Validity of a local nutritional screening tool in hospitalized Malaysian elderly patients

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ABSTRACT: Nutritional screening is a process used to identify characteristics associated with the nutritional problems. A local Malnutrition Risk Screening Tool–Hospital (MRST-H) has been developed to assess the risk of poor nutrition among elderly patients in Malaysia. The aim of this study was to evaluate the validity of MRST-H as a screening tool for malnutrition in elderly patients in Kuala Lumpur Hospital, Malaysia. A cross-sectional study was carried out at the Medical and Oncology Wards of Kuala Lumpur Hospital, Malaysia from July to August 2004. Face-to-face interviews were conducted using a structure questionnaire followed by anthropometry measurements. The MRST-H was validated against the Global Indicator of Malnutrition (GIM), combined-measures of nutritional assessment. A total of 100 respondents (37.0% men and 63.0% women) aged 65 years and above (mean age = 73.11 ± 6.03 years) were recruited. Our results showed that MRST-H was valid with 66.7% sensitivity, 96.2% specificity and 82.4% positive predictive value. The magnitude of malnutrition among the elderly patients was 21.0% according to the GIM. MRST-H is a valid nutritional screening tool for hospitalized Malaysian elderly patients. It can be used to identify patients in need of nutrition care plan.

Keywords: nutritional screening; validation; MRST-H; elderly patients

Introduction

Malnutrition is a common yet often overlooked problem among hospitalized elderly patients (Patel & Martin, 2008; Hajjar, Kamel & Denson, 2004). Malnutrition can worsen existing medical problems, increased the rate of complications, lengthy hospital stays, readmissions, institutionalization, infections, pressure ulcers, poor wound healing, impaired muscle and respiratory function and mortality (Stratton, Green & Elia, 2003; Milne, Potter & Avenell, 2002; Volkert *et al*, 1992). There is also evidence that nutritional status of elderly patients deteriorates during illness and hospitalization (Milne *et al*, 2009). In this context, it is essential to evaluate the nutritional status of elderly patients upon admission for early detection and intervention of malnutrition.

Nutritional screening is a process used to identify characteristics associated with the nutritional problems (Berner, 2003). Its purpose is to quickly identify those who are malnourished or at nutritional risk and determine whether a more detailed nutritional assessment is needed (Charney, 2005). Nutritional screening tools need to be simple, easy to use and acceptable to patients. They should also meet the criteria for reliability, validity, sensitivity, and specificity before their use in clinical practice can be recommended (Green & Watson, 2005; McLaren & Green, 1998).

In Malaysia, a local Malnutrition Risk Screening Tool-Hospital (MRST-H) has been developed to screen the risk of maltrition among hospitalized elderly patients (Sakinah, 2006). It is a holistic nutritional screening tool that includes physical, clinical and anthropometric examinations (Sakinah, 2006). The aim of this paper was to evaluate the validity of MRST-H in Malaysian elderly patients upon their admission to hospital.

Methodology

A cross-sectional study was carried out in the Medical and Oncology Wards of Kuala Lumpur Hospital, Malaysia from July to August 2004. All elderly patients (aged 65 years and above) admitted during the study period were eligible for inclusion in the study. The exclusion criteria were patients with physical deformities or impairments that would affect anthropometry measurements; critically ill patients who need intensive care (ventilated/sedated); and patients with communication difficulties. Written informed consents were obtained from patients who met the inclusion criteria and agreed to participate in the study. Face-to-face interviews were conducted on

respondents by a trained interviewer using a structured questionnaire followed by anthropometry measurements within 72 hours of their admission. This study was approved by the Director of Kuala Lumpur Hospital in May 2004 (Ref: HKL/AM/98. 882 Jld. 18).

Nutritional assessment

The nutritional status of our respondents was assessed using the Global Indicator of Malnutrition (GIM), a combination of several measures of nutritional assessment which included the anthropometric measurements – body mass index (BMI); Subjective Global Assessment (SGA); and biochemical indicators – albumin, haemoglobin, and total lymphocyte count (TLC). These nutritional assessment measures were most commonly accepted standards from the literature thus were used together as the referee gold standard of malnutrition for the purpose of this study. The respondents were considered malnourished if two or more of the indicators in GIM were presented: a BMI less than 16.0kg/m^2, SGA rating of rank C, low biochemical parameters [two or more conditions presented – hypoalbuminemia (albumin < 3.3g/dL) ; anemia (hemoglobin < 13.0g/L for men and < 11.5g/L for women); low TLC (TLC < 1200 x 10^6/L)] (**Table 1**).

