Nutrition: ICU Hungry Games

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Objectives

1. Characterize the incidence and implications of malnutrition in the intensive care unit (ICU)

2. Describe complications associated with malnutrition intra- and post-ICU admission
Financial Disclosures

No conflicts of interest to disclose
Outline

- What is malnutrition?
- Prevalence of malnutrition
- Who is at risk for malnutrition?
- Outcomes and implications of malnutrition
- Nutrition assessment in the ICU
What is Malnutrition?

- An acute, subacute or chronic state of nutrition, in which a combination of varying degrees of overnutrition or undernutrition with or without inflammatory activity have led to a change in body composition or diminished function

- Typically occurs with:
  - Inadequate intake, impaired absorption, altered transport, and/or altered utilization
  - Increased requirements

Consensus Statement

Consensus Statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: Characteristics Recommended for the Identification and Documentation of Adult Malnutrition (Undernutrition)

Jane V. White, PhD, RD, FADA; Peggi Guenter, PhD, RN; Gordon Jensen, MD, PhD, FASPN; Ainsley Malone, MS, RD, CNSC; Marsha Schofield, MS, RD; the Academy Malnutrition Work Group; the A.S.P.E.N. Malnutrition Task Force; and the A.S.P.E.N. Board of Directors
Etiology-based Malnutrition

3 etiologies driving malnutrition

1. Starvation-related
   • Typically minimal inflammation (e.g., chronic starvation, pure anorexia)

2. Chronic disease-related
   • Inflammation is usually chronic and of mild-to-moderate degree (e.g., cancer, rheumatoid arthritis, organ failure such as COPD or renal failure)

3. Acute illness or injury-related
   • Inflammation is acute and severe (e.g., major infections, burns, trauma, closed head injury)
### Characteristics for Identification of Adult Malnutrition

<table>
<thead>
<tr>
<th>Suspect malnutrition if ≥ 2 characteristics are present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient energy intake</td>
</tr>
<tr>
<td>Unintentional weight loss</td>
</tr>
<tr>
<td>Decreased subcutaneous fat</td>
</tr>
<tr>
<td>Decreased muscle mass</td>
</tr>
<tr>
<td>Fluid accumulation</td>
</tr>
<tr>
<td>Decreased functional status (e.g., hand grip strength)</td>
</tr>
</tbody>
</table>

# Acute Illness or Injury-related Malnutrition

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Non-severe (Moderate) Malnutrition</th>
<th>Severe Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy intake</td>
<td>&lt; 75% estimated energy requirement for &gt; 7 days</td>
<td>≤ 50% estimated energy requirement for ≥ 5 days</td>
</tr>
<tr>
<td>Weight loss</td>
<td>1-2% in 1 week, 5% in 2 months, 7.5% in 3 months</td>
<td>&gt; 2% in 1 week, &gt; 5% in 1 month, &gt; 7.5% in 3 months</td>
</tr>
<tr>
<td>Body fat (loss of subcutaneous fat)</td>
<td>Mild</td>
<td>Moderate</td>
</tr>
<tr>
<td>Muscle mass (muscle loss)</td>
<td>Mild</td>
<td>Moderate</td>
</tr>
<tr>
<td>Fluid accumulation</td>
<td>Mild</td>
<td>Moderate to severe</td>
</tr>
<tr>
<td>Reduced grip strength</td>
<td>N/A</td>
<td>Measurably reduced</td>
</tr>
</tbody>
</table>

*Suspect malnutrition if ≥ 2 characteristics are present*
Prevalence of Malnutrition

• 30-60% of hospitalized patients in the United States

• 38-78% of critically ill patients

• ~30% of hospitalized patients without malnutrition will become malnourished during hospital stay

• Wide range due to
  • Specific to patient population
  • Various criteria used to identify malnutrition

Pathophysiology of Malnutrition in the Critically Ill

Metabolic Alterations During Critical Illness

- Increased energy expenditure
- Alterations in carbohydrate homeostasis
  - Increased endogenous glucose production
  - Decreased glucose uptake
  - Insulin resistance
- Protein (and lean tissue) catabolism
- Oxidation of stored lipids


LBM = lean body mass
Who is at Highest Risk of Malnutrition in the ICU?

- Pre-existing malnutrition
- Decreased physical activity prior to admission
- Advanced age
- Additional losses

Why is Malnutrition Important?

