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NUTRITIONAL ASSESSMENT OF GERIATRIC OUTPATIENTS USING MNA AND MUST SCREENING TOOLS

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Abstract: *Rationale:* For optimal treatment of malnutrition, hospital outpatients need to be screened early. MUST is a recommended screening tool, but MNA or MNA-SF might be more effective in predicting outcome for geriatric outpatients. *Objective:* To compare MNA and MNA-SF with MUST in screening for malnutrition in geriatric outpatients. *Design:* A cross-sectional, comparative study was performed during 8 consecutive weeks. *Setting:* During their visit to the outpatient clinic of Hospital 'Gelderse Vallei' (ZGV) patients were screened. *Participants:* Exclusion criteria (age <65 y, truth disclosure) reduced sample size from 224 to 152. *Measurements:* After performing CGA, based on MNA-SF, MNA and MUST questions, risk of malnutrition was assessed. *Results:* MNA-SF indicated 53.9% (n=82) of patients as 'possibly malnourished', of whom MNA classified 57.3% as 'at risk' and 4.9% as 'malnourished'. MUST classified 12.5% (n=19) and 2% (n=3) of patients respectively as 'medium risk' and 'high risk'. MNA-SF and MUST classified 40.8% (n=62) and MNA and MUST 46.3% (n=38) patients differently (McNemar test, p<0.0001). There was fair agreement between both MNA-SF and MUST and between MNA and MUST (kappa=0.23 and k=0.22, respectively). Significant differences (p<0.0001) in classification were determined by the items 'mobility', 'declined food intake >3days', 'psychological stress', 'weight loss', in the MNA and 'weight loss' in the MUST. *Conclusion:* MNA classified more geriatric outpatients as malnourished than MUST, and may therefore prevent missing patients at risk. MNA may be more suitable in this population because it includes more geriatric oriented risk factors that point out the issues needing attention for treatment of malnutrition.

Key words: Mini Nutritional Assessment, malnutrition, geriatric, outpatients, screening.

Abbreviations used in this paper: MNA-SF: Mini Nutritional Assessment-Short Form; MNA: Mini Nutritional Assessment; MUST: Malnutrition Universal Screening Tool; BMI: Body Mass Index; ZGV: Hospital Gelderse Vallei; CGA: Comprehensive Geriatric Assessment.

Introduction

Malnutrition is still a common and under-recognized problem in hospital outpatients and little is known about the nutritional status of geriatric outpatients (1). Malnutrition is associated with a number of negative clinical outcomes such as higher complication rates, higher hospital costs and prolonged hospital stay (2-5). Especially among elderly people malnutrition adversely affects physical and psychological functioning and impairs patients' recovery from disease and injury, thereby increasing morbidity and mortality (6-9). Particularly depression is regarded as a major cause of malnutrition in an elderly population (7, 10). To minimize these negative consequences malnutrition should be recognized at an early stage. In 57% to 85% of outpatients malnutrition remains undetected, and only 15% of detected patients receive nutritional treatment (7-9). Timely nutritional intervention is cost-effective and can stop weight loss in undernourished elderly (11-13). Therefore, valid and practical methods are needed to screen for malnutrition, so that appropriate nutritional care can be applied (14).

For practical reasons hospitals prefer to use one screening tool among all patient groups and care paths. The Malnutrition Universal Screening Tool (MUST) (15) is one of two screening tools recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN) (4, 16). Therefore, Hospital Gelderse Vallei (ZGV) has implemented this tool in all inpatient and relevant outpatient settings. However, as the MUST has been developed for a general adult population its suitability in an elderly hospital population needs to be evaluated (17). Moreover, MUST was suspected to misclassify older patients at risk of malnutrition in ZGV.

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Only a few screening tools are specifically developed for an elderly population (6). Mini Nutritional Assessment (MNA) (11, 18) is an established screening tool for the geriatric population and includes several items relevant to this group. Furthermore, this tool has been validated in an outpatient setting and is recommended for older patients by ESPEN (14, 16, 18). A short form of the MNA (MNA-SF) was derived from the full MNA by Rubenstein et al. in 2001 to reduce screening time (19). Since the geriatric population is at high risk of malnutrition and will benefit from early identification it is important to study whether this presumed underestimation of MUST could be underpinned, and MNA or MNA-SF would be more suitable. These tools have been evaluated extensively by the five factors ESPEN (16) proposes. The aim of the present study was to compare MNA and MNA-SF with MUST in screening for malnutrition in geriatric outpatients in order to evaluate relative validity.

