Malnutrition Assessment in Action: The Academy /A.S.P.E.N. Collaboration

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Disclosures

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No commercial relationships relevant to the topic being presented.

Objectives

Review the development of evidence-informed/consensus derived indicators of adult and pediatric malnutrition

Promote the standardized use of the indicators in all clinical and community settings

Collect data to validate these approaches to malnutrition’s characterization and diagnosis
Contributors to Adult Malnutrition in Acute Care Settings

<table>
<thead>
<tr>
<th>Personal</th>
<th>Organizational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Lack of recognition</td>
</tr>
<tr>
<td>Dementia/Depression</td>
<td>Lack of screening/assessment</td>
</tr>
<tr>
<td>Disease</td>
<td>Lack of nutrition education</td>
</tr>
<tr>
<td>Overly restrictive therapeutic</td>
<td>Confusion re: responsibility</td>
</tr>
<tr>
<td>diet</td>
<td>Hi/Wh not measured/recorded</td>
</tr>
<tr>
<td>Inability to chew/swallow</td>
<td>Failure to measure/record</td>
</tr>
<tr>
<td>Limited mobility</td>
<td>food intake</td>
</tr>
<tr>
<td>Sensory loss</td>
<td>Inadequate nutrients provided</td>
</tr>
<tr>
<td>Multiple Medications</td>
<td>Lack of feeding assistance</td>
</tr>
<tr>
<td>Therapies: vents/drains/NPO,</td>
<td>Lack of care coordination</td>
</tr>
<tr>
<td>etc.</td>
<td>Nutrition status low priority</td>
</tr>
</tbody>
</table>

Pediatric Malnutrition (Undernutrition): US Statistics

≈1 in 10 households with children struggle with food insecurity.

Prevalence of acute/chronic undernutrition unknown. Those presumed to be at risk:
• ≈14% US children with "special needs".
• Those hospitalized with acute/chronic illnesses.
• Those who are homeless/live in shelters.
• Those in environmental/social situations with limited access to food.


Some Consequences of Unrecognized Adult/Pediatric Malnutrition

Impaired growth/development
Increased LOS
Impaired wound healing
Increased morbidity/mortality
Increased brain/muscle/function loss
Higher infection rates/complications
Increased admissions/readmissions

Costs - Human

Inpatient Prospective Payment System MS-DRGs

1983 – Diagnosis Related Groups (DRGs)
• Malnutrition recognized as a secondary diagnosis or "cc" (complication / co-morbid condition)
• DRG relative weights on estimated hospital costs, rather than charges. (Medicare & Medicaid)

2007 – Medical Severity DRG (MS DRGs)
• Recognize malnutrition as impacting acuity and severity of patients, so reimbursement may be increased due to increased cost of care.
• 2010 – Moderate and mild MN designated CCs
Rationale for Developing Academy/A.S.P.E.N Malnutrition Diagnostic Indicators Characteristics

No standardization
Multiple Definitions
Multiple Diagnostic (ICD-9) Codes
Multiple Characteristics used to Diagnose
Limited evidence base

- Emerging role of inflammation
- Influence on assessment parameters
- Influence on response to nutrition intervention
- Anti-inflammatory interventions
- Nutrition interventions outcomes divergence

Academy/A.S.P.E.N. Member Inquiries

Academy/A.S.P.E.N had received numerous requests from RDNs, physicians, nurses and other professionals:
- How to diagnose malnutrition
- How to document malnutrition (limit audits/paybacks)
- Correlation of current NCPT definitions with existing diagnostic coding terminology
- Which characteristics to use, i.e.:
  - why not serum proteins (albumin/prealbumin, etc.)
  - why not percentiles

National Center for Health Statistics/Centers for Medicare & Medicaid Services (CMS) Inquires

The National Center for Health Statistics (NCHS) had received multiple requests to clarify the malnutrition diagnosis codes and to determine the proper use of the ICD-9 codes

CMS was concerned by variability in incidence/severity of malnutrition diagnoses within the same state/zip code

ADA and A.S.P.E.N. invited to submit recommendations to help clarify diagnosis and standardize parameters by which malnutrition is assessed
A Vision for the Identification of Malnutrition (Undernutrition) in All Settings

Wouldn’t it be great to have standardized definitions/characteristics and to know the true prevalence of Malnutrition in...

