Recognising malnutrition in the elderly
C. Compher (US)
Recognizing Malnutrition in the Elderly

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ASPEN President, 2016-2017
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Overview

• Approaches to recognize malnutrition
• Associated clinical outcomes
• Challenges beyond recognizing malnutrition
Nutrition Screening

• Process to identify an individual who is malnourished or at risk for malnutrition to determine if a detailed nutrition assessment is indicated
  – ASPEN, NCP 2005

• A rapid, simple process conducted by admitting staff or community healthcare teams
  – ESPEN, Clin Nutr 2006

Nutrition Assessment

• Deeper exploration of same variables as nutrition screen

• More often adds physical examination, laboratory values, medical/surgical history
ESPEN Guidelines for Nutrition Screening 2003

**Community**, Malnutrition Universal Screening Tool (MUST)

<table>
<thead>
<tr>
<th>BMI</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 20</td>
<td>0</td>
</tr>
<tr>
<td>18.5-19.9</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 18.5</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight Loss in past 3-6 months</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5%</td>
<td>0</td>
</tr>
<tr>
<td>5-10%</td>
<td>1</td>
</tr>
<tr>
<td>&gt;10%</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acutely ill or likely NPO &gt; 5 days</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

**Overall Risk of Malnutrition**

<table>
<thead>
<tr>
<th>Score</th>
<th>Risk</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Low</td>
<td>Routine Care</td>
</tr>
<tr>
<td>1</td>
<td>Medium</td>
<td>Observe</td>
</tr>
<tr>
<td>≥ 2</td>
<td>High</td>
<td>Treat</td>
</tr>
</tbody>
</table>

### ESPEN Guidelines for Nutrition Screening 2003

**Hospital, Nutrition Risk Screen (NRS) 2002**

<table>
<thead>
<tr>
<th>Initial Screening</th>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  BMI &lt; 20.5 kg/m²?</td>
<td>0</td>
<td>Normal nutritional status</td>
</tr>
<tr>
<td>2  Weight loss in past 3 months?</td>
<td>0</td>
<td>Normal nutritional requirements</td>
</tr>
<tr>
<td>3  Reduced dietary intake in past week?</td>
<td>0</td>
<td>Normal nutritional requirements</td>
</tr>
<tr>
<td>4  Severely ill?</td>
<td>0</td>
<td>Normal nutritional requirements</td>
</tr>
<tr>
<td>If answer Yes to any of these, do Final Screening below</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0  Normal nutritional status</td>
<td>0</td>
<td>Normal nutritional requirements</td>
</tr>
<tr>
<td>1  Wt loss &gt; 5% in 3 months OR food intake &lt; 50-75% needs in past week</td>
<td>1</td>
<td>Hip fracture, chronic disease with acute complications</td>
</tr>
<tr>
<td>2  Wt loss &gt; 5% in 2 months OR BMI 18.5-21.5 AND impaired condition OR food intake 25-60% of needs in past week</td>
<td>2</td>
<td>Major abdominal surgery, stroke, pneumonia, hematologic malignancy</td>
</tr>
<tr>
<td>3  Wt loss &gt; 5% in 1 month OR BMI &lt; 18.5 AND impaired condition OR food intake 0-25% of needs in past week</td>
<td>3</td>
<td>Head injury, bone marrow transplantation, ICU with APACHE &gt; 10</td>
</tr>
</tbody>
</table>

**Age ≥ 70 years, add 1 to total score above**

Score ≥ 3, at nutritional risk, initiate care plan; Score < 3, rescreen weekly
## ESPEN Guidelines for Nutrition Screening 2003

### Elderly, Mini Nutritional Assessment (MNA-SF)

| Has food intake declined over past 3 months due to loss of appetite, digestive problems, chewing, swallowing? | 0-severe  
1=moderate  
2=none |
| --- | --- |
| Weight loss during last 3 months? | 0= > 3 kg  
1= unsure  
2= 1-3 kg  
3= no weight loss |
| Mobility? | 0= bed or chair-bound  
1= ambulatory but does not go out  
2= goes out |
| Psychological stress or acute disease in past 3 months? | 0= yes  
2= no |
| Neuropsychological problems? | 0= severe  
1= mild  
2= none |
| BMI (kg/m²)  
Or Calf Circumference ≥ 31 cm (low risk) | 0= < 18  
1= 19-21  
2= 21-23  
3= 23 or more |

