

Assessing the Nutritional Status of the Elderly: The Mini Nutritional Assessment as Part of the Geriatric Evaluation

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The Mini Nutritional Assessment (MNA) is a rapid and simple tool for evaluating the nutritional state of the frail elderly, which allows, if necessary, for nutritional intervention and/or diet modification (Figure 1).¹

Nutrition and Aging

The rapid increase of the elderly population is a characteristic of the second half of the 20th century.² Aging is a complex phenomenon including physiologic and psychologic changes linked to social conditions. The nutrition status of the elderly is also dependent on social conditions (e.g., widowed elderly women living alone on a reduced budget) and is influenced by the long-term effects of chronic disease and the intake of medication, which can sometimes generate undesired interactions with nutrients. The physiologic changes of aging, including perceptual, endocrine, gastrointestinal, renal, and muscular changes, may also affect nutrition needs. Dietary allowances are recommended to meet the nutrition requirements of the healthy population and do not consider disease states or other problems frequently seen in the elderly.^{3,4} Survey results suggest that part of the elderly population is at an increased risk of nutrition deficiencies because they cannot meet these nutrient needs.^{5,6}

Undernutrition

A majority of the elderly population live at home. It is estimated, however, that more than 40% of the

elderly who reach 65 years of age will enter a nursing home and that more than half will reside there for at least 1 year.⁷ Table 1 gives a summary of the prevalence of malnutrition in different elderly groups. In free-living elderly, the prevalence is relatively low (5–10%), but in nursing home elderly, homebound elderly, and hospitalized elderly, it reaches significant levels (30–60%).^{8–14} This situation usually goes unrecognized,^{15,16} although it is associated with increased mortality,¹⁷ increased susceptibility to infection,¹⁸ and reduced quality of life.¹⁹ Possibilities exist to prevent or correct this malnutrition, but they are not used due to the lack of a specific validated tool to detect malnutrition.^{20–26}

Geriatric Evaluation

Global evaluation of physical, mental, and social states before treatment and readaptation is fundamental to the care of the elderly to assess health problems and restore their autonomy.²⁷ Management after geriatric assessment is helping to improve the survival and functional status of the elderly.²⁸ Simple and rapid screening tests for functional evaluations in geriatric evaluation programs are in use for testing mental faculties (Mini-Mental State examination [MMS]²⁹), autonomy (activities of daily living [ADL]³⁰ and instrumental activities of daily living [IADL]³¹), gait and balance (Tinetti gait and balance scale³²), and emotional (Geriatric Depression Scale [GDS]³³) states (Table 2). Nutrition evaluation, however, is usually absent. This is partially explained by the lack of a specifically validated scale to assess the risk of malnutrition in the elderly.²¹

Evaluation of Nutrition Status

Evaluation of nutrition status is important for all nutrition or dietary interventions. Global evaluation of nutrition status is composed of a synthesis of information, including clinical evaluation, a dietary history, an anthropometric evaluation, and biochem-

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MINI NUTRITIONAL ASSESSMENT MNA™

ID# _____

Last Name: _____ First Name: _____ M.I. _____ Sex: _____ Date: _____

Age: _____ Weight, kg: _____ Height, cm: _____ Knee Height, cm: _____

Complete the form by writing the numbers in the boxes. Add the numbers in the boxes and compare the total assessment to the Malnutrition Indicator Score.

ANTHROPOMETRIC ASSESSMENT

	Points
1. Body Mass Index (BMI) (weight in kg) / (height in m) ² a. BMI < 19 = 0 points b. BMI 19 to < 21 = 1 point c. BMI 21 to < 23 = 2 points d. BMI ≥ 23 = 3 points	<input style="width: 20px; height: 20px;" type="text"/>
2. Mid-arm circumference (MAC) in cm a. MAC < 21 = 0.0 points b. MAC 21 ≤ 22 = 0.5 points c. MAC > 22 = 1.0 points	<input style="width: 20px; height: 20px;" type="text"/> . <input style="width: 20px; height: 20px;" type="text"/>
3. Calf circumference (CC) in cm a. CC < 31 = 0 points b. CC ≥ 31 = 1 point	<input style="width: 20px; height: 20px;" type="text"/>
4. Weight loss during last 3 months a. weight loss greater than 3kg (6.6 lbs) = 0 points b. does not know = 1 point c. weight loss between 1 and 3 kg (2.2 and 6.6 lbs) = 2 points d. no weight loss = 3 points	<input style="width: 20px; height: 20px;" type="text"/>

