Original Article

Comparison of a malnutrition screening tool with subjective global assessment in hospitalised patients with cancer – sensitivity and specificity

Judith Bauer BSc, Grad Dip Nutr & Diet, MHlthSc, APD [1,2] and
Sandra Capra BSc (Hons), Grad Dip Nutr & Diet, MSocSc, PhD, APD[2]

[1] *The Wesley Research Institute, Brisbane. Australia*
[2] *Centre for Public Health Research, Queensland University of Technology, Brisbane. Australia*

Malnutrition is common in hospitals and it is important to implement an appropriate nutrition screening tool to identify patients at risk. The aim of the study was to assess the sensitivity and specificity of the malnutrition screening tool developed by the Malnutrition Advisory Group of the British Association of Parenteral and Enteral Nutrition against subjective global assessment in hospitalised patients with cancer. A cross-sectional study assessing the risk of malnutrition and nutritional status of sixty-five hospitalised patients with cancer, aged 56 ± 15 years. According to subjective global assessment, 25 % of patients were well nourished and 75% were malnourished (63% were moderately or suspected of being malnourished and 12% severely malnourished). The malnutrition screening tool had a low sensitivity of 59% and a specificity of 75%. The positive predictive value was 88% and the negative predictive value 38%. There were significant linear trends between subjective global assessment classification and percentage weight loss in the previous six months ($P < 0.001$) and body mass index ($P = 0.007$). The malnutrition screening tool developed by the Malnutrition Advisory Group of the British Association of Parenteral and Enteral Nutrition is not a suitable screening tool for detecting risk of malnutrition in hospitalised patients with cancer.

Key Words: nutrition screening, subjective global assessment, nutrition assessment

Introduction

Malnutrition is common and frequently not recognised in hospital patients.[1,2] The consequences of malnutrition may include an increased risk of complications, decreased response and tolerance to treatment, a lower quality of life, reduced survival and higher health-care costs.[3-5] Nutrition screening is the process of identifying patients at risk of malnutrition or those suspected of becoming at risk due to disease and/or treatment. Once level of risk has been determined, the other essential elements of a nutrition support program are nutrition assessment to determine the level of deficit, and appropriate nutrition intervention. Only with a comprehensive approach to nutrition support will there be improvements in clinical, cost and patients outcomes such as nutritional status, quality of life, patient satisfaction, morbidity and mortality.[6]

A malnutrition screening tool has been published by The Malnutrition Advisory Group (MAG), a standing committee of The British Association of Parenteral and Enteral Nutrition (BAPEN).[7] This tool was developed by a multidisciplinary group for the detection and management of undernutrition in adults in the community.

Risk of malnutrition is assessed as low, moderate or high on the basis of response to two questions regarding body mass index (BMI) and unintentional weight loss in the previous three to six months. BMI is used as an indicator of chronic protein-energy status and unintentional weight loss as an indicator of more recent undernutrition. A recommendation of the Malnutrition Advisory Group that additional research was required to assess the application of the MAG nutrition screening tool in different settings such as hospitals, nursing homes and residential care settings as the tool was developed for the community setting.[7] Although the reliability, internal consistency and ease of use of the MAG nutrition screening tool has been determined, the sensitivity and specificity of the tool in hospitalised patients has not been reported.

Subjective global assessment (SGA) is a validated method of nutritional assessment based on the features of a medical history and physical examination.[8] It has been applied successfully as a method of assessing nutritional status and predicting outcomes in hospitalised patients, including patients with cancer.[8-12]

Correspondence address: J. Bauer, The Wesley Research Institute, PO Box 499, Toowong. Queensland. Australia 4066.
Tel: (07) 3232 7918; Fax: (07) 3371 6834
Email: judithba@wesley.com.au
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The aim of this study was to assess the sensitivity and specificity of the MAG nutrition screening tool against SGA in hospitalised patients with cancer.

Subjects and methods

All patients aged at least 18 years, admitted to an oncology ward of a tertiary private Australian hospital over a three month period were eligible for inclusion in the study. A sample of 65 patients agreed to participate in the study: 60% (39) were male and 40% (26) female. The mean (SD) age was 56.4 (15.2) years. The major diagnoses were 49% lymphoma and 13% breast cancer.

