle wastage, and categorical weight loss.

TABLE II
Mean values of continuous variables and their correlation with SGA class

Characteristic	SGA class*			Correlation coefficient (Kendall's tau)†
	A	B	C	
Weight loss (kg)	1.82 ± 0.26‡	5.31± 0.80	9.13 ± 1.48	0.46
Percent weight loss	2.48 ± 0.35	7.76 ± 1.12	15.90 ± 2.68	0.40
Duration of diet change (weeks)	1.91 ± 0.56	18.89 ± 8.80	14.35 ± 4.05	0.22

* A = well nourished; B = moderately malnourished; C = severely malnourished.
† $p < 0.001$.
‡ Mean ± SEM.

Multivariate logistic regression analysis was performed in two stages. The first stage predicts the assignment of class A *vs* classes B or C. The second model predicts the assignments of class C, given that the patient has been assigned either class B or C. Only two variables were consistently predictive of a more severe degree of malnutrition in both models: loss of subcutaneous tissue *($p < 0.001$)* and muscle wasting *($p < 0.05$)*. In the second stage of the model (ie, prediction of class C), percent weight loss was also a significant predictor *($p < 0.005$)*.

Interrater Reproducibility (Observer Agreement)

For the 109 patients who were given SGA ratings by two clinicians, there was agreement in 100 (91 %) of the cases, which was 78% above the agreement that could be expected by chance alone, ie, Kappa = 0.784 (SE = 0.08, 95% confidence interval 0.624 to 0.944). The individual kappas for three pairs of raters were: nurse A and resident A 0.81, nurse A and resident B 0.60, nurse A and resident C 1.0, nurse B and resident C 1.0. There is, therefore, a good level of agreement between observers in assigning SGA ratings; however, it should be noted that the level of agreement varies between pairs of raters.

DISCUSSION

The technique of performing subjective global assessment of patients' nutritional status has been described in considerable detail in this paper. We have found that a group of clinicians that included both nurses and physicians was able to learn and apply the method with ease. The univariate analyses demonstrate that the clinicians assigned lower SGA ranks (eg, C) to patients who exhibited more of the features which indicated poor nutritional status (eg, the correlations shown in Tables

TABLE III
Proportion of subjects in categorical variable levels and their correlation with SGA class

Characteristic	Levels	SGA class*			Coefficient correlation (Kendall's tau)†
		A	B	C	
Weight loss category	<5%	0.81	0.41	0.20	0.56
	6-10%	0.12	0.20	0.05	
	>10%	0.07	0.39	0.75	
Change in dietary in- take	Normal	0.73	0.19	0.20	0.48
	Suboptimal‡	0.24	0.76	0.65	
	Hypocaloric fluids	0.02	0.05	0.15	
	Starvation	0.01	0.00	0.00	
Significant GI symp-toms of n/v/d§	Absent	0.60	0.32	0.20	0.28
	Present	0.40	0.68	0.80	
Functional capacity	Full	0.61	0.20	0.15	0.42
	Suboptimal	0.36	0.63	0.45	
	Bed rest	0.03	0.17	0.40	
Loss of subcutaneous fat	None	0.94	0.17	0.00	0.82
	Mild	0.06	0.78	0.45	
	Moderate	0.00	0.05	0.50	
	Severe	0.00	0.00	0.05	
Muscle wastage	None	0.96	0.29	0.00	0.78
	Mild	0.04	0.64	0.60	
	Moderate	0.00	0.07	0.40	
Edema	None	0.98	0.88	0.60	0.35
	Mild	0.02	0.12	0.30	
	Moderate	0.00	0.00	0.10	
Ascites	None	0.98	0.93	0.85	0.20
	Mild	0.01	0.02	0.10	
	Moderate	0.01	0.00	0.00	
	Severe	0.00	0.05	0.05	

* A = well nourished; B = moderately malnourished; C = severely malnourished.
† All $p < 0.001$ except ascites where $p < 0.003$.
‡ Suboptimal solid diet and full liquid diet.
§ GI = gastrointestinal; n/v/d = nausea,vomiting, or diarrhea.

