

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

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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)**

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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

Suspect malnutrition if ≥ 2 characteristics are present

Insufficient energy intake

Unintentional weight loss

Decreased subcutaneous fat

Decreased muscle mass

Fluid accumulation

Decreased functional status (e.g., hand grip strength)



Acute Illness or Injury-related Malnutrition

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

***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

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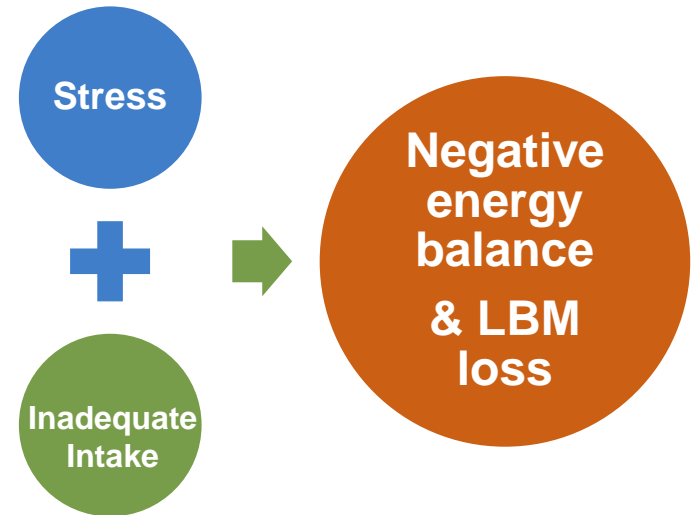
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Pathophysiology of Malnutrition in the Critically Ill

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

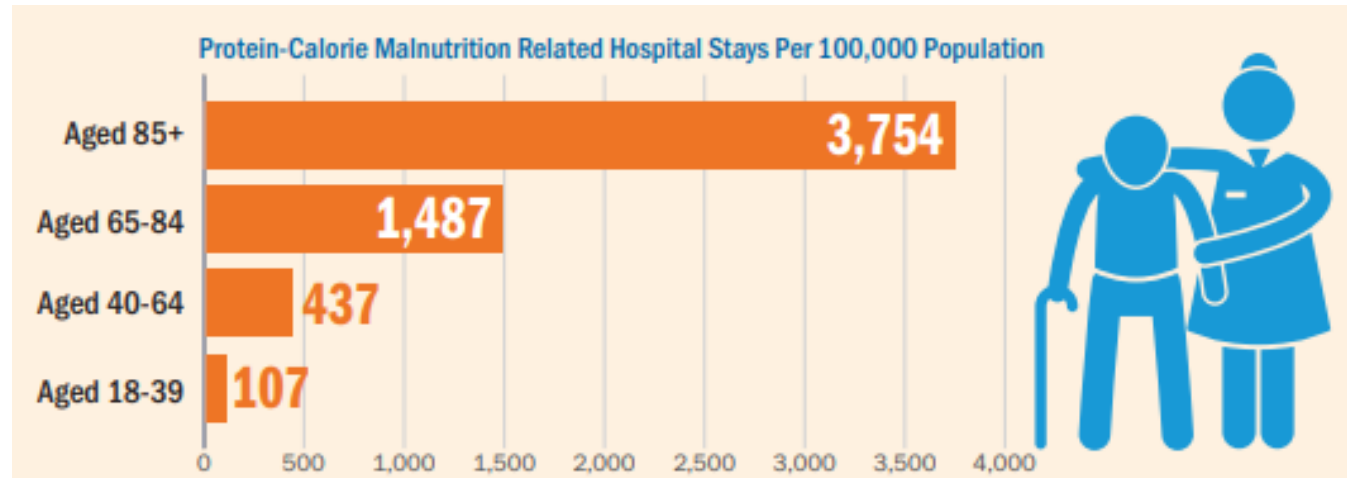
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Who is at Highest Risk of Malnutrition in the ICU?

- 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

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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

