

## Original Research

# Use of Subjective Global Assessment to Identify Nutrition-Associated Complications and Death in Geriatric Long-Term Care Facility Residents

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**Key words:** subjective global assessment, nutrition assessment, nutrition status, geriatric

**Objective:** The primary objective of this study was to assess the use of Subjective Global Assessment to identify nutrition-associated complications and death in a geriatric population. A secondary objective was to evaluate the ability of Subjective Global Assessment to identify geriatric residents of long-term care facilities who were undernourished or at risk for developing undernutrition.

**Methods:** Fifty-three consecutive residents who were  $\geq 65$  years of age and had been residing in a long-term care facility for  $< 2$  weeks were enrolled in the study. The Subjective Global Assessment Classification technique was performed according to the procedure outlined by Detsky and colleagues. Residents were classified as well-nourished (A), mild/moderately undernourished (B) or severely undernourished (C). In addition, a Subjective Global Assessment Composite Score was derived. Subjective Global Assessment measures were compared with two traditional objective measurements of nutritional status: serum albumin and serum total cholesterol. Outcome measurements of nutrition-associated complications were determined over a 3-month period by recording the incidence of major infections, decubitus ulcers, nutrition-related hospital readmissions, and mortality.

**Results:** Sixteen residents (30.2%) were categorized as Subjective Global Assessment class A, 28 residents (52.8%) were class B, and 9 residents (17%) were class C. A significant association was found between nutritional status as determined by Subjective Global Assessment Composite Score and nutrition-associated complications ( $p < 0.05$ ). Subjective Global Assessment Classification was related to death ( $p < 0.05$ ) with severely undernourished residents having the highest mortality rate. Hypoalbuminemia only demonstrated a significant relationship with nutrition-associated complications ( $p < 0.05$ ), whereas hypocholesterolemia was associated with death ( $p < 0.05$ ).

**Conclusions:** Subjective Global Assessment of nutritional status appears to be a simple, noninvasive and cost-effective tool for assessing nutritional status of geriatric residents in long-term care facilities. This assessment tool is also beneficial for identifying patients with increased risk of nutrition-associated complications as well as death.

## INTRODUCTION

The term *malnutrition* has been used in the medical literature to characterize a broad range of altered nutritional states. To delineate nutritional disorders more specifically, overnutrition is the terminology used to describe excess nutrient intake and undernutrition to

include insufficient intake. Undernutrition in long-term care facilities (LTCF) is an important clinical and public health issue in the US. The prevalence of undernutrition in geriatric residents [1] of LTCF has been reported to be 17% to 65%. Health-care professionals are becoming increasingly aware that undernourished elders are at a greater risk for developing nutrition-associated complications (NAC). These

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complications may be manifested in the form of cognitive dysfunction, fatigue, pressure ulcers and an increased susceptibility to infections [2]. In a skilled nursing facility where the majority of residents are elderly, NAC translate into significant morbidity and mortality for the nation's growing elderly population.

A high proportion of elderly residents presents to LTCF with some degree of undernutrition. It is often difficult to distinguish undernutrition from the natural process of aging. Currently, there is no 'gold standard' procedure for clinicians to identify residents who are undernourished or at risk for such an occurrence. Several types of nutrition screening tools have been developed for evaluating the nutritional status of elders. The Nutrition Screening Initiative is a project of the American Academy of Family Physicians, the American Dietetic Association, and the National Council on the Aging, Inc., developed to promote routine nutrition screening and better nutrition care for older adults [3]. The Minimum Data Set, a Health Care Financing Administration-mandated assessment instrument used in virtually all US LTCF, has been used to assess nutritional status in LTCF [4]. Finally, the Mini Nutritional Assessment has also recently been designed to provide an assessment of elderly patients in hospitals and LTCF [5]. Unfortunately, these tools have not taken the area of nutritional screening from an exercise in categorization to prediction of outcome in the elderly residing in LTCF.

