CLINICAL PRACTICE GUIDELINES

DIAGNOSTIC ASSESSMENT
OF PROTEIN-ENERGY MALNUTRITION
IN HOSPITALIZED ADULTS

September 2003
These guidelines on “Diagnostic assessment of protein-energy malnutrition in hospitalized adults” were produced at the request of the French Hospital and Care Organisation Directorate (DHOS).

The following learned societies were consulted:

- Association des diététiciens de langue française
- Centre de documentation et de recherche en médecine générale
- Collège national des généralistes enseignants
- Société de formation thérapeutique du généraliste
- Société française de gérontologie
- Société française de médecine générale
- Société francophone de dialyse
- Société francophone de nutrition entérale et parentérale
- Société nationale française de gastro-entérologie
- Société nationale française de médecine interne
- Société de néphrologie
- Société de nutrition et diététique de langue française
- Société de pneumologie de langue française.

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Secretarial services were provided by Elodie Sallez.

The National Agency for Accreditation and Evaluation in Health would like to thank the members of the Steering Committee, Working Group, Panel and Scientific Council who took part in this project.
Diagnostic assessment of protein-energy malnutrition in hospitalized adults

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GUIDELINES

I. INTRODUCTION

I.1 Requested by, target population and target audience

These guidelines on “Diagnostic assessment of protein-energy malnutrition in hospitalized adults” were produced at the request of the Hospital and Care Organisation Directorate (DHOS). They concern hospitalized adults but exclude acute nutritional stress and pregnancy. They do not address the more specific problems of cancer and AIDS patients, those of malnutrition in patients in an Intensive Therapy Unit, or the management of malnourished patients. They are intended for all health professionals in healthcare organisations.

I.2 Method

There are two major, interrelated problems in assessing instruments to diagnose or screen for nutritional status:
- there is no consensus on a working definition for state of malnutrition as the diagnosis is based on a number of concordant factors;
- there is no gold standard against which instruments can be assessed and then compared with each other.

It follows that instruments to diagnose nutritional status can be assessed only indirectly by studying the complications related to malnutrition (morbidity and/or mortality) and that guidelines can be based only on agreement among professionals. These guidelines nevertheless propose simple-to-use instruments to detect malnutrition and criteria to diagnose malnutrition on a patient’s admission to hospital. They aim to improve the management of hospitalised patients and meet the needs of health professionals. Agreement among professionals was established by a formal consensus method (Annex I).

I.3 Diagnostic instruments assessed

The diagnostic instruments assessed were:
- **Anthropometric measurements**: weight and height, body mass index (BMI), skinfolds and limb circumference;
- **Biochemical and biological measurements**: albumin, prealbumin, retinol-binding protein, transferrin, 24-hour urine creatinine, creatinine-height index, lymphocyte count, urinary 3-methylhistidine and Insulin Growth Factor 1 (IGF-1);
- **Multifactorial scores**: the Prognosis Inflammatory and Nutritional Index (PINI), Prognostic Nutritional Index (PNI) devised by Mullen, the Buzby score or Nutritional Risk Index (NRI), the Detsky score or Subjective Global Assessment (SGA), and the Mini Nutritional Assessment (MNA®).

The following were NOT assessed:
- methods for assessing food intake (particularly questionnaires);
- complex methods for assessing nutritional status such as bioelectric impedancemetry, hydrostatic densitometry, dual photon absorptiometry, isotope dilution, CT scanning and MRI imaging.
I.4 Definitions used by the working group

• **Protein-energy malnutrition**

Protein-energy malnutrition is caused by imbalance between the intake of protein and calories and the body’s requirements. This imbalance causes tissue loss, with harmful functional consequences. The tissue loss is involuntary. Ordinary weight loss is distinguished from malnutrition by the fact that the weight loss involved is not harmful. It may be voluntary or not.