GENERAL ASSESSMENT

5. Lives independently (not in a nursing home or hospital) a. no = 0 points b. yes = 1 point	<input style="width: 20px; height: 20px;" type="text"/>
6. Takes more than 3 prescription drugs per day a. yes = 0 points b. no = 1 point	<input style="width: 20px; height: 20px;" type="text"/>
7. Has suffered psychological stress or acute disease in the past 3 months a. yes = 0 points b. no = 2 points	<input style="width: 20px; height: 20px;" type="text"/>
8. Mobility a. bed or chair bound = 0 points b. able to get out of bed/chair but does not go out = 1 point c. goes out = 2 points	<input style="width: 20px; height: 20px;" type="text"/>
9. Neuropsychological problems a. severe dementia or depression = 0 points b. mild dementia = 1 point c. no psychological problems = 2 points	<input style="width: 20px; height: 20px;" type="text"/>
10. Pressure sores or skin ulcers a. yes = 0 points b. no = 1 point	<input style="width: 20px; height: 20px;" type="text"/>

DIETARY ASSESSMENT

11. How many full meals does the patient eat daily? a. 1 meal = 0 points b. 2 meals = 1 point c. 3 meals = 2 points	<input style="width: 20px; height: 20px;" type="text"/>
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	Points
12. Selected consumption markers for protein intake • At least one serving of dairy products (milk, cheese, yogurt) per day? yes <input type="checkbox"/> no <input type="checkbox"/> • Two or more servings of legumes or eggs per week? yes <input type="checkbox"/> no <input type="checkbox"/> • Meat, fish or poultry every day? yes <input type="checkbox"/> no <input type="checkbox"/> a. if 0 or 1 yes = 0.0 points b. if 2 yes = 0.5 points c. if 3 yes = 1.0 points	<input style="width: 20px; height: 20px;" type="text"/> . <input style="width: 20px; height: 20px;" type="text"/>
13. Consumes two or more servings of fruits or vegetables per day? a. no = 0 points b. yes = 1 point	<input style="width: 20px; height: 20px;" type="text"/>
14. Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties? a. severe loss of appetite = 0 points b. moderate loss of appetite = 1 point c. no loss of appetite = 2 points	<input style="width: 20px; height: 20px;" type="text"/>
15. How much fluid (water, juice, coffee, tea, milk,...) is consumed per day? (1 cup = 8 oz.) a. less than 3 cups = 0.0 points b. 3 to 5 cups = 0.5 points c. more than 5 cups = 1.0 points	<input style="width: 20px; height: 20px;" type="text"/> . <input style="width: 20px; height: 20px;" type="text"/>
16. Mode of feeding a. Unable to eat without assistance = 0 points b. self-fed with some difficulty = 1 point c. self-fed without any problem = 2 points	<input style="width: 20px; height: 20px;" type="text"/>

SELF ASSESSMENT

17. Do they view themselves as having nutritional problems? a. major malnutrition = 0 points b. does not know or moderate malnutrition = 1 point c. no nutritional problem = 2 points	<input style="width: 20px; height: 20px;" type="text"/>
18. In comparison with other people of the same age, how do they consider their health status? a. not as good = 0.0 points b. does not know = 0.5 points c. as good = 1.0 points d. better = 2.0 points	<input style="width: 20px; height: 20px;" type="text"/> . <input style="width: 20px; height: 20px;" type="text"/>

ASSESSMENT TOTAL (max. 30 points): .

