ESPEN Congress Istanbul 2006

A Patient's Journey through Complicated Pancreatitis

ESPEN Nutritional Support Recommendations

R. Meyer (Switzerland)
ESPEN - Nutritional Support Recommendations
(An Evidence based Approach and the Application in Europe)

ESPEN-FELANPE Symposium Istanbul 2006

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University Hospital
Liestal, Switzerland
Nutritional deficiencies and malnutrition are a significant problem in clinical practice.
Prevalence of Malnutrition

- ambulatory outpatients 1-15%
- institutionalized patients 25-60%
- hospitalized patients 35-65%

Omran et al, Nutrition 2000
Consequences of Malnutrition

Poor nutritional status reflects the rate of:
- in-hospital complications
- length of hospital stay
- mortality
- costs
- re-admissions
RCT: Complications and mortality

Meta-analysis of
27 RCTs with 1710 patients (complications) and
30 RCTs with 3250 patients (mortality)

Neurology, GI disease, liver disease, malignant disease, elderly,
abdominal surgery, orthopaedic surgery, critical illness/injury,
burns.

Hospital or community
Oral supplements or tube feeding

<table>
<thead>
<tr>
<th>Complications</th>
<th>28% vs. 46%&lt;sup&gt;1)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infections</td>
<td>24% vs. 44%&lt;sup&gt;2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mortality</td>
<td>17% vs. 24%&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>1)</sup> P <0.001; <sup>2)</sup>10 RCTs only

Stratton RJ, Green CJ, Elia M. Disease-related malnutrition. CABI Publishing 2003
## Costs

1 hospital day = £ 250; 1 complication = £ 80

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>LOS</th>
<th>N Comp</th>
<th>Total, £</th>
<th>Per pt, £</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at-risk</td>
<td>2848</td>
<td>6</td>
<td>335</td>
<td>4,298</td>
<td>1,509</td>
</tr>
<tr>
<td>At-risk</td>
<td>1312</td>
<td>9</td>
<td>409</td>
<td>2,984</td>
<td>2,275</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4160</td>
<td></td>
<td></td>
<td>7,283</td>
<td></td>
</tr>
</tbody>
</table>

Extra cost per at risk patient: £ 766

Stratton RJ, Green CJ, Elia M. Disease-related malnutrition. CABI Publishing 2003
Important Implication

The nutritional status must be known in all patients
ESPEN Guidelines for Nutrition Screening I

- All patients should be screened on admission to hospital
- If the patient is at risk, a nutrition plan is worked out by the staff
- Monitoring and defining outcome has to be organized
- Communication of results of screening, assessment and nutrition care plans should be communicated to other healthcare professionals when the patient is transferred.
- Audit of outcomes which may inform future policy decisions.

www.espen.org → Education → Guidelines
Screening is a rapid and simple process conducted by admitting staff. The outcome of screening must be linked to defined courses of action:

1. The patient is not at risk, but may need to be re-screened at specified intervals, e.g. weekly during hospital stay.
2. The patient is at risk and a nutrition plan is worked out by the staff.
3. The patient is at risk, but metabolic or functional problems prevent a standard plan being carried out.
4. 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.

A complete nutrition assessment consists of a combination of subjective and objective parameters. **But** no single parameter has been shown to be useful in all patients.
A nutritional assessment parameter should be highly sensitive and specific, unaffected by factors unrelated to nutrition, and correlate with response to nutritional therapy.

Most nutritional parameters lack sensitivity and specificity; therefore, methods of identifying malnourished patients are not entirely satisfactory.
Assessment of the Nutritional status

Screening

Assessment
Screening is the entry to a structured process
Nutritional screening

Is a tool for rapid and simple evaluation of patients at risk of undernutrition
Nutritional screening

History:

- **Weight loss over time**
- **Appetit, nausea**
- **Food intake**

First measurements:

- **Body weight**
- **Height**
- **BMI**
Screening tools

- Nutritional Riks Index\(^1\)
- Subjective global assessment\(^2\)
- Malnutrition Universal Screening Tool (MUST)\(^3\)
- Nutritional Risk Screening (NRS 2002)\(^4\)
- MNA (elderly)\(^5\)

2. Detsky et al, JPEN, 1984
3. BAPEN
5. Vellas et al, Nutrition 1999
Nutritional risk screening

Subjective global assessment (SGA)

I Patient’s history

(weight loss, change in dietary intake, gi-symptoms, functional capacity)

II Physical examination

(muscles, subcutaneous fat, edema, ascites)

