Comparison of tools for nutritional assessment in elderly patients: A pilot study

Nesma Gamal Ahmed, MSc[1], Menna Abdel Ghany Shawkat , MSc[1], Marian Wagieh Mansour,MSc[1], Hazem Elsayed Hussien, MSc[1],Doha Rasheedy, MD[2].

1 Assistant Lecturer of Geriatrics; Geriatrics and Gerontology Department; Faculty of Medicine, Ain shams university, Cairo, Egypt.
2 Lecturer of Geriatrics; Geriatrics and Gerontology Department; Faculty of Medicine, Ain shams university, Cairo, Egypt.

Background: Malnutrition is a major health related concern associated with higher morbidity and mortality in the elderly compared to their younger counterparts. Malnutrition is not an inevitable side effect of ageing, but many changes related to ageing can cause malnutrition. The early recognition of patients at high risk of malnutrition is needed to timely manage the condition and avoid its adverse outcomes. Several types of nutrition screening tools have been developed for evaluating the nutritional status of elders; however, the Mini-Nutritional Assessment-Short Form (MNA-SF) is the most widely used tool.
Aim: The aim of this study is to identify the most appropriate nutritional screening tool for use in hospitalized elderly population.
Method: Mini-Nutritional Assessment-Short Form (MNA-SF), Malnutrition Universal Screening Tool (MUST), The Nutritional risk screening (NRS), Patient-Generated Subjective Global Assessment (PG-SGA) and Geriatric nutritional risk index (GNRI) were administered to 20 patients. All patients were 60 years and over.
Results: Using the MNA-SF 12 (60%) of the studied sample were malnourished and 8 (40%) had normal nutritional status. Tools performance in predicting malnutrition was calculated. The sensitivity was 91%, 83%, 83% and 66% and specificity was 50%, 62%, 12% and 75% with the NRS, MUST, PG-SGA and GNRI, respectively. Combining different pairs of tools
MUST and NRS together had better sensitivity 92.8% and specificity 66.6% then 2nd better two tools together is NRS and GNRI with sensitivity 91.6% and specificity 50% with accuracy 75% other tools showed high sensitivity but low specificity as PGSGA with NRS and PGSGA and GNRI.
Conclusion: NRS had the highest sensitivity while GNRI had the highest specificity among different studied assessment tools. MUST and NRS together had better sensitivity but lower specificity than either tool alone. Combining the NRS and GNRI had better sensitivity than GNRI alone and better specificity than NRS alone. We recommend using NRS alone as the optimal screening tool.

Keywords: Malnutrition, elderly nutritional status, nutritional assessment tools

Introduction:

Malnutrition is a deficiency, excess or imbalance of energy, protein and other nutrients enough to cause adverse effects on body form, function and clinical outcome. [1]

Screening for this state is justified in the elderly, as it is a frequent cause of morbidity in this population [2]; it is associated with poor outcomes [1]; simple, reliable, valid and acceptable screening tests are available to detect those who are malnourished or at risk of malnutrition; and there is benefit from nutritional intervention in those identified by screening [3].

Nutritional screening, in its various forms, looks for characteristics associated with nutritional problems so that the individuals identified can undergo full nutrition assessment and possible intervention [4]. The tools used need to be quick and simple, acceptable to patients and healthcare workers. Furthermore, it must have good sensitivity for detecting treatable malnutrition; even if the specificity is lower [5].

The most widely used and extensively validated screening tool used by dieticians is the Mini-Nutritional Assessment (MNA). It is also a very useful tool for physicians involved in comprehensive geriatric assessment [6].

One advantage of the MNA is that it is applicable to a wide range of elderly patients. It is simple and brief. A short-form version of the MNA has been developed (MNA-SF), and is strongly correlated with total MNA score and is applicable for both community dwelling and hospitalized elderly [6].

The wide spectrum of tools available for nutritional assessment is growing larger. They include GNRI[7], NRS [5],MUST[2], and PG-SGA [8].

The current study was designed to identify the most appropriate nutritional screening tool for use in hospitalized elderly population.

Methods:

Study design:

A cross sectional study was conducted to compare the accuracy of different widely used nutritional screening tools in a sample of 20 consecutively hospitalized elderly patients. All patients were 60 years and over. The patients were categorized based on MNA SF results into 2 groups those with normal nutritional status (MNA SF score ≥11) and those with high risk of malnutrition (MNA SF score <11). The study was carried out in the Geriatrics and Gerontology Department at Ain Shams University Hospital in Cairo Egypt.