• **Acute metabolic stress**

A definition of acute metabolic stress was formulated by the consensus conference ‘*Nutrition in acute metabolic stress*’ (French-language Society for Enteral and Parenteral Nutrition, 1997):
- *acute metabolic stress* is the result of an acute situation which causes inflammatory reactions and endocrine changes, leading to increased energy expenditure and hypercatabolism with negative nitrogen balance;
- *an adult with acute metabolic stress* is a patient whose condition causes total or partial inability to satisfy their nutritional requirements for more than a week, because of the nature of the stress or because it is associated with a pre-existing disease state.

• **Age group**

As there are specific instruments to assess nutritional status and in view of the importance of early management in elderly subjects, the working group proposed age-related guidelines. On the advice of experts in geriatrics, the dividing line between a “young” and an “elderly” adult was set at 70 years.

II. **Diagnostic instruments for use in all adults on admission to hospital**

The working group proposed that “simple” instruments be used, i.e. instruments that can be used at the hospital by teams who are not specialists in nutrition (Table I).

| Table 1. Recommended instruments for assessing nutritional status on patient admission |
|----------------------------------|--------------------------------------------------|
| **Anthropometric measurements** | Weight, height, calculation of BMI |
| **Score**                        | Calculation of screening score by the MNA-SF® for patients ≥ 70 |
| **Laboratory and/or biochemical values** | No test recommended for routine use |
| **Assessment of food intake**    | Assessment required; method(s) left to professionals’ judgement |

II.1 **Assessment of nutritional status (anthropometric measurements and scores)**

Nutritional status should be assessed by calculating:

- *body mass index (BMI) = weight (kg) / height² (m²)* after weighing the patient and measuring or estimating height;
• **percent weight loss** with respect to weight before the current hospitalisation, as given in an earlier medical record;

• **a screening score** using the Mini Nutritional Assessment or MNA-SF® (14-point scale) in adults aged over 70 years (Annex 2).

**Weight measurement:** If possible, patients should be weighed in their underwear, with an empty bladder. The method depends on their autonomy, i.e. scales, chair scale or weighing machine connected to a patient hoist.

**Height measurement or estimation:** The method depends on the presence of problems affecting spine curvature (kyphosis, scoliosis, vertebral compression) and patient age.

- For patients with no spine curvature problems and who can stand, height should be measured using a height gauge.
- For patients over 70 with spine curvature problems, height is given by the Chumlea formula:
  - for women: height (cm) = 84.88 – 0.24 x age (years) + 1.83 x knee height (cm);
  - for men: height (cm) = 64.19 – 0.04 x age (years) + 2.03 x knee height (cm).

  Knee height is measured with the patient lying on their back, knees bent at 90°, using a height caliper placed under the foot with the mobile blade placed above the knee, at the condyles.
- For patients under 70 with spine curvature problems, there is no agreement among professionals on the method to be used to estimate height.

**II.2 Assessment of nutritional status (biological markers)**

There was no agreement among professionals on the need to routinely measure the following on patient admission:

- biochemical values (particularly serum albumin and serum prealbumin);
- other laboratory values (lymphocyte count).

However, serum albumin and serum prealbumin values (serum transthyretin) can suggest a diagnosis of malnutrition, and it is the doctor in charge who decides whether or not to carry out these tests. When interpreting the results, he/she should take into account any inflammatory syndrome. This was defined by the working group as a rise in any 2 of the following:

- erythrocyte sedimentation rate (ESR): ESR > age/2 for men; ESR > (age + 10)/2 for women;
- C-reactive protein (CRP) > 15 mg/l;
- haptoglobin > 2.5 g/l.

**II.3 Assessment of food intake**

- The above assessment of nutritional status should be completed with a qualitative and/or quantitative assessment of food intake. The methods used to assess food intake do not fall within the scope of these guidelines. The choice of method and how it is used depend on professional judgement until guidelines are produced.

**III. DIAGNOSTIC CRITERIA FOR MALNUTRITION**

A diagnosis of malnutrition is based on a number of concordant factors, including a history and assessment of food intake, clinical factors based on anthropometric data, laboratory values and/or
multifactorial scores and, in some cases, on the results of more complex methods of assessment. No single factor is specific for malnutrition.