Clinician’s overall judgement

• normal nutritional status
• mildly
• significantly \{ malnourished \}

Detsky et al, JPEN, 1984
Malnutrition Universal Screening Tool (MUST) for adults

<table>
<thead>
<tr>
<th><strong>BMI (kg/m²)</strong></th>
<th><strong>Weight loss in 3-6 months</strong></th>
<th><strong>Acute disease effect</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 : &gt;20.0</td>
<td>0 : &lt;5 %</td>
<td>Add a score of 2 if there has been or is likely to be no or nutritional intake for &gt; 5 days</td>
</tr>
<tr>
<td>1 : = 18.5-20.0</td>
<td>1 : = 5-10 %</td>
<td></td>
</tr>
<tr>
<td>2 : &lt; 18.5</td>
<td>2 : &gt; 10 %</td>
<td></td>
</tr>
</tbody>
</table>

**OVERALL RISK OF UNDERNUTRITION**

<table>
<thead>
<tr>
<th><strong>0 (LOW)</strong></th>
<th><strong>ROUTINE CLINICAL CARE</strong></th>
<th><strong>1 (MEDIUM)</strong></th>
<th><strong>OBSERVE</strong></th>
<th><strong>2 or more (HIGH)</strong></th>
<th><strong>TREAT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Repeat screening</strong></td>
<td><strong>Hospital - document dietary and fluid intake for 3 days</strong></td>
<td><strong>Care Homes (as for hospital)</strong></td>
<td><strong>Hospital - refer to dietitian or implement local policies.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Hospital - every week</strong></td>
<td><strong>Care Homes (as for hospital)</strong></td>
<td><strong>Community - Repeat screening, e.g. from &lt;1 mo to &gt;6 mo (with dietary advice if necessary)</strong></td>
<td><strong>Generally food first followed by food fortification and supplements</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Care Homes - every month</strong></td>
<td><strong>Community - Repeat screening, e.g. from &lt;1 mo to &gt;6 mo (with dietary advice if necessary)</strong></td>
<td></td>
<td><strong>Care Homes (as for hospital)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Community - every year for special groups, e.g. those &gt;75 y</strong></td>
<td></td>
<td></td>
<td><strong>Community (as for hospital)</strong></td>
<td></td>
</tr>
</tbody>
</table>
Nutritional Risk Screening (NRS 2002) is based on an analysis of controlled clinical trials.

- 128 randomized trials
- Classifying the patients with respect to nutritional status and severity of disease
- Determining whether the effect of nutritional intervention on clinical outcome was positive or absent
Results:

- **Patients at nutritional risk (N = 75 trials)**
  - 43 trials showed a positive effect on clinical outcome

- **Patients not at nutritional risk (N = 53 trials)**
  - 14 trials showed a positive effect on clinical outcome \( (p = 0.0006) \)

→ Likelihood ratio (true positive / false positive)
  - all 1.7 \( (CI: 2.3-1.2) \)
  - TPN (71 trials) 1.4 \( (CI: 1.9-1.0) \)
  - oral/enteral (56 trials) 2.9 \( (5.9-1.4) \)

Kondrup et al, Clin Nutr, 2003
Nutritional Risk Screening (NRS-2002)

Initial screening

- Is BMI < 20.5?  
  - Yes  
  - No

- Has the patient lost weight within the last 3 months?  
  - Yes  
  - No

- Has the patient had a reduced dietary intake in the last week?  
  - Yes  
  - No

- Is the patient severely ill? (e.g. ICU)  
  - Yes  
  - No

→ If „No“ to all questions, re-screened at weekly intervals.
→ If „Yes“ to any question, the final screening is performed.

Kondrup et al, Clin Nutr 2003
Nutritional Risk Screening (NRS-2002)
Final Screening I (Impaired nutritional status)

Absent  Score 0  = Normal nutritional status

Mild  Score 1  Wt loss >5% in 3 months or Food intake below 50-75% normal requirement in preceeding week

Moderate  Score 2  Wt loss >5% in 2 months or BMI 18.5 – 20.5 + impaired general condition or Food intake 25-50% normal requirement in preceeding week

Severe  Score 3  Wt loss >5% in 1 mo (>15% in 3 mo) or BMI <18.5 + impaired general condition or Food intake 0-25% normal requirement in preceeding week

Kondrup et al, Clin Nutr 2003
Nutritional Risk Screening (NRS-2002)

