

SPECIAL ARTICLE

ESPEN Guidelines for Nutrition Screening 2002

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Abstract—Aim: To provide guidelines for nutrition risk screening applicable to different settings (community, hospital, elderly) based on published and validated evidence available until June 2002.

Note: These guidelines deliberately make reference to the year 2002 in their title to indicate that this version is based on the evidence available until 2002 and that they need to be updated and adapted to current state of knowledge in the future.

In order to reach this goal the Education and Clinical Practice Committee invites and welcomes all criticism and suggestions (button for mail to ECPC chairman).

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Key words: Nutritional Assessment; malnutrition; hospital; community

Background

About 30% of all patients in hospital are undernourished. A large part of these patients are undernourished when admitted to hospital and in the majority of these, undernutrition develops further while in hospital (1). This can be prevented if special attention is paid to their nutritional care. Other features of the patient's primary disease are screened routinely and treated (e.g. dehydration, blood pressure, fever), and it is unacceptable that nutritional problems causing significant clinical risk are not identified. Neglect is also beginning to have medico-legal consequences, since an increasing number of cases of nutritional neglect are being brought to the courts. There is every reason, therefore, for hospitals and healthcare organizations to adopt a minimum set of standards in this area.

However, the lack of a widely accepted screening system which will detect patients who might benefit clinically from nutritional support is commonly seen as a major limiting factor to improvement.

It is the purpose of this document to give simple guidelines as to how undernutrition, or risk for development of undernutrition, can be detected, by proposing a set of standards which are practicable for general use in patients and clients within present healthcare resources.

Purpose of screening

The purpose of nutritional screening is to predict the probability of a better or worse outcome due to nutritional factors, and whether nutritional treatment

is likely to influence this. Outcome from treatment may be assessed in a number of ways:

1. Improvement or at least prevention of deterioration in mental and physical function
2. Reduced number or severity of complications of disease or its treatment.
3. Accelerated recovery from disease and shortened convalescence.
4. Reduced consumption of resources, e.g. length of hospital stay and other prescriptions.

The nutritional impairment identified by screening should therefore be relevant to these aims and outcomes and may vary according to circumstances, e.g. age or type of illness. In the community, undernutrition, with or without chronic disease, may be the primary factor determining the mental or physical function of an individual, whereas in hospital or in a nursing home, disease factors assume a greater importance with disease-associated undernutrition assuming an important albeit secondary role. Screening in the community can therefore be focused primarily on nutritional variables based on the results of semi-starvation studies such as those of Ancel Keys and his colleagues in 1950 (2). In hospitals, other aspects of disease need to be considered in combination with purely nutritional measurements in order to determine whether nutritional support is likely to be beneficial. Randomized controlled trials of nutritional support in particular disease groups may therefore provide important evidence on which to base our criteria of nutritional risk.

Methodological considerations

The usefulness of screening tools can be evaluated by a number of methods. The predictive validity is of major importance, i.e. that the individual identified to be at

risk by the method is likely to obtain a health benefit from the intervention arising from the results of the screening. This can be obtained in various ways, as described for the individual screening tools below. The screening tool must also have a high degree of content validity, i.e. considered to include all relevant components of the problem it is meant to solve. This is usually achieved by involving representatives of those who are going to use it in the process of designing the tool. It must additionally have a high reliability, i.e. little inter-observer variation. It must also be practical, i.e. those who are going to use the tool must find it rapid, simple and intuitively purposeful. It should not contain redundant information, e.g. information about vomiting or dysphagia is unnecessary when dietary intake is part of the screening. The etiology of reduced dietary intake belongs to assessment (see below) or is incorporated into the nutrition care plan. Several other aspects of evaluating screening tools are described in an analysis of 44 nutritional screening tools (3). Finally, a screening tool should be linked to specified protocols for action, e.g. referral of those screened at risk to an expert for more detailed assessment and care plans.

Screening leads to nutritional care

Hospital and healthcare organizations should have a policy and a specific set of protocols for identifying patients at nutritional risk, leading to appropriate nutritional care plans: an estimate of energy and protein requirements including possible allowance for weight gain, followed by prescription of food, oral supplements, tube feeding or parenteral nutrition, or a combination of these. It is suggested that the following course of action be adopted.

