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OVERVIEW OF THE MNA® – ITS HISTORY AND CHALLENGES

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Abstract: The Mini Nutritional Assessment (MNA®) is a simple tool, useful in clinical practice to measure nutritional status in elderly persons. From its validation in 1994, the MNA® has been used in hundreds of studies and translated into more then 20 languages. It is a well-validated tool, with high sensitivity, specificity, and reliability. An MNA® score ≥24 identifies patients with a good nutritional status. Scores between 17 and 23.5 identify patients at risk for malnutrition. These patients have not yet started to lose weight and do not show low plasma albumin levels but have lower protein-calorie intakes than recommended. For them, a multidisciplinary geriatric intervention is needed, which takes into account all aspects that might interfere with proper alimentation and, when necessary, proposes therapeutic interventions for diet or supplementation. If the MNA® score is less than 17, the patient has protein-calorie malnutrition. It is important at this stage to quantify the severity of the malnutrition (by measuring biochemical parameters like plasma albumin or prealbumin levels, establishing a 3-day record of food intake, and measuring anthropometric features like weight, BMI, arm circumference and skin folds). Nutritional intervention is clearly needed and should be based on achievable objectives established after a detailed comprehensive geriatric assessment. The MNA® has been shown to be useful for nutritional intervention follow-up as well. The MNA® can help clinicians design an intervention by noting where the patient loses points when performing the MNA®. Moreover, when a nutritional intervention is successful, the MNA® score increases. The MNA® is recommended by many national and international clinical and scientific organizations. It can be used by a variety of professionals, including physicians, dietitians, nurses or research assistants. A short screening version (MNA®-SF) has been developed, which, if positive, indicates the need to complete the full MNA®. It takes less than 4 minutes to administer the MNA®-SF and between 10 and 15 minutes for the full MNA®.

Key words: Nutrition, aging, elderly, assessment, MNA®, refeeding, malnutrition.

Introduction

The development of the Mini Nutritional Assessment (MNA®) began at the 1989 International Association of Geriatrics and Gerontology (IAG) meeting in Acapulco with a discussion between Bruno Vellas (Department of Geriatrics, Toulouse University Hospital, France) and Yves Guigoz (Researcher at the Nestle Research Centre, Switzerland). The aim of the discussion was to design a tool for assessing nutritional status in the elderly analogous to the Mini-mental State Examination (MMSE) (1) for assessing cognitive function. Despite the demonstrated high prevalence of malnutrition in institutionalized, frail and hospitalized ill elderly persons, nutritional assessment was not being performed in clinical practice due to the complexity of evaluating nutritional intake, clinical parameters and biological markers.

The MNA® as part of the Comprehensive Geriatric Assessment

It is proven that comprehensive geriatric assessment (CGA) improves diagnostic accuracy and long-term prognosis for frail elderly patients (2-4). CGA has been used in a variety of settings to detect medical, psychological, social, and environmental problems of elderly persons; to identify unmet needs; and to prevent disability (5). However, as of 1989, nutritional assessment was not part of usual CGA, which at that time included primarily the MMSE, activities of daily living (ADL) (6), instrumental activities of daily living (IADL) (7), gait and balance scales (such as the Tinetti scale (8)), and depression screening scales (such as the Geriatric Depression Scale [GDS] (9)).

The first publication of the MNA® appeared in 1994 (10). The MNA® was initially validated in a cohort of more the 150 healthy, frail and acutely ill patients in Toulouse (11). The MNA® score was compared to a full nutritional assessment including extensive dietary intake evaluated with a complete 3-day record and a diet questionnaire; a full clinical exam including all anthropometric parameters, and a comprehensive biological assessment of vitamin, trace mineral and protein status. The MNA® was designed by B. Vellas (University of Toulouse, France), W.C. Chumlea (University of Dayton, USA) and P. Garry (University of Albuquerque, USA). The nutritional status of patients was classified by two physicians with expertise in nutrition and then compared to the MNA®

score.

Subsequently, the MNA® was validated in the New-Mexico Ageing Process Study (NMAPS), a longitudinal survey on nutrition and aging. A slightly modified form of the MNA® was validated again in another cohort in Toulouse (12-15).

In 2001 a short form of the MNA® (MNA®-SF) was published in the Journal of Gerontology Medical Sciences, in collaboration with L.Z. Rubenstein (UCLA-VA, Los Angeles, USA) [16]. The MNA®-SF is a validated shortened version of the MNA® that is useful in screening, and combined with the MNA®, it can be used in a 2-step process.

Since its inception, many studies have evaluated the sensitivity, specificity and reliability of the MNA® in different settings and countries. It has been translated and validated in many languages. More than 200 scientific publications can be found in a Medline/PubMed search using MNA® as a search criterion. In both medical practice and clinical research, the MNA® is by far the most widely used tool for nutritional screening and assessment of the elderly.

The MNA® in Clinical Practice

In clinical practice, no nutritional intervention should be based solely on the MNA®. The MNA® is part of the CGA, which should be completed at each full evaluation. The geriatric population is too heterogeneous to establish general rules that apply to all. The CGA assists the clinician to establish a distinctive set of achievable nutritional goals for each patient and to design specific nutrition interventions to achieve those goals.