**Final screening II  (Severity of disease)**

<table>
<thead>
<tr>
<th>Absent</th>
<th>Score 0</th>
<th>Normal nutritional requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>Score 1</td>
<td>Hip fracture, chronic patients, in particular with acute complications: cirrhosis, COPD, chronic hemodialysis, diabetes, oncology</td>
</tr>
<tr>
<td>Moderate</td>
<td>Score 2</td>
<td>Major abdominal surgery, stroke. Severe pneumonia, hematologic malignancy</td>
</tr>
<tr>
<td>Severe</td>
<td>Score 3</td>
<td>Head injury, bone marrow transplantation, Intensive care patients (APACHE&gt;10).</td>
</tr>
</tbody>
</table>

Kondrup et al, Clin Nutr 2003
Nutritional risk screening
ESPEN – NRS 2002

- Impaired nutritional status
  weight loss % over time, food intake, BMI (Score 0-3)
- Severity of disease
  mild to severe (Score 0-3)
- Age over 70 years ad 1 point

If the total score is 3 or more nutritional support is indicated

Kondrup, Clin Nutr, 2003
Nutritional risk screening/assessment

Mini Nutritional assessment (MNA)

I. Screening (14 points)
   (food intake, weight loss, BMI, mobility)
   
   >12 not at risk
   <11 possible malnutrition

II. Assessment (16 points)
   (life style, number of meals, mode of feeding, MAC etc.)

  17-23.5 at risk
  <17 malnutrition
## Quality of screening/assessment tools

<table>
<thead>
<tr>
<th>Item</th>
<th>SGA</th>
<th>NRS-2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictive validity</td>
<td>?</td>
<td>+ 2)</td>
</tr>
<tr>
<td>Content validity</td>
<td>Redundant information</td>
<td>+</td>
</tr>
<tr>
<td>Reliability</td>
<td>+/- (Training)</td>
<td>+</td>
</tr>
<tr>
<td>Practicability</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>Conclusion</td>
<td>Subjective Assessment</td>
<td>Real Screening</td>
</tr>
</tbody>
</table>

1) Not only predicting outcome – but that outcome will improve with nutrition support

2) Validated in a systematic review of all RCTs, and in a separate RCT

*Nutrition Screening 2002, Clin Nutr, 2003*
Validation Studies

• Effect of nutritional support on clinical outcome in patients at nutritional risk (RCT)\(^1\) (N = 212)

• EuroOOPS-Study \(^2\) (N = 4160)

\(^1\) Johansen et al, Clin Nutr, 2004
\(^2\) Work in process
First study to validate a nutritional screening system in a RCT

N = 212

- Patients at risk (NRS 2002 ≥ 3) improve clinically from nutritional intervention
  - severity of complication ↓
  - \( \text{LOS}_{\text{NDI}} \downarrow \text{LOS 28} \downarrow \)

- Protein and energy intake of nutritionally at-risk patients increase

(NDI= Nutritional discharge index)

Johansen et al, Clin Nutr, 2004
## EuroOOPS

% at risk according to NRS-2002

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Western Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>% at risk</td>
</tr>
<tr>
<td>Surgery</td>
<td>1715</td>
<td>19</td>
</tr>
<tr>
<td>Internal Med.</td>
<td>1436</td>
<td>33</td>
</tr>
<tr>
<td>Geriatrics</td>
<td>107</td>
<td>53</td>
</tr>
<tr>
<td>Gsatroenterol.</td>
<td>289</td>
<td>34</td>
</tr>
<tr>
<td>ICU</td>
<td>279</td>
<td>95</td>
</tr>
<tr>
<td>Oncology</td>
<td>334</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4160</strong></td>
<td><strong>32</strong></td>
</tr>
</tbody>
</table>

J. Kondrup, personal communication
EuroOOPS
Complications, all

At risk according to NRS-2002
Percent of patients with non-infectious or infectious complications (N)

<table>
<thead>
<tr>
<th></th>
<th>No Complication</th>
<th>Non-infectious Complication</th>
<th>Infectious Complication</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at-risk</td>
<td>88% (2513)</td>
<td>7% (194)</td>
<td>5% (141)</td>
<td>100 (2848)</td>
</tr>
<tr>
<td>At-risk</td>
<td>69% (903)</td>
<td>17% (226)</td>
<td>14% (183)</td>
<td>100 (1312)</td>
</tr>
</tbody>
</table>

P<0.001

J. Kondrup, personal communication

JK
## EuroOOPS

### Length of stay (days)

At risk according to NRS-2002
Length of stay in different categories (N)