Agreement among professionals was obtained on guidelines concerning the “simple” instruments for assessing nutritional status that can be used in hospital by teams who are not specialists in nutrition (Tables 2 & 3). Diagnostic criteria and thresholds were obtained by a formal expert consensus method and should be regarded as indicative; they cannot be specifically validated for the reasons given above.

In the choice of threshold, the following considerations prevailed:
- for adults over 70: choosing more sensitive thresholds because of the importance of early management;
- for adults under 70: reducing the number of false positives, i.e. of patients who would be wrongly classed as malnourished.

### III.1 Criteria that suggest a diagnosis of malnutrition

A diagnosis of malnutrition should be considered in the following circumstances:

**Based on the tests recommended on admission to hospital** (see Table I):

**For patients < 70:**
- weight loss ≥10%, with respect to weight before the current hospitalisation, as given in an earlier medical record;
- weight loss ≥5% in 1 month, with respect to weight before the current hospitalisation, as given in an earlier medical record;
- BMI ≤17 kg/m².

**For patients ≥ 70:**
- weight loss ≥10%, with respect to weight before the current hospitalisation, as given in an earlier medical record;
- weight loss ≥5% in 1 month or ≥ 10% in 6 months, with respect to weight before the current hospitalisation, as given in an earlier medical record;
- BMI ≤ 20 kg/m²;
- MNA-SF® ≤ 11.

**If serum albumin and prealbumin have been tested:**

**In patients < 70, in the absence of inflammatory syndrome:**
- serum albumin < 30 g/l;
- serum prealbumin (serum transthyretin) < 110 mg/l.

**In patients ≥ 70, in the absence of inflammatory syndrome:**
- serum albumin: no agreement among professionals on a precise threshold;¹
- serum prealbumin (serum transthyretin) < 110 mg/l.

¹ In the absence of agreement among professionals and according to the opinion of the experts in geriatrics on the Panel, the threshold proposed in adults < 70 may be used for adults ≥ 70.
Table 2. Thresholds suggesting a diagnosis of malnutrition from “simple” diagnostic instruments used on admission to hospital

<table>
<thead>
<tr>
<th></th>
<th>Age &lt; 70</th>
<th>Age ≥ 70</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropometric data</strong> (recommended assessment)</td>
<td>- Weight loss ≥ 10%</td>
<td>- Weight loss ≥ 10%</td>
</tr>
<tr>
<td></td>
<td>- Weight loss ≥ 5% in 1 month</td>
<td>- Weight loss ≥ 10% in 6 months</td>
</tr>
<tr>
<td></td>
<td>- BMI ≤ 17 kg/m²</td>
<td>- BMI ≤ 20 kg/m²</td>
</tr>
<tr>
<td><strong>Biochemical values</strong> (if tested)</td>
<td>- Serum albumin* &lt; 30 g/l</td>
<td>- Serum albumin* &lt; 30 g/l</td>
</tr>
<tr>
<td></td>
<td>- Serum prealbumin* &lt; 110 mg/l</td>
<td>- Serum prealbumin* &lt; 110 mg/l</td>
</tr>
<tr>
<td><strong>Score</strong> (recommended assessment)</td>
<td>MNA-SF® ≤ 11</td>
<td></td>
</tr>
</tbody>
</table>

* In the absence of an inflammatory syndrome defined as a rise in 2 of the following: ESR > age/2 for men or ESR > (age + 10)/2 for women; CRP >15mg/l; haptoglobin >2.5 g/l.
** In the absence of agreement among professionals on a precise threshold and in the opinion of the experts in geriatrics on the Panel, the threshold proposed in adults < 70 may be used for adults ≥ 70.

III.2 Criteria that suggest a diagnosis of severe malnutrition

A diagnosis of severe malnutrition should be considered in the following circumstances:

*Based on the tests recommended on admission to hospital (see Table I):*

For patients < 70: weight loss ≥ 15% in 6 months or ≥ 10% in 1 month, with respect to weight before the current hospitalisation, as given in an earlier medical record.