Nutritional status should be evaluated using a 2-step process, starting with the MNA®-SF (which takes only a few minutes to complete) and if necessary proceeding with the complete version of the MNA®, which can be performed in 10 to 15 minutes (see figure 1).

The full MNA® is able to classify an elderly person as well-nourished, at risk for malnutrition and malnourished (13-15). The MNA® is correlated with clinical assessment (13-15) and objective indicators of nutritional status such as albumin (15, 16), BMI (10, 15, 17, 18), triceps skin fold (19), caloric intake, and vitamin status (15). Low MNA® scores have also been shown to predict greater incidence of adverse clinical effects during hospitalization and higher mortality (15, 20).

Patient responses to each individual MNA®-item should be carefully considered because nutritional intervention should be specifically targeted to those areas on the MNA® where the patient loses points. This ability of the MNA® to target problem areas gives the clinician a unique opportunity to design specific plans for nutritional intervention.

Use of the MNA®-SF in clinical practice

a) If the MNA®-SF score is greater than 12, the patient generally has an acceptable nutritional status. At this stage, it is important to give nutritional advice, even if no signs of malnutrition are present, and to follow the patient's weight regularly at routine visits. Intervention should be proposed if weight loss is documented.

b) If the score is less than 12, the full MNA® should be completed as nutritional intervention, if needed, should not be based on the MNA®-SF.

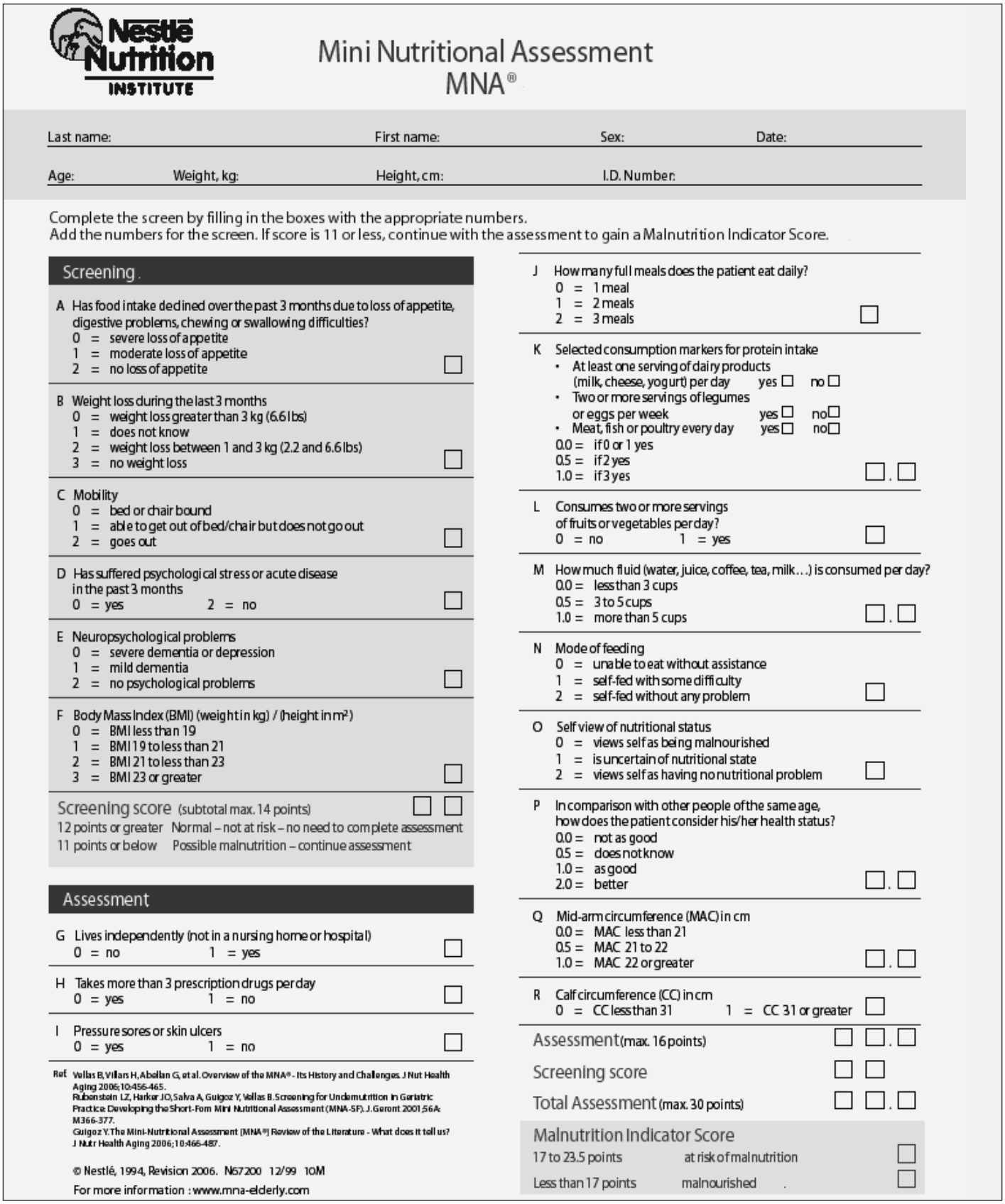
Use of the MNA® in clinical practice

a) A score of 23.5 or more classifies an individual as well nourished. No specific follow-up is needed except to follow the person's weight regularly at routine visits (usually every 6 or 12 months). Detailed nutritional evaluation and, if needed, intervention should be proposed if significant weight loss is documented or if the MNA® score decreases in the follow-up.