Malnutrition screening tools

MNA SF: [9] The score is derived from six components: reduced food intake in the preceding three months; weight loss during the preceding three months; mobility; psychological stress or acute disease in the preceding three months; neuropsychological problems; body mass index.

GNRI: [10].

The GNRI formula results calculated as follow.

GNRI = [1.489 X albumin (g/L)] + [41.7 X (weight/WLo)]

GNRI defines 4 grades of nutrition-related risk: major risk (GNRI<82), moderate risk (GNRI: 82 to <92), low risk (GNRI: 92 to≤98), and no risk (GNRI: <98).

The Malnutrition Universal Screening Tool (MUST): [2] derives a score classifying malnutrition risk as low, medium or high on the basis of three components—BMI, history of unexplained weight loss and acute illness effect.

The patient-generated-subjective global assessment (PG-SGA) [8] was adapted from the SGA. It includes additional questions regarding the presence of nutritional symptoms and short-term weight loss. It was designed so that the components of the medical history can be completed by the patient using a check box format. The physical examination is then performed by a health professional.

Ethical considerations

The study methodology was reviewed and approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of medicine, Ain Shams University.

Table 1: The scoring of the nutritional screening tools in the 2 groups

	Patients with risk of malnutrition	*Patients with normal nutritional status*	*P value*
age	*64.7±5.8*	*61.8±3.7*	*0.23*
MNA SF score	*9±1.8*	*12.5±0.7*	*0.000*
MUST score	*1.9±1.2*	*0.6±0.9*	*0.02*
PG SGA score	*6.5±3.5*	*3.2±2.6*	*0.036*
NRS score	*3±1.8*	*1.5±1.7*	*0.047*
GNRI score	*85.3±8.7*	*94.3±3.9*	*0.014*

Statistical methods:

The collected data were coded, tabulated, revised and statistical analyzed using SPSS program (version 16). Quantitative variables were presented in the form of means and standard deviation. Qualitative variables were presented in form of frequency tables (number and percent).The comparison between quantitative variables was done using t-test. Pearson's correlation coefficient was used for parametric correlations. Receiver operating characteristic (ROC) curves were constructed. The area under each ROC curve was calculated to assess the discriminatory ability of the assessed tools to detect the risk of malnutrition.

Table 2: the correlation of different nutritional screening tools scores and MNA SF scoring:

	r	P value
MUST score	-0.72	0.000
PG SGA score	-0.63	0.003
NRS score	-0.555	0.011
GNRI score	0.79	0.000

Results:

The study included 20 participants 11(55%) females and 9(45%) males. All of the participants were ≥ 60 years old with mean age 63.6± 5.1 years (range 60-75 years).

The patients were categorized based on MNA SF results into 2 groups those with normal nutritional status 8 patients (40%) and those with high risk of malnutrition 12 patients (60%) of the studied sample.

The mean age of patients at risk of malnutrition was higher than those with normal nutritional status (64.7 years vs.61.8 years) yet of no statistical significance.

Table 1 show that there was significant difference between the two groups regarding each nutritional screening tools score.

The MUST, GNRI scores correlated better with MNA SF score than the NRS, PGSGA scores did (r= -.072, 0.79) and (r=-.0555,-0.63) respectively (table 2).

Table 3 shows that NRS had the highest sensitivity while GNRI had the

highest specificity among different studied assessment tools.

Table 4 shows that using MUST and NRS together had better sensitivity 92.8% and specificity 66.6% with accuracy 85% , using NRS and GNRI together had sensitivity 91.6% and specificity 50% with accuracy 75% ,other tools showed high sensitivity but low specificity as PGSGA with NRS and PGSGA and GNRI

Table 5 and figure 1 show that GNRI had the highest area under curve (0.828) showing the highest specificity.

Table 3: the sensitivity, specificity and accuracy of each screening tool:

tool	Sensitivity %	Specificity %	Accuracy %
MUST	83	62	75
PGSGA	83	12.5	55
NRS	91	50	75
GNRI	66	75	70

Discussion:

The goal of the current study was to compare the accuracy of different widely used nutritional screening tools in a sample of 20 consecutively hospitalized elderly patients.

Mini Nutritional Assessment is the tool recommended by European Society of Parenteral and Enteral Nutrition guidelines for screening and grading malnutrition [5].