MALNUTRITION INDICATOR SCORE

≥ 24 points	well-nourished	<input style="width: 20px; height: 20px;" type="text"/>
17 to 23.5 points	at risk of malnutrition	<input style="width: 20px; height: 20px;" type="text"/>
< 17 points	malnourished	<input style="width: 20px; height: 20px;" type="text"/>

Figure 1. The Mini Nutritional Assessment Form.

Table 1. Malnutrition in the Elderly

Mode of Living	Prevalence (%)	References
Free-living	5	Department of Health and Social Security, UK ²³
	7	Dept. of Health and Social Security, UK ²⁴
	5	Blondel-Cynober et al. ²⁵
	2	Löwink et al. ⁹
	1–4	Cederholm et al. ⁸
Hospital	39	Cederholm et al. ⁸
	59	Rapin et al. ¹¹
	50	Alix ¹²
	22	Volkert et al. ¹⁴
Nursing home	30–60	Rudman et al. ¹⁰
	10–85	Kerstetter et al. ²⁶

ical evaluation (Table 2).^{21,34} Until recently, no nutrition tests were available. Lately, two different types of nutrition screenings have been developed. First is the “Public Awareness Checklist” of the Nutrition Screening Initiative.³⁵ This simple test is aimed at increasing the nutrition awareness of elderly people but is not used to diagnose malnutrition.^{36,37} Second, the Subjective Global Assessment (SGA)^{38,39} and the Prognostic Nutrition Index^{40,41} are aimed at evaluating the nutrition risks of hospitalized patients. These tests seem to be an evaluation of the risks of complications. They are not aimed at screening for risks of malnutrition in the elderly within general practice, at admission to nursing homes, or for the frail elderly. To complement these screening tools, we decided to develop a simple tool to assess the risk of malnutrition in the elderly.

The Mini Nutritional Assessment

To set up a tool for simple and rapid evaluation of nutrition status, the following requirements should

be incorporated: (1) a reliable scale, (2) definition of thresholds, (3) compatibility with the skills of a generalist assessor, (4) minimal bias introduced by the data collector, (5) acceptability to patients, and (6) inexpensiveness.

The MNA test is composed of 18 simple and rapid to measure items and can be performed in less than 15 minutes (Figure 1).¹ The test involves (1) anthropometric assessment (weight, height, arm and calf circumferences, and weight loss); (2) general assessment (six questions related to lifestyle, medication, and mobility); (3) dietary assessment (eight questions related to number of meals, food and fluid intake, and autonomy of feeding); and (4) subjective assessment (self-perception of health and nutrition). The scoring for each part categorizes the elderly patients in the following manner: (1) well-nourished (normal); (2) at risk for malnutrition (borderline, with further assessment to be done using biological markers such as albumin and C-reactive protein); and (3) malnourished.

Table 2. Geriatric Evaluation

Geriatric assessment instruments	
	<i>Screening test*</i>
Cognitive problems	MMS
Autonomy	ADL, IADL
Depression	GDS
Gait	Tinetti gait and balance scale
Nutritional problems	MNA
Global nutritional assessment	
	Clinical evaluation
	Dietary evaluation
	Anthropometric evaluation
	Biochemical evaluation
	Functional tests

* MMS, Mini-Mental State; ADL, activities of daily living; IADL, instrumental activities of daily living; GDS, Geriatric Depression Scale; MNA, Mini Nutritional Assessment.

Validation of the MNA

Validation of the MNA was carried out by three successive studies on more than 600 elderly¹: (1) a study to set up the test on 155 elderly subjects, from the very healthy to the severely malnourished elderly¹; (2) a study for the validation and test of the discriminatory potential of the MNA on 120 elderly subjects, from the frail to the healthy elderly¹; and (3) a complementary validation study in a different cultural context on noninstitutionalized elderly from the New Mexico Aging Process Study.^{1,42}

Developmental Study¹

This study was carried out with 105 frail elderly from the Clinical Center and 50 healthy elderly from the Universite du 3eme age in Toulouse. Population characteristics are given in Table 3. The MNA test was validated using two principal criteria:

Table 3. Characteristics of the Elderly Populations Studied

	Developmental Study (Toulouse 1991)		Validation Study (Toulouse 1993)		Screening Study (Albuquerque 1993)	
	Men	Women	Men	Women	Men	Women
Number	53	102	36	84	140	207
Age (years)*	78 ± 9	79 ± 9	78 ± 9	80 ± 10	77 ± 6	77 ± 7
Weight (kg)	59 ± 13	54 ± 12	66 ± 12	55 ± 13	76 ± 11	63 ± 11
Body mass index (kg/m ²)	24 ± 5	23 ± 3	25 ± 4	24 ± 5	25 ± 3	25 ± 4
Calf circumference (cm)	32 ± 5	33 ± 4	33 ± 4	32 ± 4	36 ± 3	36 ± 3
Albumin (g/L)	32 ± 7	33 ± 7	37 ± 7	34 ± 7	41 ± 3	41 ± 3

* Mean ± standard deviation.

(1) clinical status, which consisted of a nutrition assessment done independently by two physicians trained in nutrition on the basis of the subject's clinical file without knowledge of the MNA results, and (2) a comprehensive nutrition assessment of each patient. This assessment included

- measurement of the anthropometric markers according to Chumlea et al.,⁴³ including weight, height, knee height, midarm and calf circumferences, triceps, and subscapular skinfolds;
- evaluation of dietary intake, including a 3-day food record combined with a food-frequency questionnaire; and
- measurement of nutrition biochemistry markers, including albumin, prealbumin, transferrin, ceruloplasmin, C-reactive protein, α_1 -acid glycoprotein, cholesterol, triglycerides, vitamins A, D, E, B₁, B₂, B₆, and B₁₂, folate, copper, zinc, and complete hematology (hematocrit, hemoglobin, blood cell count, and differentiation).

At first analysis clinical status (normal or malnourished) was compared to classic nutrition status (biochemical indices and anthropometry). This was followed by principal component analysis and a discriminant analysis to objectively compare the clinical status with the MNA, with or without biochemical indices. The results¹ indicate that the MNA test without biochemical indices (albumin, cholesterol, creatinine, and lymphocyte counts) can assess nutrition status. Discriminant analysis showed that it identically classified 92% of the subjects with the clinical status determined by the physicians. When all variables from the comprehensive nutrition assessment, including anthropometry, biochemical markers, and part of the dietary segment were reviewed, 98% of the subjects matched the initial MNA clinical classification using discriminant analyses.¹ These results suggest that the MNA can correctly assess the nutrition status of the elderly without the use of biochemical measures and expensive laboratory investigations.

Validation Study¹

This study was carried out on 120 frail elderly (90 elderly from the Clinical Center and 30 elderly from the Université du 3ème âge in Toulouse, France) to determine the discriminatory potential of the MNA test and to classify the subjects into categories (well-nourished, at risk of malnutrition, and malnourished) on a 30-point scale (similar to the MMS). For each subject, the evaluation included

- clinical status (done by two physicians trained in nutrition),
- MNA test,
- autonomy evaluation (ADL scale),
- biochemical markers (albumin, C-reactive protein, prealbumin, α_1 -acid glycoprotein), and
- a functional evaluation (grip strength).

Nutrition assessment by the MNA was compared to clinical status by discriminate analysis.¹ Identical nutrition status was obtained by the MNA test without biochemical indices for 89% of the subjects, while the MNA with biochemical indices classified 88% of the subjects identically with clinical status determination.

Cross-Validation

The classification potential of the MNA was done by cross-classification of the subjects of the 1991 and 1993 Toulouse studies¹ using the discriminant analysis equations and using the clinical status as a reference standard. The 1993 Toulouse population was classified by computing the equations derived from the developmental study (Figure 2). By this procedure, 78% (90 subjects of 115) were classified correctly, i.e., matching the clinical status. These results were confirmed by the inverse analysis. The 1991 Toulouse population was classified using the equations derived from the validation study. Seventy-two percent of the subjects (100 of 139) were classified in the same way by using the clinical status. However, 25–30% of the subjects were situated in an intermediate MNA score (around 19 points).