II and III). As in our previous study,[2] we again have found that SGA can be applied with a high degree of interrater agreement.

The multivariate analysis allows us to examine the simultaneous impact of all of the patient characteristics on the clinicians' SGA ratings. A literal interpretation of these results would suggest that clinicians were most influenced by two findings in the physical examination; loss of subcutaneous tissue in the triceps and rib cage, and muscle wasting in the deltoids and quadriceps. It also appears that percent weight loss may be an important predictor for patients in class C. We should point out that in the data collection form used in this study, overall percent weight loss was recorded, while the rate of change and pattern of weight loss, which the clinicians were instructed to consider, were not. For example, if a patient had lost a great deal of weight but had regained some weight in the few weeks prior to admission, we instructed the clinicians to classify the patient as better nourished than if he had lost an equal percent of weight and continued to lose weight until the time of admission. We believe that this pattern of weight loss is extremely important and that our multivariate analysis may not have captured its essence because of the incomplete data collection. We would urge those performing SGA on their patients to consider carefully both the amount and pattern of weight loss, as outlined in Table I. As previously mentioned, we had considerable difficulty with the variable "disease and its relation to nutritional requirements." Whereas it is useful to note the patient's underlying diagnosis, we believe this variable may be dropped from SGA.

In teaching our raters to assign rankings, we did not use an explicit set of numerical weights such as those used in the Prognostic Nutritional Index[14] or other predictive indexes.[15] Although the derivation and testing of decision rules is currently a popular activity in clinical research, we generated the hypothesis in our previous study that subjective weighting would have predictive validity. Subjective prognostic indexes have been used to predict mortality in other clinical conditions, such as patients admitted to intensive care units[16] or general medical services.[17] The disadvantages of subjective systems is that it is harder for the researchers to describe the prognostic maneuver and demonstrate reproducibility. In addition, as suggested by Steinberg and Anderson,[18] subjective ratings may be difficult to use for prognostic stratification for the purposes of financial reimbursement for comorbid diseases (although probably no more difficult than assigning comorbid conditions such as congestive heart failure or even diabetes in the absence of strict objective diagnostic criteria). However, clinicians should not be fooled into thinking that numerical weighting schemes are better merely because the weighting system is explicit. The weights derived from statistical techniques such as stepwise regression, discrimi-

nant, or logistic regressions are notoriously unstable, particularly if the variables are correlated with each other. The need for prospective validation of such explicit decision roles cannot be overestimated.[15] The sample sizes required to achieve precision for these weights (ie, narrow statistical confidence limits) may be very large, and confirmation of predictive validity may vary in a variety of settings. Subjective weighting systems also require prospective validation. (Our subsequent report of this study will show the ability of SGA to predict post-operative complications in this sample of patients and the correlation of SGA with other measurements of nutritional status.) A major advantage of the subjective approach is its flexibility in allowing clinicians to capture subtle patterns of change in clinical variables (eg, the pattern of weight loss, rather than absolute amount, or revision of influence that weight pattern has if there has been recent fluid retention) which would require the presence of several "interaction terms" (ie, the product of two variables) in an explicit index.

To the extent that we are successful in communicating our subjective weighting approach to clinicians who read this paper, we will fill a gap in the literature which we created ourselves by not adequately describing the technique of SGA in our previous publications. This technique can be easily taught to a wide variety of clinicians involved in the care of surgical patíents. We would urge groups who wish to adopt SGA to begin with a group training period by seeing several patients together (at least two of each SGA class) in order to achieve consistency in the method of eliciting the necessary information and agreement on the SGA ratings. We also recommend a formal test of interrater reproducibility through independent assessments. Some may also wish to test predictive and convergent validity, as we will subsequently report, in their own settings. In this way, SGA can be applied as a reliable and valid method of assessing nutritional status of hospitalized surgical patients.

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