The Subjective Global Assessment (SGA) Classification technique can aid in the recognition of undernutrition by allowing for subjective assessment of a patient's nutritional status based upon features of the medical history and physical examination [6]. The SGA Classification technique of nutritional status has been used as a diagnostic tool and prognostic instrument in hospitalized patients undergoing surgery [7], dialysis patients [8] and liver transplant patients [9]. Despite the success of the SGA Classification technique in these patient populations, this nutritional assessment technique has not been validated for its ability to identify NAC and death in geriatric residents of LTCF.

The primary objective of this study was to assess the use of SGA Classification as an indicator of NAC in this geriatric population. Outcome measurements of NAC were determined over a three-month period by recording the incidence of major infections, pressure ulcers, nutrition-related hospital readmissions and mortality. A secondary objective was to evaluate the ability of SGA Classification to identify elders who were undernourished or at risk for developing undernutrition in a LTCF. The efficacy of this technique was compared with two traditional objective measurements of nutritional status in the geriatric population: serum albumin and serum total cholesterol.

## MATERIALS AND METHODS

### Patient Sample

All residents aged 65 years or older admitted consecutively to four local area LTCF were eligible for enrollment into the

study. In order to accrue an appropriate number of eligible residents, recruitment from multiple LTCF was required. Residents were excluded if they were receiving specialized nutrition support (i.e., enteral or parenteral nutrition), antibiotics for active infections, cholesterol-lowering pharmacotherapy or demonstrated the presence of a Stage IV pressure ulcer upon admission to the LTCF. Residents with altered mental status or dementia were included in the study if reliable information on baseline nutritional status could be obtained from a knowledgeable caregiver.

### Study Protocol

This research study was approved by the University of Mississippi Medical Center Institutional Review Board. Within two weeks of admission to the LTCF, residents were screened and entered into the study upon receiving informed consent from the elder or from relatives. Height and weight measurements were obtained from the Minimum Data Set, the assessment instrument that constitutes the core of the Resident Assessment Instrument system [4]. The height and weight of residents were obtained at admission, with weight measurements repeated monthly thereafter. The scale available on the unit was used for all measurements, with the attached rod used for height measurements. No special calibration was performed for the scales at the various institutions. Body mass index was calculated using the weight in kilograms divided by the square of the height in meters. Nutritional status was evaluated using SGA Classification technique as outlined by Detsky and colleagues [6]. Briefly, the SGA Classification technique used historical data gathered from the patient on weight change, altered dietary intake, gastrointestinal symptoms influencing oral intake/absorption or any effects of undernutrition which may impact functional capacity. A physical examination was also performed to detect clinical characteristics of undernutrition, such as loss of subcutaneous tissue and muscle wasting (Fig. 1). On the basis of findings from the health history and physical examination, the assessor categorized the patient as well nourished (Classification A), mild/moderately undernourished (Classification B) or severely undernourished (Classification C). For example, residents who had lost more than 10% of their usual weight over six months, reported a continued weight loss within the previous two weeks and exhibited physical signs of muscle wasting were categorized as severely undernourished. If a 5% to 10% weight loss was reported within the past six months and residents exhibited modest signs of undernutrition such as subcutaneous tissue loss, residents were classified as mild/moderately undernourished. Well-nourished residents reported no history of weight loss nor exhibited any physical signs of undernutrition.

Two pharmacists performed the SGA Classification technique on all residents enrolled into the study without knowledge of any laboratory data. Each was taught to perform the



gastrointestinal symptoms, and so on) was evaluated and assigned a SGA Classification. SGA Classifications were then converted to numerical equivalents: A=1, B=2, C=3. The point values for each clinical feature of the SGA technique were totaled, and a mean SGA Composite Score was calculated for each individual. For example, in evaluating the clinical feature of weight change, a history of no weight loss would be assigned a one-point value (A) versus a history of greater than 10% weight loss receiving a three-point value (C). Two traditional objective measurements of nutritional status were also obtained for comparison with both SGA measures (Classification and Composite Score). Blood samples for serum albumin and total cholesterol were collected upon admission into the LTCF.