**Total Score (0-14). Interpretation:** 12-14 Normal; 8-11 at risk; 0-7 Malnourished

Subjective Global Assessment

A. History
• Change in body weight
  – Past 6 months
  – Past 2 weeks
• Change in dietary intake, duration
• Functional capacity
  – Ambulatory vs bedridden vs no dysfunction
• GI symptoms > 2 weeks duration
• Diagnosis
  – Metabolic demand
    • Detsky, JPEN 11:8-13, 1987

B. Physical Examination
(for each trait: 0 = normal, 1+ = mild, 2+ = moderate, 3+ = severe).
____ loss of subcutaneous fat (triceps, chest)
____ muscle wasting (quadriceps, deltoids)
____ ankle edema
____ sacral edema
____ ascites

C. SGA rating (select one)
A = Well nourished
B = Moderately malnourished (≥ 5% wt loss, not stabilized, reduced food intake, mild fat loss)
C = Severely malnourished (Severe wasting, usually ≥ 10% wt loss)
ESPEN Consensus Definition of Malnutrition 2015

Fig. 3. A conceptual tree of nutritional disorders.

Cedarholm, Clin Nutr 23:335, 2015
ESPEN Consensus Definition of Malnutrition 2015

**Fact box:** Two alternative ways to diagnose malnutrition. Before diagnosis of malnutrition is considered it is mandatory to fulfil criteria for being “at risk” of malnutrition by any validated risk screening tool.

**Alternative 1:**
- BMI < 18.5 kg/m²

**Alternative 2:**
- Weight loss (unintentional) > 10% indefinite of time, or > 5% over the last 3 months combined with either
- BMI < 20 kg/m² if < 70 years of age, or < 22 kg/m² if ≥ 70 years of age or
- FFMI < 15 and 17 kg/m² in women and men, respectively.

Cederholm, Clin Nutr 23:335, 2015
Proposed Etiology-Based Terminology for Adults in Clinical Settings

**Starvation-related malnutrition**
- Chronic starvation without inflammation
  - Limited access to food; for example, anorexia nervosa

**Chronic disease–related malnutrition**
- Inflammation is chronic and of mild to moderate degree
  - Organ failure, pancreatic cancer, rheumatoid arthritis, or sarcopenic obesity

**Acute disease–or injury-related malnutrition**
- Inflammation is acute and of severe degree
  - Major infection, burns, trauma, or closed head injury

Nutritional Risk Identified
Compromised intake or loss of body mass

Inflammation Present?
No/Yes

NO
Starvation-Related Malnutrition
(Pure chronic starvation, anorexia nervosa)

YES
Mild to Moderate Degree
Chronic Disease–Related Malnutrition
(Organ failure, pancreatic cancer, rheumatoid arthritis, sarcopenic obesity)

YES
Marked Inflammatory Response
Acute Disease– or Injury-Related Malnutrition
(Major infection, burns, trauma, closed head injury)

## Summary

<table>
<thead>
<tr>
<th>Screening Tools</th>
<th>Assessment Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>NRS-2002</td>
</tr>
<tr>
<td>Weight loss</td>
<td>✓</td>
</tr>
<tr>
<td>Reduced food intake</td>
<td>✓</td>
</tr>
<tr>
<td>Low BMI</td>
<td>✓</td>
</tr>
<tr>
<td>Inflammation or acuity</td>
<td>✓</td>
</tr>
</tbody>
</table>
Systematic Review of Screening Tools in Hospital Setting

• Based on literature search through February 2012

• 51 studies on outcome prediction (mortality, length of stay, complications)
  – NRS-2002, SGA, and MUST predict outcome in about half the studies in adults, not in older patients
    • Van Bokhorst, Clin Nutr 2014; 33:39
Which Nutrition Screening Tools are Most Predictive of Poor Clinical Outcomes?