b) Scores between 17 and 23.5 indicate that an individual is at risk for malnutrition. While patients with scores between 17 and 23.5 have not had significant weight loss and generally do not have altered biochemical parameters (e.g., low plasma albumin, low vitamin levels), they usually have lower than recommended intake of calories, vitamins and protein on a 3-day record survey. Based on the CGA, detailed nutritional evaluation is needed and may include analysis of a 3-day food-intake record; review of the medical history, current diseases processes and treatments; as well as evaluation of oral hygiene and swallowing ability. Patients may need to augment total intake of calories, protein and micronutrients with oral supplementation. The aim is to provide sufficient nutrients to cover daily needs using a concentrated formula if necessary. Studies show supplementation improves serum albumin, retinol-linked protein, hematocrit and anthropometric measures in the majority of undernourished patients and in patients at risk for malnutrition (21-24).

c) MNA® scores of less than 17 usually indicate that individuals have protein calorie malnutrition. At this stage it is important to quantify the severity of the malnutrition (by measuring biochemical parameters, such as plasma albumin or retinol-linked protein levels; evaluating a 3-day record of food intake, and measuring anthropometric features such as weight, BMI, arm circumference and skin folds). Nutritional intervention is clearly indicated and should be based on achievable objectives established after a detailed CGA. No nutritional intervention should be started without setting specific and reasonable goals in advance. Tube feeding may be indicated to assure intake of macronutrients, micronutrients and water. If tube feeding is necessary, special care must be taken to evaluate the patient's condition and baseline pathologies, considering the goals and theoretical benefits of tube feeding, as well as the patient's desires.

Figure 1



Nestlé Nutrition INSTITUTE

Mini Nutritional Assessment MNA®

Last name: First name: Sex: Date:

Age: Weight, kg: Height, cm: I.D. Number:

Complete the screen by filling in the boxes with the appropriate numbers.
Add the numbers for the screen. If score is 11 or less, continue with the assessment to gain a Malnutrition Indicator Score.

Screening

A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
0 = severe loss of appetite
1 = moderate loss of appetite
2 = no loss of appetite ☐

B Weight loss during the last 3 months
0 = weight loss greater than 3 kg (6.6 lbs)
1 = does not know
2 = weight loss between 1 and 3 kg (2.2 and 6.6 lbs)
3 = no weight loss ☐

C Mobility
0 = bed or chair bound
1 = able to get out of bed/chair but does not go out
2 = goes out ☐

D Has suffered psychological stress or acute disease in the past 3 months
0 = yes 2 = no ☐

E Neuropsychological problems
0 = severe dementia or depression
1 = mild dementia
2 = no psychological problems ☐

F Body Mass Index (BMI) (weight in kg) / (height in m²)
0 = BMI less than 19
1 = BMI 19 to less than 21
2 = BMI 21 to less than 23
3 = BMI 23 or greater ☐

Screening score (subtotal max. 14 points) ☐☐
12 points or greater Normal – not at risk – no need to complete assessment
11 points or below Possible malnutrition – continue assessment

Assessment

G Lives independently (not in a nursing home or hospital)
0 = no 1 = yes ☐

H Takes more than 3 prescription drugs per day
0 = yes 1 = no ☐

I Pressure sores or skin ulcers
0 = yes 1 = no ☐

J How many full meals does the patient eat daily?
0 = 1 meal
1 = 2 meals
2 = 3 meals ☐

K Selected consumption markers for protein intake
- At least one serving of dairy products (milk, cheese, yogurt) per day yes ☐ no ☐
- Two or more servings of legumes or eggs per week yes ☐ no ☐
- Meat, fish or poultry every day yes ☐ no ☐

0.0 = if 0 or 1 yes
0.5 = if 2 yes
1.0 = if 3 yes ☐.☐

L Consumes two or more servings of fruits or vegetables per day?
0 = no 1 = yes ☐

M How much fluid (water, juice, coffee, tea, milk…) is consumed per day?
0.0 = less than 3 cups
0.5 = 3 to 5 cups
1.0 = more than 5 cups ☐.☐

N Mode of feeding
0 = unable to eat without assistance
1 = self-fed with some difficulty
2 = self-fed without any problem ☐

O Self view of nutritional status
0 = views self as being malnourished
1 = is uncertain of nutritional state
2 = views self as having no nutritional problem ☐

P In comparison with other people of the same age, how does the patient consider his/her health status?
0.0 = not as good
0.5 = does not know
1.0 = as good
2.0 = better ☐.☐

Q Mid-arm circumference (MAC) in cm
0.0 = MAC less than 21
0.5 = MAC 21 to 22
1.0 = MAC 22 or greater ☐.☐

R Calf circumference (CC) in cm
0 = CC less than 31 1 = CC 31 or greater ☐

Assessment (max. 16 points) ☐☐.☐
Screening score ☐☐
Total Assessment (max. 30 points) ☐☐.☐

Malnutrition Indicator Score
17 to 23.5 points at risk of malnutrition ☐
Less than 17 points malnourished ☐

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For more information : www.mna-elderly.com

Table 1
Prevalence of malnutrition in elderly determined by the MNA®.