Data collection and analysis

A dietitian experienced in performing SGA assessed each patient according to standard guidelines using a predetermined proforma.[8] This method of nutritional assessment is based on a medical history (weight change, dietary intake change, gastrointestinal symptoms that have persisted for more than 2 weeks, changes in functional capacity) and physical examination (loss of subcutaneous fat, muscle wasting, ankle/sacral oedema and ascites). The medical history accounts for 60% and physical examination 40% of the assessment and patients are classified subjectively as either well nourished (SGA A), moderately or suspected of being malnourished (SGA B), or severely malnourished (SGA C).

Risk of malnutrition was determined by an independent experienced dietitian using the guidelines accompanying the MAG nutrition screening tool and proforma. Body mass index and percentage unintentional weight loss in the previous six months were determined. High risk patients were categorised as those with either a BMI < 18.5 kg/m^2 or BMI 18.5-20 kg/m^2 plus weight loss of 5-10%. Medium risk patients were categorised as those with BMI 18.5-20 kg/m^2 and <5% weight loss (or weight gain) or BMI>20 kg/m^2 and weight loss of 5-10%. Low risk patients were categorised as those with BMI >20 kg/m^2 and weight loss <5% (or weight gain). Information on age, gender and diagnosis was obtained from the medical record.

Statistical analyses were carried out using SPSS Version 11, 2001 (SPSS Inc, Chicago, IL, USA). A contingency table was used to determine the sensitivity, specificity and the predictive value of the MAG nutrition screening tool compared to SGA. Linear regression was used to examine the linear trend between age, BMI and percentage weight loss in the previous six months for each SGA classification. Statistical significance was reported at the conventional P<0.05 level (two-tailed). The study was approved by the Multi-disciplinary Ethics Committee of the hospital and informed written consent was obtained from all participants.

Results

Baseline characteristics of the study participants

Baseline characteristics of the study participants are shown in Table 1. According to SGA, 25% (16) of 65 patients were well nourished and 75% (49) malnourished, of which 63% (41) of patients were moderately or suspected of being malnourished and 12% (8) of patients were severely malnourished.

Table 1. Characteristics of 65 hospitalised patients with cancer.

Variable	Mean ± SD
Age (years)	56.4 ± 15.2
Height (cm)	171.3 ± 10.4
Weight (kg)	71.1 ± 15.8
BMI (kg/m^2)	24.4 ± 4.8
Weight loss (%)	4.7 (0.0-26.1)*

* median (range)

Predictive value of the MAG nutrition screening tool

The ability of the MAG nutrition screening tool to predict SGA is shown in Table 2. Eighteen per cent (12) of 65 patients were correctly classified by the MAG nutrition screening tool as being well nourished (true negatives) and 45% (29) of patients were correctly classified as being malnourished (true positives). Thirty-one per cent (20) of patients were misclassified as being well nourished (false negatives) and 6% (4) of patients were misclassified as being malnourished (false positives). The MAG nutrition screening tool had a sensitivity of 59% and specificity of 75%. The positive predictive value was 88% and the negative predictive value 38%.

The two individual questions comprising the MAG nutrition screening tool (percentage weight loss in the previous six months and BMI) were assessed for association with SGA. There were significant linear trends between percentage weight loss in the previous six months and SGA classification ($F_{(1,64)}$ = 26.5, P<0.001) and BMI and SGA classification ($F_{(1,58)}$ = 7.9, P=0.007). Age, percentage weight loss in previous six months and BMI for each SGA classification are shown in Table 3.

Discussion

The aim of this study was to evaluate the sensitivity and specificity of the MAG nutrition screening tool in hospitalised patients with cancer. The MAG nutrition screening tool had a low sensitivity of 59% and specificity of 75%. Nutrition screening is the initiation of the process of recognising and responding to nutrition related problems. It helps assure that nutrition care is delivered consistently and that resources are directed to the appropriate patients. The ideal nutrition screening tool would be 100% specific and sensitive. However the need to correctly classify all patients who are malnourished (sensitivity) takes precedence over misclassifying well nourished patients (specificity). The MAG nutrition screening tool failed to identify 20 patients who were malnourished according to SGA, one of whom was severely malnourished. As the MAG screening tool was originally developed for detecting risk of malnutrition in the community, it is important that the tool is validated prior to use in a different population such as hospitalised patients. Although this was a recommendation of the MAG, no validation studies have been reported in hospitalised patients despite the tools introduction into this setting in the United Kingdom. The Malnutrition Advisory Group

has proposed an adaptation of the nutrition screening tool for use in hospitals, however, this adaptation and results of pilot studies have not been released or published and no data could be located. Nutrition screening tools should be noninvasive, quick and simple to complete, be able to be implemented in any setting and be completed by nontechnical staff, family or the patient.[13] The MAG nutrition screening tool meets these criteria.