- Update prior systematic review through 25/JUN/2015
- Differences in malnourished vs. normally nourished hospitalized patients using NRS-2002, SGA, MUST, MNA, AND-ASPEN
- Outcomes of mortality and length of stay (LOS), infections
- Data synthesis using Revman 5.2 (Nordic Cochrane Centre)
**NRS-2002**  
**Outcome Mortality**

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>High Nutrition Risk</th>
<th>Low Nutrition Risk</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diekmann, 2013</td>
<td>16</td>
<td>98</td>
<td>2.04 [0.92, 4.55]</td>
</tr>
<tr>
<td>Raslan, 2011</td>
<td>8</td>
<td>197</td>
<td>4.13 [1.37, 12.48]</td>
</tr>
<tr>
<td>Tangvik, 2013</td>
<td>352</td>
<td>952</td>
<td>3.36 [2.92, 3.87]</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>1247</td>
<td>2935</td>
<td>3.31 [2.88, 3.80]</td>
</tr>
</tbody>
</table>

Total events: 376, 269

Heterogeneity: $\chi^2 = 1.60$, df = 2 ($P = 0.45$); $I^2 = 0$

Test for overall effect: $Z = 16.87$ ($P < 0.00001$)

Diekmann, nursing home residents  
Raslan, Tangvik, hospitalized patients
NRS-2002
Outcome, Length of Stay

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>High Nutrition Risk</th>
<th>Low Nutrition Risk</th>
<th>Mean Difference</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Total</td>
<td>Mean</td>
</tr>
<tr>
<td>Alvarez-Hernandez, 2012</td>
<td>11.5</td>
<td>7.5</td>
<td>393</td>
<td>8.5</td>
</tr>
<tr>
<td>Amaral, 2008</td>
<td>12.5</td>
<td>11.9</td>
<td>37</td>
<td>7.5</td>
</tr>
<tr>
<td>Tangvik, 2013</td>
<td>22.7</td>
<td>22.83</td>
<td>952</td>
<td>18.4</td>
</tr>
<tr>
<td>Zhou, 2013</td>
<td>13.81</td>
<td>10.24</td>
<td>26</td>
<td>10.22</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>1408</td>
<td></td>
<td>3131</td>
<td></td>
</tr>
</tbody>
</table>

Heterogeneity: Chi² = 11.64, df = 3 (P = 0.009); I² = 74%
Test for overall effect: Z = 9.72 (P < 0.00001)

Alvarez-Hernandez, Amaral, Tangvik, hospitalized patients
Zhou, laparoscopic abdominal surgery
## NRS-2002 Outcome, Infections

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>High Nutrition Risk</th>
<th>Low Nutrition Risk</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events</td>
<td>Total</td>
<td>Events</td>
</tr>
<tr>
<td>Shinkawa, 2013</td>
<td>18</td>
<td>44</td>
<td>3</td>
</tr>
<tr>
<td>Zhou, 2013</td>
<td>10</td>
<td>26</td>
<td>6</td>
</tr>
</tbody>
</table>

**Total (95% CI)**

<table>
<thead>
<tr>
<th>Events</th>
<th>Total</th>
<th>Weight</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>9</td>
<td>100.0%</td>
<td>2.94 [1.45, 5.93]</td>
</tr>
</tbody>
</table>

Heterogeneity: $\chi^2 = 0.04$, df = 1 ($P = 0.84$); $I^2 = 0\%$

Test for overall effect: $Z = 3.00$ ($P = 0.003$)

Shinakawa, Zhou, post-surgical patients
NRS-2002
Readmissions, Hospital Costs

• Readmissions over 4 years
  – At nutrition risk, 4.74±0.14
  – Normal nutrition, 3.94±0.08
    • p<0.001

• Hospital costs for 1 year
  – At nutrition risk, 28,982±860 Euro
  – Normal nutrition, 21,070±541.8 Euro
    • p<0.0001
      – Tangvik, Clin Nutr 2014; 33:634
NRS-2002 Screening Questions vs Outcomes Hospitalized Patients, Norway (N=3,279)