The pharmacists monitored residents in a prospective fashion at one-month intervals for up to three months to evaluate the ability of SGA Classification to predict NAC. These complications have been previously recognized as clinical events that may occur in association with undernutrition [2]. The development of NAC for this elderly population was limited to major infections, pressure ulcers and mortality. Hospital readmission due to NAC was also recorded. Major infections were defined as fever, leukocytosis and a documented pathologic organism from a specific site (e.g., lung for pneumonia). Radiological confirmation also was used in making the diagnosis of pneumonia. Definitions of pressure ulcers were in accordance with the National Pressure Ulcer Advisory Panel [10]. Primary diagnoses and comorbid diseases for each subject were specified by the personal physician and obtained from the Minimum Data Set. Mortality was defined as death of the elder within three months from the date of enrollment. To be included in final data analysis, residents were required to have serum albumin and cholesterol measurements available within two weeks of admission to the LTCF. If individuals expired within one month of study enrollment, their nutritional characteristics were still included in statistical analyses.

### Statistical Techniques and Data Analysis

Comparisons among the three SGA Classifications were made using a one-way analysis of variance. For dichotomous independent variables such as death and hospital readmission, we used an independent *t* test when possible. If the data did not meet the parametric assumptions, a Mann-Whitney U was used. All descriptive statistics are presented as frequencies or as means  $\pm$  standard deviations unless otherwise noted. Sensitivity and specificity calculations for hospital readmission and mortality were based upon dividing the SGA Composite Score into dichotomous categories of 0–14.9 and  $\geq 15$ . This study had a power of  $>0.80$  to detect at least a 20% difference in the SGA measures for the primary outcome variables: major infections, pressure ulcers and NAC-related hospital readmission at an alpha of 0.05. The kappa statistic was used to measure inter-observer agreement between the two pharmacist nutritional assessors.

## RESULTS

Fifty-six elders were recruited from four local LTCF over a six-month period. Three individuals did not have complete data sets available for final statistical analysis. Serum total cholesterol or albumin was not collected for two elders, and one additional elder was discharged home within one month of study enrollment, precluding collection of outcome data. Thus, statistical analyses were performed on data collected from a total of 53 residents. Patient demographic characteristics and disease diagnoses are displayed in Table 1.

Descriptive statistics of nutritional variables are shown in Table 2. Of the 53 residents completing the study, 16 (30.2%) were classified as SGA Classification A, 28 (52.8%) as Classification B and 9 (17%) as Classification C. As expected, the mean values of usual body weight, percent ideal and usual body weight, and body mass index (BMI) decreased consistently across the SGA Classifications, with the lowest values of each occurring in Classification C. Of interest was the significant difference between the BMI and the three SGA classifications ( $p<0.01$ ). SGA Classifications B and C exhibited a BMI $<22$ , a value previously recognized as a significant sign of poor nutritional status in individuals over the age of 65 years [11]. As depicted in Table 2, serum albumin and total cholesterol concentrations were not significantly different across SGA Classifications.

The overall incidence of major infection was approximately 20%. The types of major infections included pneumonia (7/11), urosepsis (2/11), septicemia (1/11), and cellulitis (1/11). No

**Table 1.** Characteristics of Study Population

Demographics	n*
Age (years)	83.2 $\pm$ 5.8 <sup>†</sup>
Female	42 (79%) <sup>‡</sup>
Caucasian	50 (94%)
Disease Diagnoses from MDS <sup>§</sup>	
Endocrine/Metabolic	14 (26%)
Nutritional	
Heart/Circulation	40 (75%)
Musculoskeletal	39 (74%)
Neurological	30 (57%)
Psychiatric/Mood	7 (13%)
Pulmonary	9 (17%)
Sensory <sup>3</sup> (6%)	
Bladder Incontinence	4 (8%)
Bowel Incontinence	1 (2%)
Pressure Ulcers	6 (11%)
Other <sup>¶</sup>	15 (28%)

\* n=53.