1. *Screening* This is a rapid and simple process conducted by admitting staff or community healthcare teams. All patients should be screened on admission to hospital or other institutions. The outcome of screening must be linked to defined courses of action:
 - a. The patient is not at risk, but may need to be re-screened at specified intervals, e.g. weekly during hospital stay.
 - b. The patient is at risk and a nutrition plan is worked out by the staff.
 - c. The patient is at risk, but metabolic or functional problems prevent a standard plan being carried out.
 - d. There is doubt as whether the patient is at risk. In the two latter cases, referral should be made to an expert for more detailed assessment.
2. *Assessment*. This is a detailed examination of metabolic, nutritional or functional variables by an expert clinician, dietitian or nutrition nurse. It is a longer process than screening which leads to an

appropriate care plan considering indications, possible side-effects, and, in some cases, special feeding techniques. It is based, like all diagnosis, upon a full history, examination and, where appropriate, laboratory investigations. It will include the evaluation or measurement of the functional consequences of undernutrition, such as muscle weakness, fatigue and depression. It involves consideration of drugs that the patient is taking and which may be contributing to the symptoms, and of personal habits such as eating patterns and alcohol intake. It includes gastrointestinal assessment, including dentition, swallowing, bowel function, etc. It necessitates an understanding of the interpretation of laboratory tests, e.g. plasma albumin which is more likely to be a measure of disease severity than of malnutrition per se. Calcium, magnesium and zinc levels may be important, and in some cases laboratory measurement of micro-nutrient levels may be appropriate.

3. *Monitoring and outcome*. A process of monitoring and defining outcome should be in place. The effectiveness of the care plan should be monitored by defined measurements and observations, such as recording of dietary intake, body weight and function, and a schedule for detecting possible side-effects. This may lead to alterations in treatment during the natural history of the patient's condition.
4. *Communication*. Results of screening, assessment and nutrition care plans should be communicated to other healthcare professionals when the patient is transferred, either back into the community or to another institution. When patients are transferred from the community to hospital or vice versa, it is important that the nutritional data and future care plans be communicated.
5. *Audit*. If this process is carried out in a systematic way, it will allow audit of outcomes which may inform future policy decisions.

Although this document will focus mainly on the process of screening, this cannot be considered in isolation and must be linked to the pathway of care described above.

Components of nutritional screening

Screening tools are designed to detect protein and energy undernutrition, and/or to predict whether undernutrition is likely to develop/worsen under the present and future conditions of the patient/client. Therefore, screening tools embody the following four main principles:

1. *What is the condition now?* Height and weight allow calculation of body mass index (BMI). Normal range 20–25, obesity >30, borderline underweight 18.5–20, undernutrition <18.5. In cases where it is not possible

to obtain height and weight, e.g. in severely ill patients, a useful surrogate may be mid-arm circumference, measured with a tape around the upper arm midway between the acromion and the olecranon. This can be related to centiles of tables for that particular population, age and sex.¹ BMI may be less useful in growing children and adolescents, and in the very elderly. Nevertheless, the BMI provides the best generally accepted measure of weight for height.

2. *Is the condition stable?* Recent weight loss is obtained from the patient's history, or, even better, from previous measurements in medical records. More than 5% involuntary weight loss over 3 months, is usually regarded as significant. This may reveal undernutrition which was not discovered by 1., e.g. weight loss in obesity, and may also predict further nutritional deterioration depending on 3 and 4.
3. *Will the condition get worse?* This question may be answered by asking whether food intake has been decreased up to the time of screening, and if so by approximately how much and for how long. Confirmatory measurements can be made of the patient's food intake in hospital or by food diary. If these are found to be less than the patient's requirements with normal intake, then further weight loss is likely.
4. *Will the disease process accelerate nutritional deterioration?* In addition to decreasing appetite, the disease process may increase nutritional requirements due to the stress metabolism associated with severe disease (e.g. major surgery, sepsis, multitrauma), causing nutritional status to worsen more rapidly, or to develop rapidly from fairly normal states of (1–3) above.

Variables 1–3 should be included in all screening tools, while 4 is relevant mainly to hospitals. In screening tools, each variable should be given a score, thereby quantifying the degree of risk and allowing a direct link to a defined course of action.

Screening tools recommended by ESPEN

The community: MUST for adults (see appendix)

The purpose of the MUST system is to detect undernutrition on the basis of knowledge about the association between impaired nutritional status and impaired function (5). It was primarily developed for use in the community, where serious confounders of the effect of undernutrition are relatively rare.