Authors - Year - Reference	Type of Study	Results
Guigoz Y, Vellas B. 2002 (25)	Prevalence study n = 10,000 elderly, free-living, hospitalized or institutionalized	Prevalence of malnutrition was 1% in healthy free-living subjects, 4% in patients receiving home care services, 5% in patients with Alzheimer's disease at home, 20% in hospitalized patients and 37% in institutionalized patients.
Cairella G, Baglio G. 2005 (26)	Population study n = 237 elderly institutionalized	5% malnourished, 60% at risk. Age ≥ 90 years is a risk factor for malnutrition at the limit of statistical significance (OR 0.44; IC 0.14-1)
Gerber V, Kreig MA. (27)	Population study n = 78 elderly women Age = 86 ± 6 institutionalized	Statistically significant correlation between MNA® and triceps skinfold (r = 2003 0.508, p<0.01), ADL (r = 0.538, p<0.01) and serum albumin (r = 0.409, p<0.01)
Ruiz-Lopez MD, Artacho R. 2003 (28)	Cross-sectional study n = 89 Women age = 72 - 98 institutionalized	8% malnourished; 62% at risk
Kuzuya M, Kanda S. 2005 (29)	Cross-sectional study n = 226 elderly Mean age = 79 ± 0,5 (M = 67, W = 159) institutionalized, home care patients, geriatric outpatient and inpatients in geriatric hospital	20% malnourished; 58% at risk. Significant correlations between MNA® and age (r = 0.14), BMI (r = 0.59), albumin (r = 0.60), total cholesterol (r = 0.36), midarm circumference (r = 0.50), and triceps skinfold (r = 0.37). MNA®-SF is sensitive and specific for identifying elderly Japanese patients with malnutrition or risk of malnutrition when using cutoff point > 12 as normal. Sensitivity of full MNA® increases when cut-off point to identify malnutrition increases from <17 to <18 in this population.
Persson MD, Brismar KE. 2002 (30)	Follow-up study n = 83 elderly, Mean age=83 ± 7 (F = 68%) hospitalized in acute geriatric impatient ward	26% with malnutrition (20% SGA), 56% at risk (43% SGA). Mortality was higher in malnourished patients compared with well-nourished patients (40% at one year, 80% after 3 years vs. 20% at one year (p = 0.03-0.17) and 50% after 3 years (p > 0.01).
Ranhoff AH, Gjoen AU. 2005 (31)	Observational study comparing nurses' scoring of the MNA®-SF and comprehensive assessment by a clinical nutritionist n = 69 Age > 70 Geriatric inpatients	74% with malnutrition or at risk according to the MNA®-SF vs. 30% according to the nutritionist. MNA®-SF has a high sensitivity. The lone use of BMI <23 may be equally effective, but will give no information leading towards intervention. They recommend the MNA®-SF be completed with a BMI <23
Gomez Ramos MJ, Gonzalez Valverde FM. 2005 (32)	Cross-sectional study n = 200 Mean age 81± 7 geriatric inpatients	50% with malnutrition. Significant correlation (p <0.001) between MNA® score and biological values (total lymphocyte count, albumin and transferrin)
Salminen H. 2005 (33)	Cross-sectional study n = 351 elderly women Mean age = 73 ± 2 community dwelling	1 patient malnourished, 7% at risk of malnutrition. Half of the women with a MNA® <27 had a twofold increased risk of having osteoporosis.
Soini H, Routasalo P. 2004 (34)	Cross-sectional study n = 178 Age 75 - 94 receiving home-care services	3% with malnutrition, 48% at risk. Dry mouth and chewing and swallowing problems correlated with a lower MNA® score (p= 0.0001).
Visvanathan R, Macintosh C. (35)	Analysis and follow-up study n = 250 elderly (67-99) W = 173 community dwelling receiving home care services	5% with malnutrition, 38% at risk. Within one year, malnourished or at risk patients were more likely than well-nourished subjects to be admitted to the 2003 hospital (RR = 1.51), have two or more emergency hospital admissions (RR = 2.96), spend more than four weeks in the hospital (RR = 3.22), suffer falls (RR = 1.65), and report weight loss (RR = 2.63).
Tur JA, Colomer M. 2005 (36)	Descriptive study n = 230 elderly W = 141, M = 89 community dwelling	1% of men were malnourished, 5% of women.
Zeyfang A, Rukgauer M. 2005 (37)	n = 58 healthy elderly community dwelling	A MNA® score in the normal range from 24 to 30 can distinguish between persons at risk for cognitive or functional decline or persons with slightly impaired functions.
Izaola O, de Luis Roman DA. 2005 (38)	Prevalence study. n = 145 adults Mean age = 57± 18. hospitalized in medical wards	68% were malnourished, 30% at risk of malnutrition