Methods

Study design and patients

This observational, cross-sectional, comparative study was performed during 8 consecutive weeks in 2009 at the geriatric outpatient clinic in Hospital 'Gelderse Vallei' (ZGV) in Ede, the Netherlands. All patients visiting the clinic during this time period were invited to participate. Exclusion criteria were: age < 65 y, and 'truth disclosure' (for ethical reasons). This reduced sample size from 224 to 153. Incompletely filled out MNA or MUST forms reduced sample size further from 153 to 152. All patients were screened by a geriatrician on duty using MNA-SF, MNA and MUST, after Comprehensive Geriatric Assessment (CGA) was performed. Heteroanamnesis was used for screening of cognitively impaired patients. Patient characteristics were derived from the CGA. Although the standard procedure is to complete MNA assessment only if patients score ≤ 11 points in the MNA-SF (indicating possible malnutrition), all patients were screened with MNA. This was done to allow a complete comparison of the three screening tools for all patients. Approval for the study was given by the board judging scientific research within the hospital ZGV.

Data collection

The geriatrician on duty filled in the CGA, measured body weight and height during the first visit at the outpatient clinic with patients wearing underclothing and without shoes. Weight was measured to the nearest 0.1 kg using a SECA calibrated ward scale or a chair scale if patients were not able to stand independently. Height was measured to the nearest 0.1 cm using a stadiometer. Body Mass Index (BMI) was calculated as weight (kg) divided by height $(m)^2$. Percentage of unplanned weight loss was calculated using the measured weight and the former documented weight in patients' medical records or using heteroanamnesis, and scored accordingly. MUST and MNA questions were answered and scored.

Statistical analysis

For data analysis SPSS version 15.0 was used (20). Standard descriptive statistical methods were used to determine means, standard deviations, percentages and frequencies (20). Cohen's Kappa test was used to assess agreement between MNA and MUST (21, 22). To test the concurrent validity between MNA and MUST, agreement and chance-corrected agreement (k) of malnutrition risk categorization were assessed (21). Landis and Koch (21) characterize a Kappa of <0 as no agreement, 0-0.20 as slight agreement, 0.21-0.40 as fair agreement, 0.41-0.60 as moderate agreement, 0.61-0.80 as substantial agreement, and 0.81-1 as almost perfect agreement.

In addition, the binomial McNemar test was used to examine relative under- or over classification of malnutrition risk comparing MNA and MUST (23). Medium and high risk categories of MUST were combined to categorize MNA-SF and MUST in a 2x2 cross-tabulation. For 3x3 cross-tabulation of MNA and MUST only data of patients that scored ≤ 11 on MNA-SF (possible malnutrition) was used (n=82). Pearson's chi-square test was used to signal items determining classification differences between patients. P-values below 0.05 were considered statistically significant. Finally, sensitivity, specificity and predictive values were calculated (14, 23). Sensitivity represents the probability that the screening tool correctly identifies patients as "at risk" or "malnourished". Specificity represents the probability that the screening tool score correctly identifies patients that are "not at risk". Positive predictive value represents the probability that a patient with a screening tool score for "at risk" or "malnourished" is correctly classified as such. Negative predictive value represents the probability that a patient with a screening score "not at risk" is indeed not at risk of malnutrition.

Results

Patient characteristics

As shown in table 1, the patients were typical of the geriatric population. Their mean age was about 80 y, a larger part was female, and the majority (74%) had neuropsychological problems. The reasons for referral were heterogeneous. All types of geriatric syndromes were represented. Malnutrition was none of them, neither was acute somatic disease.

Table 1
Characteristics* of the study population

Characteristics	n=152
Age (y)	79 ± 6.4
Sex (% female)	95 (63)
Body Mass Index (in kg/m²)	26.9 ± 4.6
Lives independently	135 (89)
Takes > 3 prescription drugs per day	93 (61)
Views self as being malnourished	3 (2)
Neuropsychological problems ‡	113 (74)

* Data are presented as mean ± standard deviation or as number (percentage); ‡ Diagnosed by geriatrician

Prevalence of malnutrition risk

As shown in Table 2, the prevalence of malnutrition according to MUST was 14.5% (n=22), only half that of MNA; of these patients 12.5% (n=19) was classified at 'medium risk' and 2% (n=3) at 'high risk'. MNA-SF classified 53.9% (n=82) of all patients as 'possible malnutrition'. MNA classified 57.3% (n=47) of those patients with 'possible malnutrition' as 'at risk of malnutrition' and 4.9% (n=4) as 'malnourished'.