Evaluation. The predictive validity of MUST in the community is based on previous and new studies of the effect of semi-starvation/starvation on mental and

physical function in healthy volunteers concurrent validity with other tools, and utilisation of health care resources. The new series of studies describe the impairment of function as a result of various extents of weight loss, with various rates of weight loss, from various initial nutritional statures (low or high BMI) (6).

It has been documented to have a high degree of reliability (low inter-observer variation) with a $\kappa = 0.88–1.00$. Its content validity has been assured by involving a multidisciplinary working group in its preparation. Its practicability has been documented in a number of studies in different community regions in the UK (5) (Table 1). The tool has recently been extended to other health care settings, including hospitals, where again it has been found to have excellent inter-rater reliability, concurrent validity with other tools, and predictive validity (length of hospital stay, mortality in elderly wards, and discharge destination in orthopaedic patients).

The hospital: NRS-2002 (see appendix)

The purpose of the NRS-2002 system is to detect the presence of undernutrition and the risk of developing undernutrition in the hospital setting (4). It contains the nutritional components of MUST, and in addition, a grading of severity of disease as a reflection of increased nutritional requirements. It includes four questions as a pre-screening for departments with few at risk patients. With the prototypes for severity of disease given, it is meant to cover all possible patient categories in a hospital. A patient with a particular diagnosis does not always belong to the same category. A patient with cirrhosis, for example, who is admitted to intensive care because of a severe infection, should be given a score of 3, rather than 1. It also includes old age as a risk factor, based on RCTs in elderly patients (4) (Table 2).

Evaluation. Its predictive validity has been documented by applying it to a retrospective analysis of 128 RCTs of nutritional support which showed that RCTs with patients fulfilling the risk criteria had a higher likelihood of a positive clinical outcome from nutritional support than RCTs of patients who did not fulfill these criteria (4). In addition, it has been applied prospectively in a controlled trial with 212 hospitalized patients selected according to this screening method, which showed a reduced length of stay among patients with complications in the intervention group (when adjusted for occurrence of operation and death).² Its content validity was maximized by involving an ESPEN ad hoc working group under the auspices of the ESPEN Educational and Clinical Practice Committee in the literature based validation. It has also been used by nurses and dietitians in a 2 years' implementation study in three hospitals (local, regional and university hospital) in Denmark (7),

¹Data on simultaneous measurements of BMI and mid-arm circumference have not been published in a form that allows comparison of cut-off points for these measurements. An analysis of RCTs, in which mean values BMI were given together with mean values of mid-arm circumference, suggested that a mid-arm circumference <25 cm corresponds to a BMI <20.5 (4). The data did not allow for distinguishing between lower cut-off points for BMI.

²The trial was completed in April 2002 and a manuscript is in preparation by N. Johansen et al. A copy is available upon request (kondrup@rh.dk)

which indicated that staff and investigators seldomly disagreed about a patient's risk status. Its reliability was validated by inter-observer variation between a nurse, a dietitian and a physician with a $\kappa = 0.67$. Its practicability was shown by the finding that 99% of 750 newly admitted patients could be screened. The incidence of at-risk patients was about 20% (7).

The elderly: MNA

The purpose of MNA is to detect the presence of undernutrition and the risk of developing undernutrition among the elderly in home-care programmes, nursing homes and hospitals. The prevalence of undernutrition among the elderly may reach significant levels (15–60%) under these circumstances (8). The screening methods mentioned above will detect undernutrition among many elderly patients, but for the frail elderly the MNA screening is more likely to identify risk of developing undernutrition, and undernutrition at an early stage, since it also includes physical and mental aspects that frequently affect the nutritional status of the elderly, as well as a dietary questionnaire. It is in fact a combination of a screening and an assessment tool, since the last part of the form (not reproduced here) is a more detailed exploration of the items in the first part of the form.

Evaluation. The predictive validity of MNA has been evaluated by demonstrating its association with adverse health outcome (9), social functioning (10), mortality (11, 12) and a higher rate of visits to the general practitioner (13). In a randomized trial of elderly at risk according to MNA, those given oral supplements increased body weight, but not grip strength (14), and in another similar (but small) randomized trial of elderly in a nursing home, the intervention group increased dietary intake but no functional or clinical outcome data were reported (15). The content validity has not been reported. The reliability (inter-observer variation) was estimated, with a $\kappa = 0.51$ (8). The MNA takes < 10 min to complete and its practicability has been shown by its use in a large number of studies, see (8).