- 2.2 million hospital stays involve malnutrition
- Hospital stays involving malnutrition cost $49 billion
- 30 day readmissions are 1.6x higher with malnutrition compared to without it
- Most hospital stays were 2x longer with malnutrition
- Malnutrition related stays have 3x higher in-hospital deaths
- 20%-30% of adults in the community have malnutrition or are at risk

References:

Implications of Malnutrition in Critically Ill Patients

• Increased risk of nosocomial infections
• Prolonged mechanical ventilation
• Prolonged ICU and hospital length of stay (LOS)
• Increased ICU readmission rates
• Increased pressure ulcers and delayed wound healing
• Increased need for rehabilitation or home care after hospitalization
• Increased hospital mortality

In ICU patients who survive hospitalization, preexisting malnutrition is a predictor of post-discharge mortality and 30-day unplanned hospital readmission.
Guidelines for the Provision and Assessment of Nutrition Support Therapy in the Adult Critically Ill Patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.)

Stephen A. McClave, MD; Beth E. Taylor, RD, DCN; Robert G. Martindale, MD, PhD; Malissa M. Warren, RD; Debbie R. Johnson, RN, MS; Carol Braunschweig, RD, PhD; Mary S. McCarthy, RN, PhD; Evangelia Davanos, PharmD; Todd W. Rice, MD, MSc; Gail A. Cresci, RD, PhD; Jane M. Gervasio, PharmD; Gordon S. Sacks, PharmD; Pamela R. Roberts, MD; Charlene Compher, RD, PhD; and the Society of Critical Care Medicine and the American Society for Parenteral and Enteral Nutrition
Nutrition Assessment in the ICU – Guideline Recommendations

- All hospitalized patients should undergo an initial nutrition screen within 48 hours of admission
- Suggest nutrition risk should be determined for all ICU patients for whom volitional intake is anticipated to be insufficient
- 2 validated screening tools in randomized controlled trials
  - Nutrition Risk Score (NRS)-2002
  - Nutrition Risk in the Critically Ill (NUTRIC) Score
- High nutrition risk
  - Identifies those patients most likely to benefit from early enteral nutrition
  - Recommend a full assessment and care plan

**NRS-2002**

NRS-2002 score > 2 (most ICU patients) = nutritionally at-risk!  
→ Nutrition care plan should be initiated

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### NRS-2002 Nutritional Risk Screening (NRS 2002)

**Table 1: Initial screening**

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is BMI &lt; 20?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Has the patient lost weight within the last 3 months?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Has the patient had a reduced dietary intake in the last week?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Is the patient severely ill? (e.g., in intensive therapy)</td>
<td></td>
<td></td>
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</tbody>
</table>

*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-screening 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.

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**Table 2: Final screening**

<table>
<thead>
<tr>
<th>Score</th>
<th>Impaired nutritional status</th>
<th>Severity of disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absent Score 0</td>
<td>Absent Score 0</td>
</tr>
<tr>
<td></td>
<td>Normal nutritional status</td>
<td>Normal nutritional requirements</td>
</tr>
</tbody>
</table>

- **Mild**  
  - Score 1: Wt loss > 5% in 3 mths or Food intake below 50-75% of normal requirement in preceding week.  
  - Score 1: Hip fracture*  
  - Chronic patients, in particular with acute complications: cirrhosis*, COPD*.  
  - Chronic hemodialysis, diabetes, oncology.

- **Moderate**  
  - Score 2: Wt loss > 5% in 2 mths or BMI 18.5 - 20.5 + impaired general condition or Food intake 25-50% of normal requirement in preceding week.  
  - Score 2: Major abdominal surgery*  
  - Severe pneumonia, hematologic malignancy.

- **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.  
  - Score 3: Head injury*  
  - Bone marrow transplantation*  
  - Intensive care patients (APACHE > 10).