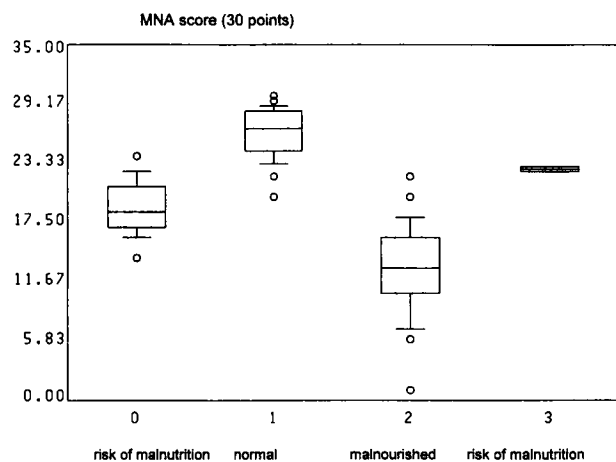


Figure 2. Mini Nutritional Assessment (MNA) results compared to clinical status, cross-validation (Toulouse 1991 and 1993).¹ Nutrition evaluation of the subjects ($n = 120$; missing values, $n = 2$) from the validation study (Toulouse 1993) computed by discriminant analysis equation of the developmental study (Toulouse 1991) and compared to their clinical status. Same evaluation of nutritional status: normal ($n = 41$, 35%); malnourished ($n = 48$, 41%). Different evaluation between clinical status and MNA. Risk of malnutrition: normal/malnourished ($n = 25$, 21%); malnourished/normal ($n = 4$, 3%).

They represent elderly at risk of malnutrition and need further evaluation for exact assessment of their nutrition status, including a biochemical assessment or a clinical evaluation. These results show that 70–75% of the subjects can be directly classified as normal (well-nourished) or undernourished using the MNA without biochemistry.

MNA Scoring and Thresholds

According to the cross-validation results, the threshold for a well-nourished status is situated at approximately 22–24 points and for malnutrition at about 16–18 points on a 30-point scale.¹ Threshold values were further defined using serum albumin, a general indicator of health status,⁴⁴ as the independent variable. Subjects with low serum albumin associated with inflammation (defined by serum levels of C-reactive protein > 20 mg/L) were excluded. Thresholds were selected by cross tabulations of cutoffs for albumin and MNA scoring levels. In this way the following threshold values were set for the MNA: ≥ 24 points, well-nourished/normal; $17 < 24$ points, at risk of malnutrition/borderline; < 17 points, malnourished (Table 4).

MNA Screening on Healthy Elderly¹

The longitudinal New Mexico Aging Process study in Albuquerque, NM, USA, examined the nutrition and health status of noninstitutionalized elderly who

Table 4. Threshold Values for the Mini Nutritional Assessment

Score (maximum 30 points)	Nutritional Status
≥ 24	Well-nourished/normal
17–23.5	At risk of malnutrition/borderline
< 17	Malnourished

were healthy and over 60 years of age at the start in 1979.⁴² An evaluation of the nutrition status of these elderly was made using the MNA test, and threshold values of 24 and 17 were described. From this evaluation, about 20% of the elderly were found to be at risk of malnutrition (borderline), even when albumin levels and body mass index were still in the normal range.¹

Conclusion

Malnutrition is associated with higher morbidity and mortality, as well as a poor quality of life.⁴⁵ As it is difficult to correct the nutrition status once it has deteriorated, an early detection of malnutrition is very important. In order to effectively use this rapid screening technique, the MNA has been validated on more than 600 elderly whose nutrition status varied from very good to severely malnourished.¹

The MNA is a practical, noninvasive tool allowing for rapid evaluation of the nutrition status of frail elderly. We propose to integrate the MNA in the geriatric assessment programs, such as the MMS. Nutrition assessment using the MNA can easily be done by health professionals at hospital admission, admission into nursing homes, or by general physicians for early detection of risk of malnutrition. When malnutrition is detected, early management by nutrition intervention is of high importance and is associated with improvement in nutrition parameters.⁴⁶

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