Children

A universally accepted screening tool for children is not yet available (although guidelines are in preparation under the Chairmanship of Professor Bert Koletzko, Munich). It is already standard practice among paediatricians to maintain height and weight charts, allowing calculation of growth velocity which is high-sensitive to nutritional status. Pubertal development is also impaired during undernutrition.

Other screening systems

In their recent guidelines, the ASPEN board of directors stated that no screening system has been validated with respect to clinical outcome (16). They also suggested that,

in the absence of an outcomes validated approach, a combination of clinical and biochemical parameters should be used to assess the presence of malnutrition. They suggest using the subjective global assessment, SGA (17), which classifies patients subjectively on the basis of data obtained from history and physical examination, since this system has been validated in several ways other than with respect to clinical outcome, e.g. inter-observer variation. However, the lack of a direct connection between the observations and the classification of patients leaves the tool more complex and less focused than desired for rapid screening purposes.

An analysis of a total of 44 screening tools for use in hospital and the community (3) indicated that tools were published with insufficient details regarding their intended use and method of derivation, and with an inadequate assessment of their effectiveness. No one tool satisfied a set of criteria regarding scientific merit. The present recommendations by ESPEN may share some of these short-comings, but in view of the massive neglect of nutritional problems in health institutions, and the explicit lack of generally accepted screening tools, the predictive validity given above is considered sufficient to provide a practical and reasonable approach in the light of present knowledge. These recommendations may need to be modified in the light of future experience.

Predictive validity vs meta-analyses of treatment

The predictive validity reported here needs to be commented upon in relation to recent meta-analyses, or systematic reviews. Such analyses suggest that nutritional support by the enteral or oral route improves functional capacity and clinical outcome, and reduces length of stay and mortality, e.g. (18, 19). In a recent meta-analysis of studies employing parenteral nutrition (20), it was pointed out that there are inadequate data to assess the efficacy of parenteral nutrition in patients who are severely undernourished, who have highly catabolic disease processes, or who cannot be provided with enteral nutrition for several weeks. These are in fact the patients who most commonly receive supportive parenteral nutrition now-a-days, and for ethical reasons, there will probably not be randomized trials available in the future either. The majority of studies available deal with the grey area of patients who are less undernourished/not undernourished and/or are mildly/moderately catabolic. With these studies at hand, it was difficult to identify clinical conditions where parenteral nutrition would be clinically effective (20). However, the literature analysis mentioned above (4) suggests that parenteral nutrition is clinically effective in studies of patients who rather more than just fulfill the criteria for being nutritionally at risk.

Furthermore, nutrients known to be essential for healthy humans are also essential for patients, and therefore the required documentation is not to confirm

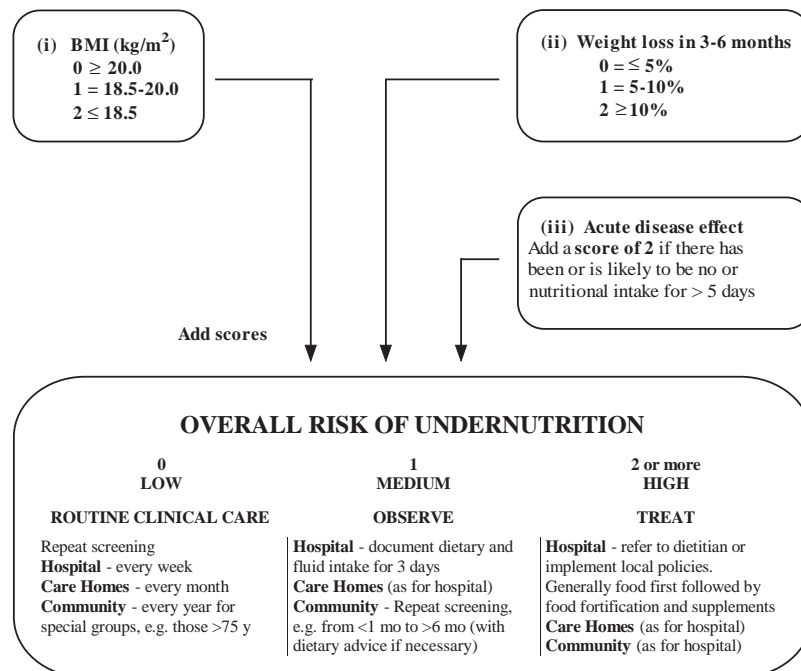
the essentiality of nutrients among patients, but rather to define when a certain form of nutritional support is more beneficial than leaving the patient to develop nutritional deficiencies. Therefore, meta-analyses and systematic reviews of nutritional support are too simplistic, if performed by analogy with treatment using a new drug. Finally, a nutritional care plan in most cases will involve food, oral supplements, tube feeding and parenteral nutrition, often used interchangeably in the same patient, whereas the majority of randomized trials, and meta-analyses, have dealt with studies of single modality treatments. The predictive validity of a screening tool therefore cannot be directly based on meta-analyses available at present.