Tangvik, Clin Nutr 2014; 33:634
SGA
Outcome, Mortality

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>SGA B/C Events</th>
<th>SGA A Events</th>
<th>Total Events</th>
<th>Total</th>
<th>Weight</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agarwal, 2013</td>
<td>43</td>
<td>28</td>
<td>1975</td>
<td>55.2%</td>
<td>3.21 [2.00, 5.13]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raslan, 2011</td>
<td>10</td>
<td>4</td>
<td>431</td>
<td>9.5%</td>
<td>3.93 [1.25, 12.41]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEER, 2013</td>
<td>49</td>
<td>9</td>
<td>214</td>
<td>35.4%</td>
<td>2.98 [1.48, 5.95]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td><strong>1611</strong></td>
<td><strong>2620</strong></td>
<td><strong>100.0%</strong></td>
<td></td>
<td><strong>3.19 [2.20, 4.63]</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total events: 102, 41

Heterogeneity: Chi² = 0.16, df = 2 (P = 0.92), I² = 0%
Test for overall effect: Z = 6.14 (P < 0.00001)

Agarwal, Raslan, SEEN hospitalized patients
SGA
Outcome, Length of Stay

• LOS > 15 days in 705 Brazilian hospital patients
  – SGA B, OR 1.9 (95% CI 1.2-3.2)
  – SGA C, OR 3.8 (95% CI 2.0-7.2)
    • Raslan, Clin Nutr, 2011; 30:49

• LOS in median (IQR) in 922 Canadian hospital patients
  – SGA A, 6 (4,11) days in 558 patients
  – SGA B, 7 (2, 117) days in 199 patients
  – SGA C, 9 (2,46) days in 78 patients
    • Allard, JPEN 2015
MNA
Outcome, Survival

- 444 hospitalized patients
- Mean age 85.3±6.7 years
- Malnutrition in 25.5%
- Risk of malnutrition in 50.5%
- Malnutrition poor predictor of mortality, due to comorbidities and acute disease
  - Vischer, Clin Nutr 2012; 31:113
### Nursing Home Residents Outcome, Mortality

<table>
<thead>
<tr>
<th></th>
<th>MNA</th>
<th>Risk of malnutrition</th>
<th>Malnourished</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months</td>
<td>2/52 (3.9%)</td>
<td>14/108 (13.0%)</td>
<td>8/28 (28.6%)</td>
<td>0.003</td>
</tr>
<tr>
<td>12 months</td>
<td>4/52 (7.7%)</td>
<td>29/108 (26.9%)</td>
<td>11/28 (39.3%)</td>
<td>0.001</td>
</tr>
<tr>
<td>NRS</td>
<td>No Risk</td>
<td>Weekly Screening Risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>8/100 (8%)</td>
<td>12/81 (14.8%)</td>
<td>4/17 (25.5%)</td>
<td>0.041</td>
</tr>
<tr>
<td>12 months</td>
<td>18/100 (18%)</td>
<td>20/81 (24.7%)</td>
<td>7/17 (41.2%)</td>
<td>0.039</td>
</tr>
<tr>
<td>MUST</td>
<td>Low risk</td>
<td>Medium risk</td>
<td>High risk</td>
<td>P-value</td>
</tr>
<tr>
<td>6 months</td>
<td>15/166 (9%)</td>
<td>3/15 (20%)</td>
<td>6/17 (35.3%)</td>
<td>0.001</td>
</tr>
<tr>
<td>12 months</td>
<td>33/166 (19.9%)</td>
<td>4/15 (26.7%)</td>
<td>8/17 (47.1%)</td>
<td>0.012</td>
</tr>
</tbody>
</table>

Diekmann, J Nutr Health & Aging 2013; 17:326
Identification of Malnutrition Predicts Hospital Costs (N=637)

Guerra, J Human Nutr Dietet 2014; Guerra RS, JAND 2015; 115:927
Summary

- Malnourished patients, regardless of how they’re identified, have worse outcomes
  - Higher mortality (~3 fold)
  - Higher costs of care (~20-25%)
  - More frequent readmissions
  - Longer length of stay
Challenges Beyond Recognizing Malnutrition

• Standardization of language on malnutrition
  – To strengthen global awareness
  – To enable more rigorous outcome comparisons

• Identification of key knowledge gaps
  – Which nutrition interventions are most effective
  – Which nutrition disorder responds best to intervention
  – Which setting demands most urgent response