MNA-SF and NRS categorize patients into two categories of nutritional status: not at risk of malnutrition and at risk of malnutrition. However, MUST and PG SGA categorize patients into three categories of nutritional status: not at risk of malnutrition, at moderate risk of malnutrition and at severe risk of malnutrition. GNRI categorizes patients into 4 groups: severe risk, moderate risk, low risk, and those with no risk. For comparison reasons, the three risk categories of MUST and the four risk categories of GNRI were combined into two risk categories like in Raslan's study [11].

Those with normal nutritional status accounted for 40% of the studied sample while those with high risk of malnutrition accounted for 60% of the studied sample.

This agrees with multiple previous studies that proposed hospitalization as a major predictor of malnutrition in elderly population [12][13][14].
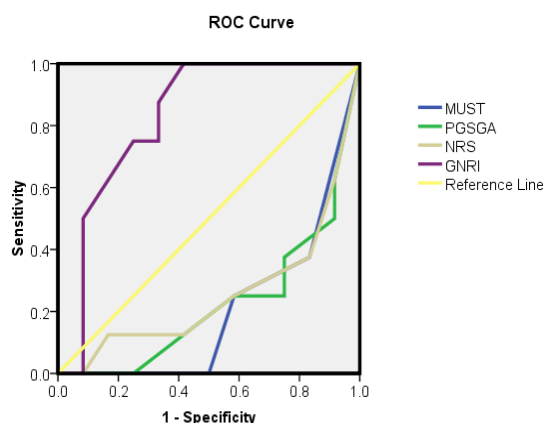
The MUST, NRS, GNRI, and PG-SGA scores not only were able to discriminate between the two categories, but they also correlated well with MNA SF score.NRS had the highest sensitivity 91% while specificity 50% with accuracy 75% then MUST sensitivity 83% and with specificity higher than NRS 62 % and accuracy 75% then PGSGA had same sensitivity as MUST but less specificity and accuracy.

This is in line with previous studies: Neelemaat et al., 2011 who reported that NRS was found to have higher sensitivity (62%) and specificity (93%) than MUST (sensitivity 61%, specificity 76%) and NRI (sensitivity 43%, specificity 89%), compared with SGA[15].Moreover, Raslan et al., 2009 reported that NRS was the best yield

for predicting unfavorable clinical outcomes [11].

Table 4: the sensitivity, specificity and accuracy of the combined screening tools:

	SENSTIVITY	SPECIFICITY	ACCURACY
MUST + PGSGA	83.3	62.5	75
MUST + NRS	92.8	66.6	85
MUST + GNRI	83.3	62.5	75
PGSGA +NRS	100	12.5	65
PGSGA +	100	12.5	65

Figure 1: ROC curve for detection of malnutrition

Table 5: Area under curve for each screening tool:

Tool	Area under curve
MUST score	0.203
PG SGA score	0.224
NRS score	0.255
GNRI score	0.828

Most of the studies agreed that GNRI is a simple, easy and valid tool in assessing malnutrition in elderly and in hospitalized elderly. Advantages of the GNRI are the low level of participation required from patients and subsequent exclusion of bias associated with past unintentional weight loss investigations [7][16].

In the current study, the sensitivity of GNRI was 66% and specificity 75% while Szeto, Kwan et al., 2010 [17] found the sensitivity and specificity of GNRI in predicting malnutrition to be 68.0% and 67.7% even when using another reference test (SGA).

The current study found PG-SGA to have sensitivity 83% and specificity 12.5% while in another study of Bauer et al., 2002 its sensitivity was 98% and the specificity was 82% [18]. low specificity in the current study may be due to small sample size, lack of confirmatory laboratory investigations as reference test.

Many studies compared combining nutritional screening tools to different anthropometric or laboratory markers of malnutrition [19][20], but to our knowledge the current study is the only one assessed the effect of using different nutritional screening tools combinations on increasing their accuracy.

The sensitivity of using both NRS and GNRI together increased to be 92.8% with specificity of 66.6% and accuracy of 85%. So, using MUST and NRS together added little to the sensitivity of NRS alone. As a result NRS is considered the optimal screening tool for malnutrition in elderly hospitalized patients.