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Appendix

Malnutrition Universal Screening Tool (MUST) for adults



Can be adapted for special circumstances (e.g. when weight and height cannot be measured or when there are fluid disturbances) using specified alternative measurements including subjective criteria. It also identifies obesity (BMI > 30 kg/m²).

Nutritional Risk Screening (NRS 2002)

Table 1 Initial screening			
		Yes	No
1	Is BMI <20.5?		
2	Has the patient lost weight within the last 3 months?		
3	Has the patient had a reduced dietary intake in the last week?		
4	Is the patient severely ill ? (e.g. in intensive therapy)		

Yes: If the answer is 'Yes' to any question, the screening in Table 2 is performed.
No: If the answer is 'No' to all questions, the patient is re-screened at weekly intervals. If the patient e.g. is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status.

Table 2 Final screening			
Impaired nutritional status		Severity of disease (≈ increase in requirements)	
Absent Score 0	Normal nutritional status	Absent Score 0	Normal nutritional requirements
Mild Score 1	Wt loss >5% in 3 mths or Food intake below 50–75% of normal requirement in preceding week	Mild Score 1	Hip fracture* Chronic patients, in particular with acute complications: cirrhosis*, COPD*. <i>Chronic hemodialysis, diabetes, oncology</i>
Moderate Score 2	Wt loss >5% in 2 mths or BMI 18.5 – 20.5 + impaired general condition or Food intake 25–60% of normal requirement in preceding week	Moderate Score 2	Major abdominal surgery* Stroke* <i>Severe pneumonia, hematologic malignancy</i>
Severe Score 3	Wt loss >5% in 1 mth (>15% in 3 mths) or BMI <18.5 + impaired general condition or Food intake 0-25% of normal requirement in preceding week in preceding week.	Severe Score 3	Head injury* Bone marrow transplantation* <i>Intensive care patients (APACHE>10).</i>
Score:	+	Score:	= Total score
Age	if ≥70 years: add 1 to total score above	= age-adjusted total score	
<p>Score ≥3: the patient is nutritionally at-risk and a nutritional care plan is initiated Score <3: weekly rescreening of the patient. If the patient e.g. is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status.</p>			

NRS-2002 is based on an interpretation of available randomized clinical trials. *indicates that a trial directly supports the categorization of patients with that diagnosis. Diagnoses shown in *italics* are based on the prototypes given below.
Nutritional risk is defined by the present **nutritional status** and risk of impairment of present status, due to **increased requirements** caused by stress metabolism of the clinical condition.

A nutritional care plan is indicated in all patients who are

(1) severely undernourished (score = 3), or (2) severely ill (score = 3), or (3) moderately undernourished + mildly ill (score 2 + 1), or (4) mildly undernourished + moderately ill (score 1 + 2).

Prototypes for severity of disease

Score = 1: a patient with chronic disease, admitted to hospital due to complications. The patient is weak but out of bed regularly. Protein re-

quirement is increased, but can be covered by oral diet or supplements in most cases.

Score = 2: a patient confined to bed due to illness, e.g. following major abdominal surgery. Protein requirement is substantially increased, but can be covered, although artificial feeding is required in many cases.

Score = 3: a patient in intensive care with assisted ventilation etc. Protein requirement is increased and cannot be covered even by artificial feeding. Protein breakdown and nitrogen loss can be significantly attenuated.

Initial Screening in Mini Nutritional Assessment (MNA[©]) for the elderly

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 last months? 0 = weight loss greater than 3 kg 1 = does not know 2 = weight loss between 1 and 3 kg 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 physical 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 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 (total max. 14 points)		
12	points or greater	Normal—not at risk → no need to complement assessment
11	points or below	Possible malnutrition → continue assessment