Table 1: Global Indicator of Malnutrition (GIM)

No.	Items	References
1.	Body Mass Index < 16.0 kg/m^2	James *et al*. (1988)
2.	Subjective global assessment – SGA C (severely malnourished)	Detsky *et al.* (1987)
3.	≥ 2 following parameters (albumin, hemoglobin, total lymphocyte count) Hypoalbuminemia – Albumin < 3.3g/dL Anemia – Hemoglobin (men) < 13.0g/L; – Hemoglobin (women) <11.5 g/L Low total lymphocyte count – Total lymphocyte count <1200x10^6/L)	Hurwitz (1993) Kamel *et al.* (2000)
	Malnutrition → presentend ≥ 2 of the indicators above	

Anthropometric parameters of the respondents were taken using standard procedures. The body weight and standing height of the respondents were measured using the TANITA digital weighing scales and SECA bodymeter to the nearest 0.1 kg and 0.1 cm respectively. For respondents who were bed-ridden or wheelchair bounded, calf circumference (CC), knee height (KH), mid upper arm circumference (MUAC), and subscapular skinfold (SSF) measurements were used to estimate body weight using a derivation equation developed by Chumlea et al (1986); and armspan was used to estimate height using the derivation equation developed by Suzana and Ng (2003). BMI was then calculated from weight (kilograms) divided by height (meters) squared.

SGA assessed patients' nutritional status based on features of the medical history (weight change, dietary intake change, gastrointestinal symptoms that have persisted for more than two weeks, and changes in functional capacity) and physical examination (loss of subcutaneous fat, muscle wasting, ankle/sacral edema, and ascites). Features were combined subjectively into an overall or global assessment, where respondents were rated as being well nourished (SGA A); moderately, or suspected of being malnourished (SGA B); or severely malnourished (SGA C) (Detsky *et al*, 1987). Medical records were referred in order to obtain the results for analysis of serum albumin, haemoglobin and TLC.

Nutritional screening using MRST-H

MRST-H consisted of 5 items that included anthropometric measurements (MUAC and CC), clinical (unintentionally weight loss over the last month or the last 6 months), functional (self-feeding) and socio-economic status (economic dependency). A respondent was identified as having risk of malnutrition with a score of five and above (≥ 5 points) (Sakinah, 2006) (**Figure 1**).

Malnutrition Risk Screening Tool-Hospital (MRST-H)

Note:

There are 5 questions in this malnutrition risk screening tool. Its purpose is to **screen** elderly while they first admit into ward (within 72 hours) in order to identify those who are at risk of developing malnutrition.

Step 1 – Circle the correct answer for each question (either Yes or No)

Step 2 – Total up the score for all questions

No	**Questions**	**Malnutrition**	
		Yes	**No**
1	Do you depend on someone for your source of income? (Is your source of income not enough to buy the food supply?)	**1**	**0**
2	Are you unable to feed or eat by your own self?	**1**	**0**
3	Do you have any unintentional weight loss in the last one month or six months? (≥ 5% 1 month or ≥10% 6 months)? Original weight =……kg Current weight =……kg % weight loss = {original weight – current weight } x 100 original weight	**3**	**0**
4	Mid Upper Arm Circumference (MUAC) in cm 0 = MUAC ≥ 23.0 (male), 22.0 (female) 2 = MUAC < 23.0 (male), 22.0 (female)	**2**	**0**
5	Calf Circumference (CC) in cm 0 = CC ≥ 30.1 (male), 27.3 (female) 1 = CC < 30.1 (male), 27.3 (female)	**1**	**0**
	Total score =		

Interpretation:

Total score ≥ **5** = an individual is at high risk of malnutrition

Please refer to dietitian for nutritional assessment and intervention within 24 hours if patient is at high risk of malnutrition.

Figure 1: The Malnutrition Risk Screening Tool-Hospital (MRST-H)

The criterion in using MUAC to assess muscle wasting/malnutrition was based on the classification proposed by Ferro-Luzzi & James (1996). The cut-off points of MUAC for men and women at risk of muscle wasting/malnutrition were 23.0cm and 22.0cm respectively. The criterion in using CC to assess muscle wasting/malnutrition was based on the local classification developed by Sakinah and colleges (2004) for Malaysian elderly. The cut-off points of CC for men and women at risk of muscle wasting/malnutrition were 30.1cm and 27.3cm respectively.

Statistical analysis

All data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 11.0. Descriptive statistics were used to characterize the study respondents. Mean and standard deviation (SD) were calculated for the continuous variables. Frequency and percentage (%) were calculated for the categorical variables.

The MRST-H was validated against the referee gold standard of malnutrition – GIM in our study. Its validity was expressed in the sensitivity, specificity, and positive predictive value (PPV). A contingency table (crosstab) was constructed to present the relationship of the MRST-H score with the GIM. Sensitivity is the probability (0-100%) that the MRST-H can accurately identify patients with malnutrition (true positive rate). Specificity represents the probability (0-100%) that the MRST-H can correctly identify the patient who does not have malnutrition (true negative rate). PPV (0-100%) represents the probability that a

patient with a positive test result (MRST-H score ≥ 5 points) is indeed malnourished according to the GIM (Neelemaat *et al*, 2011).

Results

A total of 100 elderly patients out of 124 elderly patients who met the inclusion criteria had agreed and gave written consent to take part in this study, achieved a response rate of 80.6%. **Table 2** shows the general characteristics of the respondents. Their age range was 65 to 95 years with the mean (SD) of 73.11 ± 6.03 years. More than half of our respondents were female (63.0%), Malay (54.0%), literate (54.0%), single/divorced/widowed (59.0%), and do not depend on others economically (56.0%). Circulatory disease was found to be the main diagnosis among our respondents (36.0%), followed by respiratory diseases (16.0%), neoplasm (12.0%), digestive diseases (12.0%), and endocrine and metabolic diseases (10.0%).