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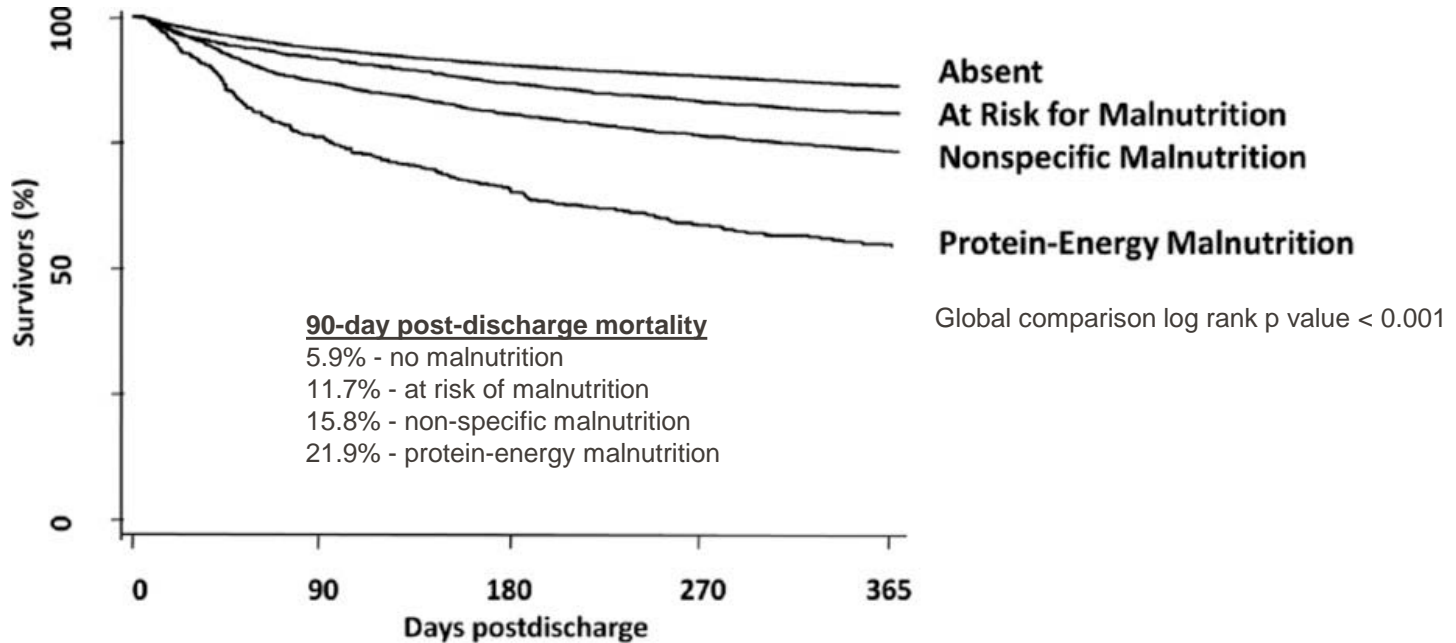
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Malnutrition and Mortality



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.)

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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



Nutritional Risk Screening (NRS 2002)

| Table 1: Initial screening | | Yes | No |
|----------------------------|--|-----|----|
| 1 | Is BMI <20? | | |
| 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-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.

**NRS-2002 score > 2
(most ICU patients) =
nutritionally at-risk!**



**Nutrition care plan
should be initiated**

| 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 25-50% 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 | 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</p> <p>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> | | | |



NUTRIC (or mNUTRIC) Score

Table 1: NUTRIC Score variables

| Variable | Range | Points |
|-------------------------------------|----------|--------|
| Age | <50 | 0 |
| | 50 - <75 | 1 |
| | ≥75 | 2 |
| APACHE II | <15 | 0 |
| | 15 - <20 | 1 |
| | 20-28 | 2 |
| | ≥28 | 3 |
| SOFA | <6 | 0 |
| | 6 - <10 | 1 |
| | ≥10 | 2 |
| Number of Co-morbidities | 0-1 | 0 |
| | ≥2 | 1 |
| Days from hospital to ICU admission | 0 - <1 | 0 |
| | ≥1 | 1 |
| IL-6 | 0 - <400 | 0 |
| | ≥ 400 | 1 |

Table 2: NUTRIC Score scoring system: if IL-6 available

| Sum of points | Category | Explanation |
|---------------|------------|---|
| 6-10 | High Score | <ul style="list-style-type: none"> ➤ Associated with worse clinical outcomes (mortality, ventilation). ➤ These patients are the most likely to benefit from aggressive nutrition therapy. |
| 0-5 | Low Score | <ul style="list-style-type: none"> ➤ These patients have a low malnutrition risk. |

Table 3. NUTRIC Score scoring system: If no IL-6 available*

| Sum of points | Category | Explanation |
|---------------|------------|---|
| 5-9 | High Score | <ul style="list-style-type: none"> ➤ Associated with worse clinical outcomes (mortality, ventilation). ➤ These patients are the most likely to benefit from aggressive nutrition therapy. |
| 0-4 | Low Score | <ul style="list-style-type: none"> ➤ These patients have a low malnutrition risk. |

*It is acceptable to not include IL-6 data when it is not routinely available; it was shown to contribute very little to the overall prediction of the NUTRIC score.²

**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

Muskoskeletal

- 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)

ASPEN Adult Nutrition Care Pathway

https://www.nutritioncare.org/uploadedFiles/Documents/Malnutrition/ASPEN_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 to 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 \geq 3 or mNUTRIC score \geq 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

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

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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