Table 2
Prevalence of Malnutrition Associated with Other Diseases

Authors - Year - Reference	Disease	Type of Study	Results
Toliusiene J, Lesauskaite V. 2004 (39)	Prostatic cancer and benign prostatic hyperplasia	Men suffering from prostate cancer vs. benign prostatic hyperplasia. N = 40 with cancer Mean age = 72	50% of patients with cancer at risk for malnutrition vs. 8% in control group
Formiga F, Chivite D. 2005 (40)	Hip fracture	Prospective study of patients suffering from hip fracture N = 73 patients (W = 84%), Mean age = 82	53% at risk of malnutrition. MNA®-SF values reflect a clinical process in post-operative hip-fractured patients which is different from serum albumin, serum cholesterol and lymphocyte count.
Bauduer F, Scribans C. 2003 (41)	Hematological pathology	Prospective study. N = 120 patients Mean age = 74 hospitalized	Mean MNA® = 22. 8. 13% had MNA® <17. Factors predictive of malnutrition in patients with MNA® <17 were intake of more than 3 drugs ($p<0.01$) and recent weight loss ($p= 0.015$).
Langkamp-Henken B, Hudgens J 2005 (42)	Pressure ulcers stage I to IV	Cross-sectional study comparison between MNA® (and MNA®-SF) and other indicators of malnutrition. N = 23 men with pressure ulcers stage I to IV Mean age = 79 ± 1	13 malnourished patients, 7 at risk for malnutrition and 3 with normal MNA®. Serum albumin and prealbumin did not correlate with MNA®. MNA® and MNA®-SF provide advantages over using serum proteins in screening and assessing nutritional status of elderly men with pressure ulcers.
Arellano M, Garcia-Caselles MP. 2004 (43)	Dementia	Evaluation of clinical usefulness of MNA® in patients suffering from dementia N = 63 (W = 47, M = 16) (MMSE <21/30). Mean age = 80 ± 8 geriatric convalescence unit.	MNA® scores identified 62% of patients as malnourished, 37% at risk of malnutrition, and 2% as normal vs. the sequential model of American Institute of Nutrition (AIN) which identified 43% as malnourished and 57% normal. Highest correlation between scores of the sequential model of the AIN and the MNA® were in patients with MNA® <13.5.
Magri F, Borza A. 2003 (44)	Dementia	Descriptive and interventional study. N = 174 patients with dementia Mean age = 80 ± 8	Demented patients show a high percentage of malnutrition particularly evident in subjects with severe cognitive impairment. Nutritional status seems to be linked more to functional abilities than to duration of disease.
Murphy MC, Brooks CN 2000 (45)	Orthopedic patient	Descriptive and interventional study. n=49 women age 60 - 103	Compared with albumin levels and energy intake, the sensitivity of a MNA® score of <17 varies from 27 to 57% and specificity is 66 - 100%. If cutoff is increased to <23.5, sensitivity of the MNA® increases to 75 - 100%, but specificity decreases to between 37 and 50%.
Wu GH, Liu ZH 2005 (46)	Surgical patients	N = 4012 adults	Prevalence of malnutrition defined by MNA® was 21% compare to 39% according to SGA. Prevalence of malnutrition was high in subjects age >60 years (48%) and those with neoplasia (65%) or digestive tract disease (53%).

Table 3
Prevalence of malnutrition in elderly determined by the MNA®.

Authors - Year - Reference	Type of Study	Results
Bauer JM, Vogl T 2005 (47)	Prospective study n = 121 geriatric patients hospitalized in acute geriatric wards	MNA® identified 70% with malnutrition or at risk, compared to 45% identified by SGA, and 40% identified by the NRS. The MNA® is still the first choice for geriatric hospital patients. For those to whom the MNA® cannot be applied, the NRS is recommended.
Christensson L, Unosson M 2002 (48)	Cross-sectional study n = 261 elderly, Age = 65 - 104 (W = 148, M = 113) institutionalized	According to the MNA®, 79% malnourished or at risk, versus 53% according to the SGA. Sensitivity of SGA was 93% and MNA® was 96%. Specificity of SGA was 61% and MNA® was 26%. The SGA is more useful in detecting residents with established malnutrition, while the MNA® is more useful in detecting residents who need preventive nutritional measures.
Stratton RJ, Hackston A 2004 (49)	Prospective study n = 86 medical patients (mean age = 78) n = 85 surgical patients (mean age = 61)	The MNA® tool systematically over-categorized risk of malnutrition in elderly medical patients, but significantly under-categorized risk in this population compared with MUST.
Charlton KE, Kolbe-Alexander TL 2005 (50)	Cross sectional study of validation n = 238 (age > 60) black South Africans institutionalized or free-living	Tool to screen elderly South Africans has good sensitivity (88%) and specificity 95%) compared with the MNA® scoring system. It has a very high negative predictive value (99.5%).
Reodecha P, Putwatana P 2004 (51)	Prospective study n = 190 patients Age $\geq$ 60 surgical patients	The NRC (Nutritional Risk Classification) was best of four screening tools for predicting the occurrence of post-operative infectious and wound complications.
Kuzu MA, Terzioglu H 2006 (52)	Population study n = 460 Age > 59 patients with major surgery	58% with malnutrition according to the SGA, 64% according to Nutritional Risk Index (NRI) and 67% according to MNA®. Odds ratio for morbidity between malnourished and normal patients is 3 (CI 95% 1-10) for MNA®. All screening indices except the MNA® are significantly predictive of morbidity.
Woo J, Chumlea WC 2005 (53)	Study of validation n = 867 Age > 65 (M = 340, W = 527) hospitalized and institutionalized patients	The CNS (Chinese Nutrition Screen), based on the MNA®, identified 90% of all patients with normal nutrition. The applicability of screening tools may vary depending on the site and the population characteristics.
Chubb PE 2005 (54)	Study of reliability and validity n = 86 (age >65) institutionalized	Nutritional Risk Screening Tool (NRST) has a high level of reliability and a moderate high level of validity. NRST is more appropriate for use than MNA®.
Barone L, Milosavljenic M 2003 (55)	Prospective study n = 43 elderly hospitalized	Compared to the SGA, the MNA® is better able to identify severe malnutrition. Findings are consistent at day 0, day 30 and day 60 and are statistically significant ($p < 0.05$).
Kucukerdonmez O, Koksal E 2005 (56)	Cross-sectional study n = 1564 elderly Mean age 70 $\pm$ 8 (M = 71 $\pm$ 9, W = 70 $\pm$ 9) community dwelling	MNA® results indicate 7% of men and 9% of women were malnourished. Both MNA® and Nutrition Screening Initiative Checklist could be used to assess nutrition in elderly but are not interchangeable. The MNA® is a practical and more valid method.
Thorsdottir I, Jonsson PV 2005 (57)	Prospective study n = 60 elderly age >65 inpatients	Full nutritional assessment (FNA) identified 58% as malnourished. The sensitivity of a simplified screen was 89% and specificity 88% (compared with 77% and 36% for the MNA® and 89% and 60% for the screening sheet for malnutrition [SSM]).