It is over 25 years since Butterworth[1] published the landmark article stating malnutrition was common and unrecognized in hospitals. Two Australian studies found that according to SGA, the prevalence of malnutrition on admission in two tertiary hospitals was 36% each and a private tertiary hospital 17%.[2,12] Recent reports have shown that between 62 and 70% of malnourished patients admitted to hospital were not recognised as malnourished.[2,14] Many nutrition screening tools have been published, however, a recent review suggests that there has been inadequate assessment of their effectiveness.[15] Of 44 published nutrition screening and assessment tools reviewed, the sensitivity and specificity of only 6 were reported. Many nutrition screening tools appear to be based on expert or consensus opinion – not usually accepted as evidence.

The prevalence of malnutrition in the study population was high with 75% of patients malnourished according to SGA. These findings are not unexpected, as the incidence of malnutrition amongst patients with cancer has been estimated at between 40–80%.[16,17] Subjective global assessment is a valid and reliable tool and has been used as the preferred method of nutritional assessment in patients with cancer as well as other groups.[9-11,18,19] It has been correlated with objective parameters (anthropometric, biochemical and immunological), measures of morbidity (incidence of infection, use of antibiotics, length of stay), quality of life and has a high degree of inter-rater reproducibility.[8,12,20-22]

Weight loss has been shown to be a major prognostic factor for decreased length of survival in patients with cancer.[18,19] There was a significant linear trend between the percentage weight loss in the previous 6 months and SGA classification. There was also a significant linear trend between BMI and SGA classification, with the severely malnourished patients having the lowest BMI. However malnourished cancer patients may have a BMI within the healthy or overweight range, with body fat masking loss of lean body mass.[20] In this study the mean (SD) BMI of malnourished patients (moderately or severely) was 23.8 (5.0) kg/m^2, although they had experienced a median weight loss of 6.9 % (range 0.0-26.1%) in the previous six months.

Irwig *et al.*,[21] suggest that test accuracy may vary considerably from one setting to another and this may be due to several factors such as the target condition, the clinical problem, what other tests have been done or how the test was carried out. In this study, SGA has been used to diagnose malnutrition. However, as there is no universally accepted definition or diagnostic tests for malnutrition, using alternative methods to diagnose malnutrition or other criteria and cut-off points will result in different sensitivity and specificity.

Conclusion

In summary, the low sensitivity and specificity of the MAG nutrition screening tool suggest that it is not a suitable screening tool for detecting risk of malnutrition in hospitalised patients with cancer.

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Table 2. Classification of the Malnutrition Advisory Group nutrition screening tool of 65 hospitalised patients with cancer against subjective global assessment (SGA)

	Malnourished (SGA B + C)	Well nourished (SGA A)
At risk of malnutrition (MAG nutrition screening tool – medium + high risk)	29 (True Positive)	4 (False positive)
Not at risk (MAG nutrition screening tool –low risk)	20 (False negative)	12 (True negative)

Table 3. Age, percentage weight loss in previous six months and body mass index for subjective global assessment (SGA) classification in 65 hospitalised patients with cancer

	SGA A Well nourished	SGA B Moderately or suspected of being malnourished	SGA C Severely malnourished	*P value
Age (years) mean ± SD	49.9 ± 14.0	56.1 ± 15.0	71.0 ± 8.0	0.02
Percentage weight loss in previous six months mean ± SD	2.3 ± 4.2	6.4 ± 4.8	13.9 ± 9.2	<0.001
Body mass index (kg/m^2) mean ± SD	26.2 ± 4.0	24.5 ± 4.9	19.4 ± 2.2	0.002

*linear trend

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