<table>
<thead>
<tr>
<th></th>
<th>No Complication</th>
<th>Non-infectious Complication</th>
<th>Infectious Complication Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Not at-risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.9 ± 0.1d</td>
<td>11.1 ± 0.4d</td>
<td>10.8 ± 0.5d</td>
</tr>
<tr>
<td></td>
<td>(2400)</td>
<td>(180)</td>
<td>(117)</td>
</tr>
<tr>
<td><strong>At-risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8.6 ± 0.2d</td>
<td>10.9 ± 0.4d</td>
<td>12.8 ± 0.4d</td>
</tr>
<tr>
<td></td>
<td>(844)</td>
<td>(181)</td>
<td>(147)</td>
</tr>
</tbody>
</table>

Not at-risk No Complication versus all other groups: P<0.0001 for each

J. Kondrup, personal communication
Length of stay; survival

Length of stay analyzed by survival statistics
(median; IQR; N; ≥ 28 days excluded)

P<0.0001

J. Kondrup, personal communication
NRS 2002 is able to distinguish between trials with positive effects vs no effect

↓

Identify patients who are likely to benefit from nutritional support
NRS-2002 is the best instrument today because the nutritional risk screening (NRS-2002) is:

- A method based on an analysis of controlled clinical trials
- Robust (Consensus ESPEN)
- Validated in intervention studies
- Simple to use (3 questions per item)
- Quickly done
Nutritional Assessment

Is a more detailed process and has to be done in those patients screened at risk or when metabolic or functional problems prevent a standard plan being carried out.
Assessment tools

- Anthropometric tools
- Laboratory values
- Measurements of body composition
  - BIA
  - Creatinine excretion in urine
  - Creatinine height index (CHI)
Anthropometry

Muscle mass

Fat mass
Laboratory testing can be useful for

- assessment of the nutritional status in certain conditions
- monitoring nutritional interventions
Serum proteins

- Albumin \((T^{1/2}): 20\) days
- Transferrin \((T^{1/2}): 8-10\) days
- Prealbumin \((T^{1/2}): 2-3\) days
- Retinol-binding protein \((T^{1/2}): \sim 12\) h
Limitations of serum protein

- These proteins are manufactured by the liver, hepatic insufficiency affects their production.
- Serum concentrations of visceral proteins decline with overhydration and increase with dehydration independent of nutritional status.
- Use of growth hormone or other anabolic hormones improves short-term synthesis of visceral proteins.
The serum-albumin is a good predictor for outcome and reflects disease severity but is a bad marker to assess nutritional status.
• **Hypoalbuminemia** is a potent, dose-dependent independent predictor of poor outcome (morbidity, mortality, LOICUS)

• The association between hypoalbuminemia and poor outcome is independent of both nutritional status and inflammation

30-day Mortality and Morbidity Rate by Pre-Op Albumin Levels

![Graph showing mortality and morbidity rates by serum albumin level.](image-url)
In most hospitalized patients, DHR and TLC are not useful components of a nutrition assess profile.
Assessment somatic protein compartment

- Anthropometric assessment
- BIA
- Creatinine excretion in urine
- Creatinine height index (CHI)
1) Review of principles & methods.
Clin Nutr 2004; 23: 1226-1243

2) Utilisation in clinical practice.
Clin Nutr 2004; 23: 1430-1453

www.espen.org/education
Bioelectrical impedance analysis (BIA)

- BIA allows the determination of:
  - fat-free mass and
  - total body water
  in subjects without significant fluid and electrolyte abnormalities when using appropriate equations (age, sex, race)

- BIA in subjects at extremes of BMI ranges or with abnormal hydration cannot be recommended
Bioelectrical impedance analysis (BIA)

- Longitudinal follow-up of body composition by BIA is possible between BMI of 16-34 kg/m² without abnormal hydration
- Further research is needed for segmental and multi-frequency BIA

ESPEN-Guideline BIA I, Clin Nutr, 2004
ESPEN-Guideline, BIA II, Clin Nutr, 2004
Conclusions

• **For screening and assessment** a large arsenal of tools can be used in specific steps in a structured process when the simple case gets complicated

• **The future will not only ask**, if the patient is malnourished or nutritionally at-risk for adverse outcome, but also: **at risk for what?**

• **Treatment should be targeted to treat the specific risk problem of the patient**
  → screening, planning a nutritional therapy and monitoring the outcome has to be considered
Comparison of tools for nutritional assessment and screening at hospital admission: a population study (n = 995)

- NRS-2002 had higher sensitivity and specificity than the MUST and NRI, compared to SGA
- There was a significant association between LOS and nutritional status and risk by SGA, NRS-2002, MUST and NRI
- Nutritional status and risk can be assessed by SGA, NRS-20002 and MUST in patients at hospital admission