<sup>†</sup> Mean  $\pm$  SD.

<sup>‡</sup> Percentage in parentheses.

<sup>§</sup> MDS=Minimum Data Set.

<sup>¶</sup> Other=includes diagnoses of allergies, anemia, cancer, renal failure, gout, gastrointestinal diseases.

**Table 2.** Nutritional Characteristics of Study Population

Variables	SGA Classifications			One-Way ANOVA <i>p</i> -value*
	A (n=16)	B (n=28)	C (n=9)	
Height (cm)	164.0 ± 10.9 <sup>†</sup>	164.5 ± 6.7	160.1 ± 11.4	0.430
Actual weight (kg) <sup>‡</sup>	69.4 ± 12.6	57.4 ± 9.1	51.2 ± 18.9	0.001
Usual weight (kg) <sup>§</sup>	70.5 ± 12.7	62.6 ± 9.4	55.6 ± 14.7	0.009
% Usual weight <sup>  </sup>	98.6 ± 4.8	92.2 ± 9.6	82.8 ± 9.7	0.000
Ideal weight (kg)	56.8 ± 11.5	57.2 ± 6.6	54.3 ± 11.8	0.715
% Ideal weight <sup>  </sup>	122.9 ± 11.9	99.5 ± 14.9	85.0 ± 18.8	0.000
BMI (kg/m <sup>2</sup> ) <sup>¶</sup>	25.7 ± 2.6	21.4 ± 3.7	17.7 ± 3.8	0.000
Albumin (g/L)	35 ± 4.0	33 ± 5.0	31 ± 4.0	0.121
Cholesterol (mmol/L)	5.3 ± 1.1	5.1 ± 0.9	4.4 ± 1.2	0.152

\* *Post hoc* analysis performed (for significant ANOVA only) - using Tukey HSD.

<sup>†</sup> Mean ± SD.

<sup>‡</sup> Group A is significantly greater than groups B and C; Group B is significantly greater than Group C.

<sup>§</sup> Group A is significantly greater than group C.

<sup>||</sup> All pair-wise comparisons are significantly different.

<sup>¶</sup> BMI=body mass index.

significant relationship was demonstrated between major infections and nutritional status as determined by SGA Class (Mann-Whitney=162.5, *p*=0.097), albumin [t(51)=1.14, *p*=0.260], nor cholesterol [t(51)=1.98, *p*=0.053]. However, major infections were significantly related to nutritional status as determined by SGA Composite Score (Mann-Whitney=139.0, *p*=0.043). The presence of pressure ulcers was documented in 10 of 53 residents (19%). However, four of the ten elders entered the study with pressure ulcers, and the other six individuals developed pressure ulcers during the course of the study. All pressure ulcers were Stage I and II, and the ulcers either healed or remained unchanged throughout the study period. Neither the SGA Classification nor the SGA Composite Score were related to the presence of pressure ulcers [Mann-Whitney=177.5, *p*=0.195; t(51)=1.33, *p*=0.189], respectively. Hospital admissions from the LTCF occurred in 16 of 53 residents. The admitting diagnoses for nine of 53 residents (56%) met criteria for NAC, and all but one NAC were classified as major infections. The remaining individuals were admitted to the hospital for factors that could not be directly

attributed to nutritional status, such as falls (n=3), congestive heart failure (n=1), renal stones (n=1), gout (n=1), and poorly controlled diabetes mellitus (n=1).