MNA® studies

Since its development in 1989, the MNA® has been used in hundreds of studies in a range of settings and in many countries. Tables 1 and 2 summarize publications of studies performed in community and clinical settings and in elderly persons with specific diseases. Table 3 summarizes surveys done to compare the MNA® with other nutritional tools such as the Subjective Global Assessment (SGA) (58), the Nutritional Risk Classification (NRS) 2002 (59), or the Malnutrition Universal Screening Tool (MUST) (60). These studies using the MNA® provide comparative and comprehensive data on the prevalence of malnutrition in clinical settings, including hospitals and nursing homes, and in community settings around the world and show very similar trends. The MNA® is clearly correlated with morbidity and mortality in many studies.

MNA® and nutrition follow up

The MNA® has been used successfully in many interventional studies in patients who are ill, frail or demented (61, 62). It has been demonstrated that those at risk for malnutrition (that is MNA® <23.5) are a good target population for nutritional intervention. In studies of patients who received oral supplementation, the MNA® score and weight increased during follow-up. Nutritional intervention, when indicated, should start as soon as possible before secondary functional decline becomes irreversible. The Comprehensive Geriatric Assessment (CGA), which includes nutritional evaluation, is an effective overall method for detecting patients at risk for functional decline.

Similar results were also seen in patients suffering from dementia, and the MNA® appears to be a good tool for clinical studies in these patients. In studies of patients suffering from mild to moderate dementia who live at home with a caregiver, thirty percent were found to have an MNA® score < 23.5. In this subgroup, low MNA® scores were associated with an increase in mortality at 1 year and 2 years, increased risk for nursing home admission, and more rapid cognitive decline (63, 64). Nutritional intervention has been found effective in improving weight, MNA® score and muscle mass assessed by dual-absorptiometry, DEXA.

New Challenges for the MNA®?

The MNA® provides a number of unique opportunities useful for practice. It is important to teach health professionals who care for the elderly, especially the frail and ill elderly, how to use the MNA®. It is also important to educate medical students about nutritional assessment and intervention in the elderly.

The MNA® allows us to intervene earlier, to improve compliance with refeeding and, ultimately, to improve patient prognosis. It also affords opportunities in clinical research. As demonstrated with nearly 200 publications to date, the MNA® is a very useful tool for clinical research. It was recommended for use by the International Association of Gerontology/International Academy of Nutrition and Aging (IAG-IANA) Task force on the Minimum Data Set for Nutritional Studies in the Elderly.

Finally, the MNA® is not only a tool to assess nutritional status but it is also useful in screening populations to identify frail elderly persons. It will be very important in the future to establish a specific score to identify the frail elderly patient in clinical practice. More studies are needed on the links between MNA® scoring and frailty.

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DISCUSSION

David Thomas, MD, Saint Louis University, St. Louis, MO, USA: *Professor Vellas, in the studies that you did in the Alzheimer's Group, what was the magnitude of the improvement in the Mini Nutritional Assessment (MNA®)? It statistically improved when you gave the supplement.*

Bruno Vellas, MD, Toulouse University, Toulouse, FR: *The magnitude was between two and three points. This is not very high but it is statistically significant.*

David Thomas: *And to follow up, was there any particular question in the MNA® that typically improved or accounted for most of the improvement?*

Bruno Vellas: *We need to look at that. I do not know exactly which question it was but that is an interesting area to see what brings about the improvement.*