Conclusion:

NRS had the highest sensitivity while GNRI had the highest specificity among different studied assessment tools. MUST and NRS together had better sensitivity but lower specificity than either tool alone. We recommend using NRS for malnutrition screening in elderly hospitalized patients

Limitations of the study:

A principal limitation of our study was that we compared all nutritional screening tools with the MNA SF, which is widely recommended, but is not regarded as the gold standard measure of malnutrition diagnosis.

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Disclosure:

The author(s) declared no conflicts of interest with respect to the authorship and/or publication of this article.

References:

1. Stratton RJ, Green CJ, Elia M., (2003): Disease Related Malnutrition: an Evidence Based Approach to Treatment. Oxford: CABI.

2. Elia M., (2003): Screening for Malnutrition: A Multidisciplinary Responsibility. Development and use of the 'Malnutrition Universal Screening Tool' ('MUST') for Adults. BAPEN.

3. Cheskin LJ and Mitchell AM., (2003): Review: oral protein and energy supplements reduce all-cause mortality in elderly persons. ACP J Club; 138(3):59.

4. Berner YN. (2003): Review Assessment tools for nutritional status in the elderly. Isr Med Assoc J; 5(5):365-7.

5. Kondrup J, Allison SP, Elia M, Vellas B, Plauth M, Educational and Clinical Practice Committee, European Society of Parenteral and Enteral Nutrition (ESPEN).,(2003): ESPEN guidelines for nutrition screening 2002.ClinNutr; 22(4):415-21.

6. Wells J. L& Dumbrell A.C: Nutrition and aging: assessment and treatment of compromised nutritional status in frail elderly patients; Clinical Interventions in Aging 2006:1(1) 67–79.

7. Bouillanne O, Morineau G, Dupont C, Coulombel I, Vincent JP, Nicolis I, et al. Geriatric Nutritional Risk Index: a new index for evaluating at-risk elderly medical patients. Am J Clin Nutr 2005;82: 777–783.

8. Ottery FD (1994): Rethinking nutritional support of the cancer patient: the new field of nutritional oncology. Sem. Oncol. 21,770 – 778.

9. Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for Undernutrition in Geriatric Practice: Developing the Short-Form Mini Nutritional Assessment (MNA-

SF). J. Geront 2001; 56A: M366-377.

10. - Pablo AM, Izaga MA, Alday LA. Assessment of nutritional status on hospital admission: nutritional scores. Eur J Clin Nutr 2003;57:824–31.

11. Raslan M, Gonzalez MC, Goncalves Dias MC, Nascimento M, Castro M, Marques P, Segatto S, Torrinhas RS, Cecconello I & Waitzberg DL.Comparison of nutritional risk screening tools for predicting clinical outcomes in hospitalized patients.Nutrition:2009; 26, 721–726.

12. Gariballa SE, Sinclair AJ. Nutrition, ageing and ill health. Br J Clin Nutr 1998;80:7–23

13. Bauer JM, Sieber CC: Significance and diagnosis of malnutrition in the elderly. Z Arztl Fortbild Qualitatssich 2007, 101(9):605-9.

14. Cuyac Lantigua M, Santana Porbán S: The Mini Nutritional Assessment of the elderly in the practice of a hospital geriatrics service: inception, validation and operational characteristics. Arch Latinoam Nutr 2007, 54(3):255-65.

15. Neelemaat F, Meijers J, Kruizenga H, van Ballegooijen H, van Bokhorstde M, de van der Schueren B. Comparison of five malnutrition screening tools in one hospital inpatient sample. J Clin Nurs 2011; 20: 2144-2152.

16. Cereda E, Pedrolli C. The geriatric nutritional risk index. Curr Opin Clin Nutr Metab Care. 2009;12:1–7.

17. Szeto CC, Kwan BC, Chow KM, Law MC, Li PK. Geriatric nutritional risk index as a screening tool for malnutrition in patients on chronic peritoneal dialysis. J Ren Nutr. 2010;20:29–37

18. BauerJ, Capra S and Ferguson M. Use of the scored Patient-Generated Subjective Global Assessment (PG-SGA) as a nutrition assessment tool in patients with cancer .European Journal of Clinical Nutrition. 2002:56, 779 – 785.

19. Almeida AI, Correia M, Camilo M, Ravasco P. Nutritional risk screening in surgery: valid, feasible, easy!. Clin Nutr. 2012;31:206–211

20. Kyle UG, Kossovsky MP, Karsegard VL, Pichard C. Comparison of tools for nutritional assessment and screening at hospital admission: a population study. Clin Nutr. 2006; 25:409–417.