In Table 3, the relationship between measurements of nutritional status with outcome parameters is depicted. A significant difference in SGA Composite Score was noted between those readmitted and those not readmitted for NAC. Those readmitted had a significantly higher SGA Composite Score (*p*<0.05). When the SGA Composite Score was divided at 15, the sensitivity of this measurement for hospital readmission was 50%, with a specificity of 80%. Serum albumin concentration was the only other measurement that exhibited a significant relationship with this outcome parameter. The mortality rate among all four local LTCF during the three-month follow-up period was 15% (8/53). Both SGA measurements (i.e., Class and Composite Score) were significantly related to patient death (*p*<0.05), with severely undernourished individuals displaying the highest mortality. When the SGA Composite Score was divided at 15, the sensitivity of this measurement for mortality was 75%, with a specificity of 84.4% Total serum

**Table 3.** Relationship Between Nutrition Assessment Techniques and Outcome Measures

Measurements	Death		NAC Readmissions*	
	Yes (n=8)	No (n=45)	Yes (n=8)	No (n=45)
Albumin (g/L)	31.6 ± 4.9 <sup>†</sup>	33.4 ± 4.4	29.7 ± 3.1	33.7 ± 4.9 <sup>‡</sup>
Cholesterol (mmol/L)	4.16 ± 0.82	5.16 ± 1.04 <sup>‡</sup>	4.58 ± 1.16	5.08 ± 1.05
SGA <sub>class</sub> <sup>§</sup>	37	25.2 <sup>  </sup> †	34.69	25.63 <sup>  </sup>
SGA <sub>score</sub> **	15.81 ± 3.51	12.44 ± 2.20 <sup>‡</sup>	15.0 ± 3.3	12.59 ± 2.44 <sup>‡</sup>

\* Represents hospital readmissions due to nutrition-associated complications.

<sup>†</sup> Mean ± SD.

<sup>‡</sup> *p*<0.05, independent *t* test.

<sup>§</sup> SGA<sub>class</sub>=SGA classification as outlined by Detsky [3].

<sup>||</sup> Mean rank of SGA<sub>class</sub>.

<sup>†</sup> *p*<0.05, Mann-Whitney U Test.

\*\* SGA<sub>score</sub>=SGA composite score derived based upon the severity of each clinical feature of SGA.

cholesterol concentrations were also related to patient outcome. Hypocholesterolemia was associated with a reduction in survival. Elders who died within three months of study enrollment demonstrated mean total serum cholesterol concentrations of 4.1 mmol/L compared with patient survivor concentrations of approximately 5.2 mmol/L ( $p < 0.05$ ).

There was good level of agreement between the two pharmacists in assigning SGA Classifications. Exact agreement on SGA Classification occurred in 45 of 53 residents (85%). Kappa statistics applied to the data revealed a concordance of 0.75. Thus, the proportion of agreement between examiners was 75% above the agreement that could be expected by chance alone. A kappa greater than 0.80 is considered almost perfect agreement in all instances [12].

## DISCUSSION

This is one of the first investigations to find a relationship between clinical assessment of nutritional status and outcome parameters in geriatric residents of LTCF. The present study demonstrated that nutritional status as determined by SGA Classification was highly indicative of patient mortality and nutrition-related hospital readmission in this population. SGA Classification has been shown to be predictive of mortality and functional dependence in older patients after hospital discharge. Covinsky and colleagues [13] demonstrated that moderate and severe undernutrition as determined by SGA Classification was highly predictive of mortality at 90 days and one year after hospital discharge. In patients surviving hospitalization, the most severely undernourished patients at the time of hospital discharge displayed the highest risk for spending time in a LTCF for delayed functional recovery. Similar results have been shown in a group of elderly patients admitted to a geriatric recuperative care and rehabilitation unit [14]. The best predictor of non-elective hospital readmission at the time of discharge was serum albumin. An additional nutritional assessment parameter, subscapular skinfold thickness, was also identified as an independent predictor for hospital readmission. Our results demonstrate that the SGA measures (i.e., Classification and Composite Score) may be a useful addition to laboratory or anthropometric measurements for determining the probability of morbidity and mortality in undernourished elders residing in a LTCF. For example, the SGA Composite Score exhibited a relatively high specificity for mortality and hospital readmission. Thus, this measurement was helpful in identifying the patients most likely alive in three months and not readmitted to the hospital for nutrition-related complications. Such information would allow resources to be redirected toward other residents found to be at an increased risk for undernutrition.