Differences in classification between screening tools

The McNemar test showed significant differences in classification of malnourished patients ($p<0.0001$) for both MNA-SF and MUST, and MNA and MUST (Tables 3 and 4).

There was fair agreement (kappa=0.23) according to Landis and Koch (21) between MNA-SF and MUST in 2x2 cross-tabulation. MNA-SF classified 61 (40.1%) of patients as ´possible malnutrition´, whereas they classified ´low risk´ according to MUST (Table 3). One patient was classified 'not at risk' according to MNA-SF and 'medium-high risk' to MUST.

There was fair agreement (kappa=0.22) (21) comparing MNA and MUST in 3x3 cross-tabulation. MNA classified 38 (46.3%) patients differently compared with MUST (Table 4). Of these patients 31 (37.8%) classified 'at risk of malnutrition' with MNA but 'low risk' with MUST. Two patients, classified as 'malnourished' according to MNA, were classified as ´medium risk´ according to MUST. Another 2 patients were classified with MNA as 'at risk of malnutrition', while they classified 'high risk' according to MUST. On the other hand, two patients were classified by MUST as 'medium risk' and by MNA 'not at risk'. While comparing MNA with MUST, sensitivity was 44% and specificity was 95%, positive predictive value was 90% and negative predictive value was 61%.

Table 2
Prevalence of malnutrition per MUST, MNA-SF and MNA categories

Geriatric Outpatients n=152	n	%
MUST = 0 'low risk'	130	85.5
MUST = 1 'medium risk'	19	12.5
MUST = 2 'high risk'	2	1.3
MUST = 3 'high risk'	1	0.7
MUST = 4-6 'high risk'	0	0
Total	152	100
Geriatric Outpatients n=152		
MNA-SF ≥ 12 'Normal-not at risk'	70	46.1
MNA-SF ≤ 11 'possible malnutrition-continue MNA assessment'	82	53.9
Total	152	100
Geriatric outpatients that classified ≤ 11 'possible malnutrition-continue MNA assessment' n=82		
MNA = 17 – 23.5 'At risk of malnutrition'	47	57.3
MNA ≤ 17 'Malnourished'	4	4.9
MNA > 23.5 'Normal-not at risk'	31	37.8
Total	82	100

MUST: Malnutrition Universal Screening Tool, MNA-SF: Mini Nutritional Assessment-Short Form, MNA: Mini Nutritional Assessment

Table 3
2x2 cross-tabulation of malnutrition risk according to MNA-SF and MUST

Geriatric Outpatients (n=152)	MNA-SF (2 categories) 'Normal-not at risk'	'Possible malnutrition'	Total
MUST (2 categories)	n	n	n
'Low risk'	69	61	130
'Medium' or 'high risk'	1	21	22
Total	70	82	152

MUST: Malnutrition Universal Screening Tool, MNA-SF: Mini Nutritional Assessment-Short Form

Table 4
3x3 cross-tabulation of malnutrition risk according to MNA and MUST, if MNA-SF conclusion is 'possible malnutrition' (≤11 points)

Geriatric Outpatients (n=82)	MNA (3 categories) 'Normal-not at risk'	'At risk of malnutrition'	'Malnourished'	Total
MUST (3 categories)	n	n	n	n
'Low risk'	29	31	1	61
'Medium risk'	2	14	2	18
'High risk'	0	2	1	3
Total	31	47	4	82

MUST: Malnutrition Universal Screening Tool, MNA: Mini Nutritional Assessment

Determinants

A number of screening items was scored significantly different ($p<0.05$) between patients who classified

similarly according to MUST and SF-MNA or MNA and those classifying differently. The most significant ($p<0.0001$) of these items were 'mobility', 'declined food intake >3days', 'psychological stress', 'weight loss', in the MNA and 'weight loss' in the MUST.

Discussion

MNA classified more geriatric outpatients as 'at risk of malnutrition' or as 'malnourished' than MUST. We found significant differences in classification between MNA-SF and MUST and between MNA and MUST.