For patients ≥ 70: weight loss ≥ 15% in 6 months or ≥ 10% in 1 month, with respect to weight before the current hospitalisation, as given in an earlier medical record.

*If serum albumin and prealbumin have been tested:*

In patients < 70, in the absence of inflammatory syndrome:
- serum albumin < 20 g/l;
- serum prealbumin (serum transthyretin) < 50 mg/l.

In patients ≥ 70, in the absence of inflammatory syndrome:
- serum albumin: < 25 g/l;
- serum prealbumin (serum transthyretin) < 50 mg/l.

When a diagnosis of severe malnutrition is suggested, serum prealbumin should be determined.

Table 3. Thresholds suggesting a diagnosis of severe malnutrition from “simple” diagnostic instruments on admission to hospital

<table>
<thead>
<tr>
<th></th>
<th>Age &lt; 70</th>
<th>Age ≥ 70</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropometric data</strong> (recommended assessments)</td>
<td>- Weight loss ≥ 15% in 6 months</td>
<td>- Weight loss ≥ 15% in 6 months</td>
</tr>
<tr>
<td></td>
<td>- Weight loss ≥ 10% in 1 month</td>
<td>- Weight loss ≥ 10% in 1 month</td>
</tr>
<tr>
<td><strong>Biochemical values</strong> if testedrecommended to assess severity</td>
<td>- Serum albumin* &lt; 20 g/l</td>
<td>- Serum albumin* ≤ 25 g/l</td>
</tr>
<tr>
<td></td>
<td>- Serum prealbumin* &lt; 50 mg/l</td>
<td>- Serum prealbumin* &lt; 50 mg/l</td>
</tr>
<tr>
<td><strong>Score</strong> (recommended assessment)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

* : See footnote to Table 2.
IV. REASSESSMENT OF NUTRITIONAL STATUS DURING THE HOSPITAL STAY

- **Routine reassessment of nutritional status** during the hospital stay, by weighing the patient and calculating weight loss, was recommended for all patients (not malnourished on admission and not requiring special nutritional care):

  *During a short stay in a medical or surgical unit:*
  - *For patients < 70*: no consensus on frequency
  - *For patients ≥ 70*: every week.

  *In follow-up and rehabilitation units or during long-term care:*
  - *For patients < 70*: every month
  - *For patients ≥ 70*: every month.

- **Specific reassessment of nutritional status** is advised if one or more of the following situations occurs during the hospital stay:
  - uncontrolled disease causing hypercatabolism (or cachexia) over a 7-day period;
  - inadequate food intake without supplementation over a 7-day period;
  - serum albumin < 30 g/l in the absence of inflammatory syndrome;
  - lymphocyte count < 1500/mm$^3$ in patients aged under 70, when tested during the hospital stay for an indication other than assessment of nutritional status.

Besides weighing the patient and calculating weight loss, as above, the following are determined:
- serum albumin (unless it was the result of a serum albumin test that prompted reassessment);
- serum prealbumin.
ANNEX 1

I. FORMAL CONSENSUS METHOD (See flowchart)

Steering committee
The learned societies concerned are brought together in a steering committee and consulted to define the subject of the report, to find out what reports and guidelines have already been produced, and to nominate professionals who would be suitable members of the working group and panel.

Working group
Starting from a critical appraisal of the literature, the working group draws up a questionnaire containing the proposed guidelines. These proposed guidelines are sent, with a rationale, to a panel of experts in the field.

Expert panel
Members of the panel are asked, by post or e-mail, to score each guideline using a visual scale from 1 to 9:
- a score of 1: the proposed intervention is never recommended;
- a score of 9: the proposed intervention is always recommended;
- scores 2 to 9: intermediate situations.

First round. The scores are entered by hand into a system at ANAES which automatically calculates median scores for each proposed guideline. The decisions taken are given in Table 1.