Previous studies have suggested that laboratory measurements are strongly related to adverse outcomes and mortality in older persons. Serum albumin and total cholesterol are two traditional laboratory measurements of nutritional status in the

geriatric population. The serum albumin concentration has been proposed as the classic marker of visceral protein status, since the liver synthesizes it. A decrease in this serum protein concentration is believed to reflect a decline in biosynthesis from a reduction in liver mass [15]. Although serum albumin concentrations  $< 35$  g/L may identify younger individuals with protein malnutrition, this level of hypoalbuminemia frequently occurs in elderly persons in the absence of weight or muscle loss. Inflammatory processes, liver/renal disease and the presence of fluid retention have been associated with depressed serum albumin concentrations [16]. Many or all of these illnesses are present in geriatric residents residing in LTCFs, decreasing the sensitivity of this nutritional assessment technique. Although serum albumin did exhibit a significant negative relationship with hospital readmission in this investigation, it displayed no relationship with patient mortality. Furthermore, serum albumin did not exhibit a relationship with SGA Classification, with concentrations not differing significantly between the three classifications of nutritional status as determined by the SGA technique.

Likewise, hypocholesterolemia has been used to detect undernutrition based upon observations that decreased hepatic synthesis and secretion of lipoproteins occur in severely undernourished individuals [17]. Factors unrelated to nutritional status that contribute to low cholesterol concentrations may include hypercatabolism of lipoprotein particles, gastrointestinal malabsorption, or extravasation of serum lipoproteins into the extravascular space [18]. Increased protein requirements in some geriatric patients have accounted for low total serum cholesterol concentrations [19]. While total cholesterol was directly related to death in our patient population, it showed no relationship to hospital readmissions for NAC. Total cholesterol concentration also did not demonstrate a relationship with SGA Classification, with similar concentrations present among the three classifications of nutritional status.

Undernutrition is a common problem in geriatric LTCFs. One survey revealed that up to 85% of residents in a LTCF were at risk for undernutrition [20]. Despite its associations with increased morbidity, poor immune status and decreased quality of life, undernutrition frequently goes unrecognized and is often left untreated [21]. A primary reason for this lack of identification is the absence of simple, reliable and comprehensive methods for evaluating nutritional status in LTCF residents. A variety of objective measurements have been utilized to diagnose or identify patients at risk for undernutrition. Examples of these assessment techniques include anthropometric evaluation, weight change, determination of immune competence, creatinine-height index and visceral protein status [22]. Each of these single measurements lacks the sensitivity and specificity to be a reliable index of nutritional status. Therefore, a comprehensive assessment technique incorporating several nutritional variables is needed to identify patients with undernutrition accurately.

SGA Classification is one comprehensive assessment technique that has been shown to be a valid screening tool for the prevention and treatment of undernutrition in various patient populations. The original validation study of SGA Classification was performed in 59 hospitalized patients admitted for elective surgery [23]. SGA Classification was compared to objective measurements of body composition, serum hepatic protein concentrations, total lymphocyte count and delayed hypersensitivity skin testing. A strong relationship was noted between clinical assessment and all measures of nutritional status except total lymphocyte count, transferrin and total body nitrogen. Outcomes were also directly linked to clinical assessment as determined by the SGA Classification technique. Of the 18 individuals who developed infectious complications, 69% were categorized as severely malnourished (C), 43% were mild/moderately malnourished (B) and 16% were well-nourished (A). In a follow-up study by the same group of investigators [7], SGA was evaluated as a predictor of major postoperative complications in patients undergoing gastrointestinal surgery. SGA Classification was compared with six traditional measurements of nutritional status, including serum albumin, serum transferrin, delayed cutaneous hypersensitivity, anthropometry, creatinine-height index and the prognostic nutritional index. NAC such as infection and wound dehiscence were found to correlate significantly with the use of SGA Classification. Nutritional assessment by SGA Classification was also noted to be the most sensitive (0.82) and the most specific (0.72) technique applied.