Cameron Chumlea, PhD, Wright State University, Dayton, OH, USA: *Bruno, at the time you developed it, age of the person was not included. It was just not a factor that came into the scoring system. That was 17 years ago. I do not exactly know about Europe. However, in the United States, the demographic changes within our population, particularly within the older population, are much different than they were 17 years ago. I am just wondering if age maybe is a factor that comes into play. 17 years ago it may not have mattered; now it is much more important to know whether a person was over 85. In the statistics I have, the population over 85 is the fastest growing segment of our population. People are simply living longer than they used to. Age, therefore, may be something that really should be considered within certain systems.*

Bruno Vellas: *Yes, the MNA® was validated for the 65 plus. We know that the prevalence of malnutrition between 65 and 75 is much lower than in later years.*

Gordon Jensen, MD, Vanderbilt University, Nashville, TN, USA: *I think a reasonable hypothesis might be that the MNA® would be very good as a proxy indicator of active inflammatory state manifest as elevated C-Reactive Protein (CRP), IL1, or IL6. We have not looked at that systematically. It would certainly be worth doing. In some of the population studies you have already done, you may at least have CRPs. Of those that screen as either malnourished or as at risk, how many of them turn out to be in an active pro-inflammatory condition?*

Bruno Vellas: *I do not have the data, but that would be interesting to look at. In those that have a MNA® less than 17, many have some inflammation, which is due to associated disorders. That would be interesting to see if patients in the hospital with MNA® scores between 17 and 23.5 have some kind of inflammation, for example elevated CRP.*

Gordon Jensen: *One other thing you might well pick up are people with undiagnosed disease processes.*

Tommy Cederholm, MD, Karolinska University Hospital Huddinge, Stockholm, SW: *In my opinion, the MNA® is good for screening and diagnosing or identifying patients at risk. I have not used it so far as a tool for surveillance or intervention. I usually advocate weight and easy performance or functional tests. What is your opinion on that?*

Bruno Vellas: *We were surprised because we developed the MNA® for nutritional screening. In most of these intervention studies, when you have some improvement of weight and you do the examination, you find some statistically significant improvements of the MNA®.*

Tommy Cederholm: *And does that mean that you advocate it as a surveillance tool for follow-up?*

Bruno Vellas: *Which follow-up is better than the MNA®? However when you do a trial, you look at how many positive markers there are. We need to follow the weight; that is much more important.*

Antonio Salva, MD, Barcelona University, Barcelona, ES: *One of your questions was whether the MNA® is useful for healthy elderly people. We are very interested in using the MNA® as a screening tool in the community. In the community the percentage of healthy elderly people is very high and we know that the percentage of people identified at positive risk is low. This is important when you would like to use some screening tool or strategy that applies to a large population group. Before, we used the 18 item full MNA®, and for the community population it was too long as a screening tool. I remember the cohort we used to validate the MNA® Short form; about 400 patients were from Barcelona and 200 from the community. Only 0.5% had malnutrition and 9.5 % were at risk for undernutrition. In a new study we have just finished including 2500 people in Catalonia, we used the MNA® short form that seems more adequate for this big population with a high percentage of healthy people.*

Bruno Vellas: *Yes, the full MNA® may be too long for the elderly people. The short MNA® can really help.*

Cornel Sieber, MD, Erlangen-Nürnberg University, Nürnberg, DE: *I would like to come back to what you asked, Tommy. I think I would not be an advocate to always say that weight is the better means for surveillance studies. If you are looking for an easy tool, weight will often be very easy to measure. If you go for a tool like the MNA®, you need much more time. It is clear, however, that weight is somehow diluted in the MNA®. That means you could have no change in the MNA® but have, let us say, an increase in weight. The MNA® gives us much more information. It gives you indirect measures of activity of day living. Many other things are going on. I would say, if you conduct large studies and you work with lay people who are not used to doing it, the weight will be alright. As soon as you have trained people, however, I think the MNA® gives you a lot of additional information about other functionality in the patient, which is very useful.*

Bruno Vellas: *We all think that weight loss is very useful to detect malnutrition. We do not, however, have a study of that. Maybe it is not useful. It is very difficult to see if we have a weight change in elderly people over six months or one year. It depends on how you measure the weight. Sometimes you can have a change of two or three kilograms and you are not able to see it. I do not know about the reliability of measuring weight in the same conditions with the same scales in clinical practice. We do not know if that works.*

Cameron Chumlea: *Along with the issue of weight, I think that also relates to body mass index (BMI) and the other measurements. I think there are a couple of things we need to think about. First, the cut points in here are based on French data that would probably have been collected, I think, in the early 1980s. Second, the determination for arms circumference and calf circumference, these cut points are based on French data and that data is about 20 some years out of date which raises an interesting question. That is again going back to the point I was making about age. If you administer this to someone who might be 70 years of age, you could have a 70 year old person who needs to lose weight in the United States. Therefore, a weight loss that shows up as being a negative indicator here actually might be a positive indicator. That may be more informative than having arm circumference or calf circumference in the MNA®. In addition, if you are looking for a weight change as being critically important, you may want to actually document that. If you are asking somebody in the current MNA® 'Have you lost weight?' and the answer is 'Yes, I lost a lot of weight', that does not mean anything. However, if they lost 10 pounds or five or six kilos, that may have a bigger meaning, or if they gained, you can actually have a weight gain. I think if there is something to be considered for the future for the MNA®, it is this issue of what are the particularly important measurements. I think weight should be in there. Whether you actually need some of the other pieces of information, which actually are population specific, I do not know. I do not know whether the body measurements would actually provide as much information today as they did in the past and actually whether they were collected properly.*