Attributes of Characteristics/Indicators of Adult/Pediatric Malnutrition

- Evidence informed/consensus derived
- Universally available/easily obtained
- Applied inexpensively in multiple settings
- Reproducible with minimal training
- Support diagnosis/characterize severity
- Reflect change in nutritional status
- Will change over time as evidence of validity accrues

Adult Malnutrition
Characteristics/Indicators of Adult Malnutrition

• Unable/unwilling to eat (caloric deficit)
• Unintended weight change
• Changes in Body Composition
  • Muscle loss
  • Subcutaneous Fat loss
  • Fluid Accumulation
• Decline in Functional Status
  • Handgrip strength

Any 2 or more characteristics identify adult malnutrition

Unable/unwilling to eat

• Compromised nutrient intake of varying degree and duration
  – Includes acute/chronic disease/condition; inadequate access to food for any reason, i.e.
    • abuse, neglect, depression, frailty, homelessness, poverty, immigration from poorly resourced country
  – Acute time frame < 3 months
  – Chronic time frame ≥ 3 months
  – *avoid contributing to iatrogenic malnutrition in these patients

Unintended Weight Change

Unintended weight loss:
  In order to determine the percentage of weight change and to interpret the significance of weight change:

• Height, weight should be routinely measured
• Typical weight should be obtained
Changes in Body Composition

- Loss of Subcutaneous Fat
  » orbital, triceps, fat overlying the ribs

- Muscle Loss
  » Loss of lean mass at temples (temporalis muscle); clavicles (pectoralis & deltoids); shoulders (deltoids); interosseous muscles; scapula (latissimus dorsi, trapezius, deltoids); thigh (quadriceps) and calf (gastrocnemius).

Fluid accumulation

- Localized (hand, lower extremity or scrotal edema)
- Generalized fluid accumulation - clinically evident edema on examination

**May mask weight loss, might be reflected as weight gain**

Changes in Body Composition (con't.)

### Assessing Edema, 2 methods:

1+ Mild pitting, slight indentation, no perceptible swelling of the extremity
2+ Moderate pitting, indentation subsides rapidly
3+ Deep pitting, indentation remains for a short time, extremity looks swollen
4+ Very deep pitting, indentation lasts a long time, extremity is very swollen

Or

1+ if the pitting lasts 0 to 15 sec
2+ if the pitting lasts 16 to 30sec
3+ if the pitting lasts 31 to 60sec
4+ if the pitting lasts >60sec
Changes in Body Composition (con’t.)

Assessing/Documenting Changes in Body Composition:
(for each trait specify: 0 = normal, 1+ = mild, 2+ = moderate, 3+ = severe)
# ______loss of subcutaneous fat (triceps, ribs, orbital)
# ______muscle wasting (quadriceps, deltoids, etc.)
# _______extremity edema (hand/arm, ankle/leg)
# _______scrotal edema
# _______generalized edema

Measure of Functional Status

Hand Grip Strength *
- Dynamometer
- Standards (excellent, good, average, fair, poor) for dominant hand by gender and age
- Maximum reading (kg) from 3 attempts, allow 1 minute rest between attempts

3 or 6 minute walk
Stair climbing
Peak Expiratory Flow
Short Physical Performance Battery (NIA-geriatrics)

* Strongest correlation to date with muscle mass and nutritional status

Severe Malnutrition in Adults
J Acad Nutr Diet. 2012;112(3): 730-738

<table>
<thead>
<tr>
<th>For Example: ICD-9 Code 262*</th>
<th>Acute Illness/Injury</th>
<th>Chronic Illness</th>
<th>Social/Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss</td>
<td>1/5% (week &lt; 1 month)</td>
<td>3/5% (months &lt; 6 months)</td>
<td>1/5% (years &lt; 6 months)</td>
</tr>
<tr>
<td>Energy intake</td>
<td>≤ 50% for ≥ 2 days</td>
<td>≤ 75% for ≥ 1 month</td>
<td>≤ 50% for ≥ 1 month</td>
</tr>
<tr>
<td>Body Fat</td>
<td>Moderate Depletion</td>
<td>Severe Depletion</td>
<td>Severe Depletion</td>
</tr>
<tr>
<td>Muscle Mass</td>
<td>Moderate Depletion</td>
<td>Severe Depletion</td>
<td>Severe Depletion</td>
</tr>
<tr>
<td>Fluid Accumulation</td>
<td>Moderate - Severe</td>
<td>Severe</td>
<td>Severe</td>
</tr>
<tr>
<td>Grip Strength</td>
<td>Not recommended in ICU</td>
<td>Reduced for Age/Tender</td>
<td>Reduced for Age/Tender</td>
</tr>
</tbody>
</table>

* 2012 ICD-9-CM Physician Volumes 1 and 2 American Medical Association
Non-Severe Malnutrition in Adults

For Example:

- ICD-9 Code 263.0 *

<table>
<thead>
<tr>
<th>Diagnostic Indicators</th>
<th>Acute Illness/Injury</th>
<th>Chronic Illness</th>
<th>Social/Environmental</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss</td>
<td>&lt; 2.5% for &gt; 7 days</td>
<td>&lt; 75% for &gt; 1 month</td>
<td>&lt; 2.5% for &gt; 7 days</td>
</tr>
<tr>
<td>Energy Intake</td>
<td>&lt; 75% for &gt; 1 month</td>
<td>&lt; 75% for &gt; 1 month</td>
<td>&lt; 75% for &gt; 2 months</td>
</tr>
<tr>
<td>Body Fat</td>
<td>Mild Depletion</td>
<td>Mild Depletion</td>
<td>Mild Depletion</td>
</tr>
<tr>
<td>Muscle Mass</td>
<td>Mild Depletion</td>
<td>Mild Depletion</td>
<td>Mild Depletion</td>
</tr>
<tr>
<td>Fluid Accumulation</td>
<td>Mild</td>
<td>Mild</td>
<td>Mild</td>
</tr>
<tr>
<td>Grip Strength</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