**Total score: Age-adjusted total score**

- Age if ≥ 70 years: add 1 to total score above

- **Score ≥ 3:** the patient is nutritionally at-risk and a nutritional care plan is initiated

**Score < 3:** weekly re-screening 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.

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**mNUTRIC score > 4:** Worse clinical outcomes **AND** Likely to benefit from aggressive nutrition therapy

NUTRIC Score – Comorbidities

Co-morbidities: ☐ Yes ☐ No
If yes, check all that apply:

Myocardial
☐ Angina
☐ Arrhythmia
☐ Congestive heart failure (or heart disease)
☐ Myocardial infarction
☐ Valvular

Vascular
☐ Cerebrovascular disease (Stroke or TIA)
☐ Hypertension
☐ Peripheral vascular disease or claudication

Pulmonary
☐ Asthma
☐ Chronic obstructive pulmonary disease (COPD, emphysema)

Neurologic
☐ Dementia
☐ Hemiplegia (paraplegia)
☐ Neurologic Illnesses (such as Multiple sclerosis or Parkinsons)

Endocrine
☐ Diabetes Type I or II
☐ Diabetes with end organ damage
☐ Obesity and/or BMI > 30 (weight in kg/(ht in meters)²)

Renal
☐ Moderate or severe renal disease

Gastrointestinal
☐ GastroIntestinal Disease (hernia or reflux)
☐ GI Bleeding
☐ Inflammatory bowel
☐ Mild liver disease
☐ Moderate or severe liver disease
☐ Peptic ulcer disease

Cancer/Immune
☐ AIDS
☐ Any Tumor
☐ Leukemia
☐ Lymphoma
☐ Metastatic solid tumor

Psychological
☐ Anxiety or Panic Disorders
☐ Depression

Musculoskeletal
☐ Arthritis (Rheumatoid or Osteoarthritis)
☐ Connective Tissue disease
☐ Degenerative Disc disease (back disease or spinal stenosis or severe chronic back pain)
☐ Osteoporosis

Substance Use
☐ Heavy alcohol use or binge drinking history
☐ Current smoker
☐ Drug abuse history

Miscellaneous
☐ Hearing Impairment (very hard of hearing even with hearing aids)
☐ Visual Impairment (cataracts, glaucoma, macular degeneration)
ASPNEN Adult Nutrition Care Pathway

https://www.nutritioncare.org/uploadedFiles/Documents/Malnutrition/ASPNEN_Adult_Nutrition_Care_Pathway.pdf
Body Composition Analysis

- Computed tomography (CT)
  - Skeletal muscle quality at the third lumbar vertebra

- Ultrasound
  - Quadriceps muscle layer thickness or rectus femoris cross-sectional area
  - Serial measurement of rectus femoris cross-sectional area

- Bioelectrical impedance analysis
  - Low phase angle or high impedance ratio
Malnutrition – Take Home Messages

- 6 characteristics to determine malnutrition presence and severity
- Malnutrition affects at least 30% of hospitalized and ICU patients
- Malnutrition is associated with increased morbidity and mortality
- NRS-2002 or mNUTRIC should used to help identify high nutrition risk patients – those that need a complete nutrition assessment and would benefit from early EN
When and How to Feed ICU Patients?

Suggest

- **Low** nutrition risk [normal baseline nutrition status and low disease severity (e.g., NRS 2002 < 3 or NUTRIC score < 5)] do **not** require specialized nutrition therapy over the 1st week in ICU

- **High** nutrition risk (e.g., NRS 2002 ≥ 3 or mNUTRIC score ≥ 5) or severely malnourished should be advanced toward goal as quickly as tolerated over 24–48 hours while monitoring for refeeding syndrome. Efforts to provide >80% of estimated or calculated goal energy and protein within 48–72 hours should be made to achieve the clinical benefit of EN over 1st week of hospitalization

- **Sufficient** (high-dose) protein should be provided (1.2–2.0 g/kg actual body weight per day and may likely be even higher in burn or multi-trauma patients)

When and How to Feed ICU Patients?

Recommend

- Early EN within 24–48 hours if unable to maintain volitional intake
- Either trophic or full nutrition by EN is appropriate for patients with ARDS or ALI and expected to need mechanical ventilation ≥72 hours (similar patient outcomes over 1st week of hospitalization)

Learning Assessment Question 1

Based on SCCM/ASPEN guidelines recommendations, which of the following is a validated screening tool to determine nutrition risk based on nutrition status and disease severity in critically ill patients?

A. Nutrition Risk Screening (NRS) 2002
B. Subjective global assessment (SGA)
C. Malnutrition Screening Tool
D. Short Nutritional Assessment Questionnaire
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C. Malnutrition Screening Tool
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Learning Assessment Question 2

True or False. Malnourished hospitalized patients are associated with higher costs, longer stays and increased mortality.
Learning Assessment Question 2

True or False. Malnourished hospitalized patients are associated with higher costs, longer stays and increased mortality.
Thank you!

Questions?

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