The geriatrician in this setting could not be blinded to the outcome of the screening tools, since the CGA was performed beforehand. However, the data analysis was performed by a blinded researcher. Furthermore we feel the risk of bias is minimal, as the screening tool criteria are, to a large extent, objective, therefore minimising the risk of subjectivity. Different wording of the result categories may have influenced the results, since MNA-SF (version 2006) categorises patients into two categories of nutritional status, whereas MUST and MNA categorise patients into three categories of nutritional status. And we considered MUST 'low risk' the same as MNA 'normal-not at risk'.

The strong points were that the geriatrician filled out an extensive medical record (CGA) of most patients previously to screening. Most MNA items are part of this assessment. Therefore, the geriatricians felt that the extra burden of filling out the MNA was limited in this outpatient clinic. Our approach also corresponds to the MNA-guidelines that suggest to let the health professional respond if a patient with dementia is unable to do so (18).

Moreover, our study differs from others because almost all patients at the geriatric outpatient clinic participated, including patients who had neuropsychological problems, like dementia or depression. It is important to include these patients because having neuropsychological problems appears to be a common condition in the geriatric population. The prevalence of 74% of patients with neuropsychological problems in our study is comparable with that of elderly patients in long-term care hospitals in Finland, in whom MNA was used as well (8). In the latter study, 75.5% of patients with a normal nutritional status and 84.4% of the malnourished patients had dementia, which is also comparable with the 82% found in our study.

The percentages of patients classifying similarly using the screening tools (59.2% for MNA-SF and MUST and 53.7% for MNA and MUST) were lower than those reported by Stratton et al. (14). They also compared MNA and MNA-SF with MUST and reported 86% and 85% respectively for agreements in these classifications. The differences may be explained by different characteristics of the patient groups, because Stratton et al. assessed a group of elderly and surgical inpatients whereas we screened outpatients.

Agreements between MNA, MNA-SF and MUST were fair according to Cohen's kappa test (21). Because agreement is affected by prevalence, it may be better to compare prevalences than kappa values between different studies. We found prevalences of 57.3% for 'at risk of malnutrition' and 4.9% for 'malnourished' according to MNA. These percentages are best comparable to a study by Cottee et al. (2001), presenting prevalences of 48% and 11% respectively in geriatric outpatients in the UK (24), and to those of a study in geriatric outpatients in Turkey, showing prevalences of 31% and 13% (25). The prevalences of 12.5% 'medium risk' and 2% 'high risk' by MUST found in our study are best comparable to those of 18% and 12% found by Stratton et al. in gastroenterology outpatients (14). The result that MNA classified more patients as 'at risk of malnutrition' or ´malnourished´ than MUST in outpatients confirms findings by Stratton et al. (14). A disagreement in classification by the MNA and MUST may be caused by an underestimation of medium nutritional risk by the MUST-tool, as reported by Kyle et al. (4).

Disagreements in classification between MUST and MNA may be further explained by the number and type of items taken into account, as well as the cut-off points of items. MUST items are limited to BMI, weight loss and acute illness, whereas MNA focuses on 18 items. Especially acute illness is a less important factor in a geriatric outpatient clinic, since patients have no acute diseases but a multiplicity of non-acute problems. In addition, MUST classifies patients as 'malnourished' at a lower BMI cut-off point (< 20 kg/m2) than MNA (< 23 kg/m2) (18). Although unintentional weight loss is an important aspect in both MUST and MNA screening tools MUST does not identify patients at risk if their weight loss is less than 5%. MNA classifies a smaller amount of weight loss as pathologic in elderly, and weight losses are expressed in kg, which is more specific. Scoring on items that MNA includes to determine malnutrition risk, such as psychological stress and mobility, was different between patients classifying similarly and those classifying differently according to MUST and SF-MNA or MNA, supporting the finding that these items are crucial (Volkert et al. and Norman et al.) for identifying malnutrition in geriatric patients (5, 18, 26).

In conclusion, MNA classified more geriatric outpatients as malnourished than MUST, and therefore may prevent missing patients. In addition, MNA includes more items related to malnutrition and is therefore considered important to evaluate geriatric outpatients. The obtained insight in the most appropriate nutritional screening tool for this specific patient group has led to implementation of MNA in the geriatric outpatient clinic of ZGV where we performed this study. Furthermore, the

nutritional care plan at this clinic was adapted accordingly. This has increased recognition and treatment of malnutrition, since MNA is an effective method to point out the issues that need attention when treating patients for malnutrition.

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