Tommy Cederholm: *I think it depends a lot on which setting we are actually looking at. For acute care, I think if edema is not present, weight together with some easily performed functional tests like handgrip or Activities of Daily Living (ADLs) are good enough. I am not aware if there are any studies on repeated measurements of MNA® in elderly care. I think that for people who live for a long time in long-term elderly care, it appears that repeated MNA®s would be a good tool. I am not sure whether there are any.*

Bruno Vellas: *There is a reliability study that was done. In Europe we now have 1000 patients with Alzheimer's disease with the MNA® scoring every six months for a four year period.*

Tommy Cederholm: *I would think that repeated MNA® would be a good tool for long-term elderly care.*

Cameron Chumlea: *Jane Read did a paper. It was in Nutrition and Cancer (Read JA, et al. Nutr Cancer 2005;53:51-56). They did a repeat measurement of MNA® and the Patient Generated Subjective Global Assessment (PGSGA). I think there is also a South African study. There are one or two papers on this subject.*

Maureen Otto, MS, RD, Director, American Dietetic Association (ADA), Chicago, IL, USA: *My question is about the short form. In the 2001 study it seemed that the population from nursing homes was just about 10 %. I am curious if there are later studies that have a higher percentage from nursing homes, and can we feel comfortable to use this tool in the nursing home, based on the 2001 study?*
Bruno Vellas: *I think the 2001 study was not done in nursing homes. I think there were no patients in nursing homes. Some were hospitalised, some were at home.*
Maureen Otto: *There were just a very few in the nursing home.*
Bruno Vellas: *Very few in nursing homes, yes. The MNA® short form is not for nursing home patients. If you do it in nursing homes, we will have maybe 80% of the population that will have a low score in the MNA®. The MNA® short form is mostly for the general population. If you use it in a nursing home or a clinical setting, it is better to use the full MNA®.*
Cameron Chumlea: *Let me follow up on that in terms of the issue of administration in nursing homes. Again, within the United States there are other situations besides nursing homes. You have dialysis centres, you have lots of places where elderly people can or need to be screened for nutritional status assessment. I think we should maybe think a bit more expansively. We should possibly include those sites also.*
David Thomas: *Just to follow up on that because we have actually looked at this. I think later on in the session we are going to compare the instruments. None of the other instruments have been validated in nursing homes. Most of the instruments have not been validated in the elderly population at all. For example, subject global assessment is only validated in gastrointestinal cancer and neurology cancer patients. There is much broader and more validation in the MNA® literature than there is for any other instrument that we are using. I would also like to ask a question. One of the things that concern many is that this is a very good tool to tell us who is at risk or who is undernourished. It does not separate, though, this inflammation that Dr. Jensen was talking about. Cachexia may be resistant to administration of adequate nutrients while undernutrition should be remediable by administration of nutrients. That is what we really need to be looking at. I think we are identifying two populations with the MNA®. One is an inflammatory population that is sick and is going to die. As you know, the mortality data correlates extremely well with the MNA®. What the instrument does not tell us, though, is who in that population is going to get better if we correct malnutrition associated with starvation.*
Bruno Vellas: *We said if the MNA® is less than 17, we need to look at inflammatory markers, look at CRP, look at albumin to be able to determine the prognosis and degree of inflammation.*
Kathleen Niedert, RD, Western Home Communities, Cedar Falls, IA, USA: *My concern is that if there was a way to have set interventions for each group, then we could get outcomes based research by using the MNA® and by using the specific interventions. When clinicians found that the score was less than 17 or between 17 and 23, these set interventions would be initiated so that we could get outcome-based research. That is something that I would like to see happening, especially in the long-term care arena. The problem with the long-term care arena is our residents are only there for an average of 2.5 years. What can I do to make these people's lives better? Weight changes are a big issue in the long-term care arena. Weight loss is usually the first indication of demise, even over functional changes.*
Bruno Vellas: *In long-term care it is important to do the MNA® at entry, when the patient comes into long-term care, to have some information on the nutritional status and to see whether you need to start some intervention.*
Naomi Trostler, PhD, American Overseas Dietetic Association, Hebrew University, Kfar Saba, Israel: *I was wondering where hydration comes into the picture. Mainly in re-feeding or the measurements following, the hydration status may change irrespective of weight and may give us some inconsistent data. It may look as if the weight went up or it is not the real weight when we measure the low weight. This is one concern I have with using it. The other one is going back to BMI. I think some populations, for example, Ethiopians that we worked with, have a much lower BMI than the standard. You have to set totally different criteria for the various cut offs of BMI.*
Bruno Vellas: *MNA® was a tool to detect undernutrition. We know that some elderly people who have dehydration are more likely to also be malnourished. That is an important measure. Many times families say that the elderly do not want to drink. What many physicians know is that when elderly people do not drink, they also do not eat. There is a link here. When some elderly people do not drink, they do not eat either. For this reason, dehydration is a risk factor. Often, the physician is concerned about dehydration and gives water to patients who are not drinking. They do not, however, always think about assessing the nutritional status. I have never seen elderly people who are dehydrated without malnutrition. Usually, when they do not drink, they do not eat.*