The promising results obtained with SGA Classification in multiple patient populations [8,9] prompted this group to evaluate the SGA Classification technique in an institutionalized elderly population. Detection of undernutrition in this population has been shown to be particularly difficult because the aging process can affect many of the anthropometric and biochemical indices commonly used in the younger population. The presence of several comorbid disease states also complicates the accurate diagnosis of undernutrition. In this study, the SGA Classification technique appeared to be a useful tool for assessing nutritional status. Elders classified as SGA class C were those individuals who exhibited the most features consistent with poor nutritional status (e.g., <90% IBW, <90% UBW, BMI <20).

The results from this study illustrate that the SGA Classification technique can avoid many of the confounding variables associated with traditional objective measurements of nutritional status in geriatric LTCF residents. One criticism of subjective assessment techniques has been the increased difficulty of describing these processes to general practitioners and in obtaining reproducible results [6]. Yet the subjectivity may be viewed as a strength, as this allows clinicians to use clinical judgment rather than apply rigid criteria that may not be valid in all clinical scenarios. In addition, multiple studies using the

SGA Classification technique have demonstrated a high reproducibility and agreement among numerous assessors. Interobserver reproducibility has been shown to be 81% (kappa statistic: 0.72)[24], 91% (kappa statistic: 0.784)[6] and 77.8% (kappa statistic: 0.76)[25] in studies using the SGA technique. Furthermore, one study was conducted with the explicit purpose of comparing the reliability of results obtained by first-year residents *versus* specialists in clinical nutrition using the SGA Classification technique for measuring nutritional status [26]. The concordance between residents and specialist ratings was 79% (kappa statistic: 0.66). Agreement was 85% (kappa statistic: 0.75) among the two assessors in our study, reflecting that the proportion of agreement between the two assessors was 75% above the agreement that could be expected by chance alone. We determined this level of agreement to be acceptable, considering that a kappa greater than 0.80 is considered almost perfect agreement in all instances. In an effort to further address the issue of subjectivity, a SGA Composite Score was also created based upon a numerical rating generated by the severity of clinical features composing the SGA technique. In this way, the assessors demonstrated more confidence in assigning the final SGA Classification of nutritional status to each patient. When SGA Classification was determined using this score, there appeared to be a stronger relationship with the outcome parameters of death and NAC compared to assigning the SGA Classification without using the score. For example, those patients determined to be the most undernourished with the SGA Composite Score displayed the highest incidence of major infections. The nutrition assessors were also able to retain their flexibility in detecting subtle variations in clinical symptoms that ultimately determined the patient's final classification of nutritional status.

Several issues should be considered when interpreting the results of this study. One limitation of SGA Classification is its inability to detect acute declines in nutritional status while primarily detecting alterations of chronic nutrient deprivation. Yet an evaluation of nutritional status over a long-term period is usually desired in the clinical environment of LTCF. As mentioned earlier, malnutrition may encompass both undernutrition and obesity. One weakness of the SGA Classification technique is that it only attempts to identify measurements of undernutrition. Obese patients are classified as well nourished. Thus, the SGA Classification technique is not effective for predicting outcomes for all nutritional disorders, but primarily for disorders resulting from a deficiency of nutrient intake.

In summary, SGA measures are an important indicator of outcome in these individuals, with the SGA Composite Score significantly identifying residents with a propensity for nutrition-related hospital readmissions and mortality. SGA measures also proved to be simple, reproducible and noninvasive methods for identifying persons with a history and physical signs consistent with undernutrition. In this age of health care, when resources available to most nursing homes are limited, practitioners can use this method of nutritional assessment to

identify those elders who are at high risk for complications related to altered nutritional status. Savings achieved from reducing NAC and minimizing the labor intensive process of nutritional screening may be possible by incorporating this simple instrument for nutritional assessment. Future studies are needed to determine if substantial cost savings for the health care system are possible if health care practitioners are able to identify and intervene to potentially reverse a patient's nutritional deficits.

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*Received March 3, 2000; revision accepted July 27, 2000.*