Table 1. Procedure on return of scores from first round

<table>
<thead>
<tr>
<th>Median, minimum and maximum scores</th>
<th>Decision regarding proposed guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>=7, with no missing scores</td>
<td>Accepted and worded “positively”, e.g. “it is recommended that…”</td>
</tr>
<tr>
<td>= 3, with no missing scores</td>
<td>Accepted but worded “negatively”, e.g. “it is not recommended that…”</td>
</tr>
<tr>
<td>All other cases</td>
<td>Discussed at a meeting between working group and panel</td>
</tr>
</tbody>
</table>

Results are presented and discussed during a plenary meeting of the working group and panel at which each expert is informed of how their individual score compares with the overall group score (median, minimum and maximum scores). At the end of this meeting, members are invited to rescore all guidelines not accepted at the end of the first round.

Second round. The results (communicated by post or e-mail) are analysed as for the first round, however with the difference that a single missing score is allowed or a single score outside the range for acceptance or rejection of a proposed guideline can be excluded. In all other cases, the proposed guideline is rejected and the conclusion “no consensus” is reached.
Peer review
A peer review group may be asked for its opinion to assess the clarity, feasibility and applicability of the guidelines. This phase is optional.

Validation by the Scientific Council
The final report is submitted to the Agency’s Scientific Council before publication.

Flowchart. Method to produce guidelines by formal consensus
II. **SPECIAL POINTS RELATING TO THE SUBJECT OF THESE GUIDELINES**

- **Drafting of proposed guidelines**
  The critical appraisal of the literature in the rationale was used to draft a questionnaire proposing guidelines on screening, diagnosis and assessment of the severity of protein-energy malnutrition in hospitalized adults, excluding situations of acute metabolic stress and pregnancy.

  The aim of the questionnaire was to define the following, for the target population:
  - recommended instruments to screen for malnutrition, i.e. instruments to be used routinely or in a targeted population to screen for malnutrition, when a patient is admitted to hospital;
  - diagnostic criteria and thresholds for malnutrition;
  - criteria and thresholds to assess the severity of malnutrition;
  - situations when nutritional status should be reassessed during hospital stay.

  The questionnaire consisted of proposed guidelines classified into five sections:
  I   Methods for measuring the different instruments proposed to assess nutritional status;
  II  Indications for the different instruments for screening, diagnosis and assessment of severity of malnutrition;
  III Diagnostic criteria for malnutrition;
  IV  Criteria indicating severity of malnutrition;
  V   Reassessment of nutritional status during hospital stay in patients who were not malnourished on admission.

  The questionnaire was produced by a group of two experts in the field of malnutrition in hospital, the report author and the ANAES project manager.

- **Obtaining the formal opinion of professionals**
  Eleven experts in malnutrition were invited to join the working group:
  - 2 geriatricians
  - 1 nephrologist
  - 2 dieticians
  - 1 general practitioner
  - 4 nutritionists
  - 1 hepatologist.

- **Taking account of expert opinion**
  During the meeting of the working group, the experts in malnutrition in the elderly drew attention to age-specific research that had not been included in the scientific rationale. An additional literature search was performed, and the proposed guidelines for subjects aged over 70 were redrafted. This led to a second meeting of the working group during which only guidelines specific to adults over 70 were discussed. Four out of the eleven experts could not take part in this second meeting but received a detailed report of the meeting, together with the guidelines to be rescored.

  There was no peer review group.

Last name: ______________ First name: ______________ Sex: _____ Date: _________
Age: ___/___/___ Weight: ___/___/___ kg Height: ___/___/___ cm Knee height: ___/___/___ cm

Screening (MNA-SF®)
A. Has the patient lost their appetite? 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. Recent weight loss (< 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 = from bed to chair
   1 = able to get around but does not go out
   2 = goes out

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

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

F. Body Mass Index (BMI) = weight in kg/(height in m)²
   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 maximum = 14 points)
12 points or more: normal
11 points or below: possible malnutrition