Table 2: General characteristics of the respondents (n=100)

Variable	**Frequency (%)**
Gender	
Male	37 (37.0)
Female	63 (63.0)
Ethnic	
Malay	54 (54.0)
Chinese	23 (23.0)
Indian	23 (23.0)
Mean age (year)	73.11 ± 6.03 *
Education level	
Literate	54 (54.0)
Illiterate	46 (46.0)
Marital status	
Married	41 (41.0)
Single/divorced/widowed	59 (59.0)
Economic dependency	
No	56 (56.0)
Yes	44 (44.0)
Primary diagnosis	
Circulatory diseases	36 (36.0)
Respiratory diseases	16 (16.0)
Neoplasm	12 (12.0)
Digestive diseases	12 (12.0)
Endocrine and metabolic diseases	10 (10.0)
Others	14 (14.0)

* Mean (standard deviation)

The magnitude of malnutrition among the elderly patients in Kuala Lumpur Hospital was 21.0% according to the referee gold standard of malnutrition – GIM (**Table 3**). The MRST-H identified 17.0% of our respondents as having nutritional risk. It has 66.7% sensitivity, 96.2% specificity, and 82.4% PPV while validated using GIM.

Table 3: Matrix table of Global Indicator of Malnutrition

Indicators	Alb N Hb N TLC N	Alb N Hb L TLC N	Alb L Hb N TLC N	Alb N Hb N TLC L	Alb L Hb N TLC L	Alb L Hb L TLC N	Alb N Hb L TLC L	Alb L Hb L TLC L	TOTAL
BMI N SGA N	21	19	1	7	2	7	8	4	69
BMI N SGA L	3	5	0	2	**1**	**6**	**2**	**3**	22
BMI L SGA N	0	0	0	0	0	0	0	0	0
BMI L SGA L	**0**	**1**	**2**	**1**	**1**	**3**	**1**	**0**	9
TOTAL	24	25	3	10	4	16	11	7	100

- Abbreviations: Alb, albumin; BMI, Body mass index; Hb, hemoglobin; L, low; N, normal; SGA, Subjective Global Assessment; TLC, total lymphocyte count.
- Malnutrition: presented with 2 or more indicators of GIM = 21.0%.

Discussion

Validity and reliability of nutritional screening and assessment tools are essential prior to their use in clinical practice or other studies (Green & Watson, 2006). Our study evaluated the validity of a local screening tool, MRST-H in hospitalized elderly patients of a general hospital in Malaysia and found this simple and easy to use questionnaire to be a valid tool for screening of malnutrition.

The rationale of using GIM for nutritional assessment and validation is that there is still lacking of reference gold standard for the optimal definition and diagnosis of malnutrition (Meijers *et al*, 2010). Combination of several measures of assessment into a standard test (GIM) should ensure a more accurate identification of malnutrition among our patients.

The MRST-H was validated in a population of mixed medical and oncological patients. Nahid *et al*. (1999) indicated that the values were considered as a good screening tool with a sensitivity and specificity of at least 80% to prove its usefulness. A high sensitivity allows further diagnosis to be done and enables clinical intervention. A high specificity (identifies all those without risk) is important as well as it can reduces the probability of giving unnecessary and in depth assessment and treatment to those who do not required it (Suzana, Dixon & Earland, 1999). Our MRST-H had high specificity (96.2%) but moderate sensitivity (66.7%). Altman (1995) reported that the PPV can be used to support the validity of a screening tool even with a low sensitivity value and a high specificity value.

Predictive value is also important as it can be used to support the validity of a screening tool even with a low sensitivity value and high specificity. PPV is an estimation of the presence of a disease in a subject with a positive result. The PPV is influenced by the prevalence of the disease or exposure that is being measured in the population studied (Altman, 1995). Our study showed high PPV (82.4%) which indicated that only 17.6% of patients who were referred for further assessment, were not malnourished. The high PPV of MRST-H enables an accurate screening of elderly at risk of malnutrition in ward although the sensitivity value was moderate.

The subjects in this current study are a reflection of the nutritionally relevant population of a general hospital. This is largely due to the fact that Kuala Lumpur Hospital is a central hospital in Malaysia and receives referrals from other state hospitals. To understand the true validity of a screening tool, its impact on clinical outcome had to be proved. Thus, the length of hospital stay, care complexity, and weight changes during hospital stay were recorded to determine whether the use of the MRST-H and its subsequent treatment plan were beneficial and cost-effective.

Conclusion

This locally developed screening tool, MRST-H has been proven as a valid instrument in detecting malnourished elderly patients during hospitalization. It is quick and easy to use, does not result in large numbers of patients being referred inappropriately and only few false negative results

occur. By implication, it would result in a more effective use of resources and earlier nutritional intervention towards elderly patients.

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