* 2012 ICD-9-CM Physician Volumes 1 and 2. American Medical Association

Pediatric Malnutrition

Diagnostic Indicators of Pediatric Malnutrition (undernutrition) (ages 1 month-18 years)

- Weight Gain Velocity
- Adequacy of Food/Nutrient Intake & Utilization
  - Energy & Protein needs assessment
- Mid Upper Arm Circumference (MUAC)
- Handgrip Strength (ages 6+)
- Tanner Stage
  - Should be tracked in all pre-teens/adolescents
  - Utility as a nutritional marker limited by the significant variability (up to 5 years) in genetic determinants for onset of puberty

5/5/2015
Adequacy of Macronutrient Intake

Food / nutrient intake & utilization
- Primary determinants of nutritional status
- Accuracy of estimation critical
  - Magnitude of deficit
  - Extent and acuity of deficit
- Is current intake adequate to meet needs in context of current clinical situation, stage of growth, developmental level?
  - History
  - Direct observation

Assessment of Energy/Protein Needs

ENERGY
- Indirect calorimetry – most precise
- Estimated (based on “healthy” populations)
  - Standard equations
  - FAO/WHO, Schofield, etc.
  - 1989 RDA
  - 2005 DRI

PROTEIN
- DRI
  - Consider clinical status, i.e. major surgery, burns, infection, catch-up growth, renal function, etc.
  - Establish estimated needs as a starting point
  - Monitor and adjust, monitor, and adjust, etc.

Assessment of Growth Parameters

Measure every time a child presents for any care in all settings.

**WHO** comparative data charts *birth to age 2*
- Length-for-age
- Weight-for-age
- Head circumference-for-age
- Weight-for-length

**CDC** comparative data charts *ages 2-20 years*
- Standing height-for-age
- Weight-for-age
- BMI-for-age
Assessment of Growth Parameters: 
*Z Score versus Percentile*

**Z Score**
- How a single data point compares to the norm, and if that point is above/below “average”, how “atypical” the measure is.

**Percentile**
- Portion of the reference population whose measurement lies above or below that of the child being measured.

*Z Score comparisons preferred*

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Weight Gain Velocity

Average daily/monthly rates of weight gain that facilitate a stable pattern of growth.

Very low weight velocity – best predictor of mortality\(^1\)

Considerable plasticity in growth in short term
- Adaptive response to illness/injury
- Adequate nutrient intake → catch-up growth

\(^1\) J Nutr 2012 Mar;142(3):520-525
Mid Upper Arm Circumference (MUAC)

Independent anthropometric assessment
- Children ages 6-59 months
Correlates with BMI but more sensitive to changes in muscle & fat mass
Percentile guidelines available for ages 1-79 years
Especially important in presence of edema, ascites, steroid use that may impact fluid status
Sensitive indicator of malnutrition-related mortality


Mid-Upper Arm Circumference

Comparative standards for MUAC use right arm
Left arm may be used if it is the dominant arm or if the right arm has a shunt or port
Equipment: firm, non-stretchable measuring tape

Mid-Upper Arm Circumference

Procedure
- Remove clothing from arm to be measured
- Place child in seated position, facing forward. Infants may be held on lap.
- Place child’s right arm with right hand on hip at a right (90°) angle
- Measure the length of the arm from the acrionium process of the scapula to the olecranon (elbow tip). Mark mid point with washable pen.
- Measure around the arm at the level of the mark with firm contact without compression
- Note & record the measurement to the nearest 0.1 cm.
Handgrip Strength

Simple, non-invasive, low cost
Muscle function reacts earlier to changes in nutritional status than does muscle mass
• May more accurately measure response to nutrition intervention than lab/anthropometrics

Procedure standardization; adequate staff training necessary
Reference range device dependent

Functional Outcomes Potentially Impacted by Malnutrition

Lean Body Mass Measurement
Muscle Strength
Neurocognitive Outcomes
• IQ decrease of 4.2 in FTT infants in meta analyses but not helpful in the individual child

Immune Function
• Increased infection rate if increased exposure

Duration of illness

Primary Indicators (1 data point available):
Pediatric Malnutrition

<table>
<thead>
<tr>
<th>Indicator (z score)</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight for height</td>
<td>-1 to -1.9</td>
<td>-2 to -2.9</td>
<td>-3 or more</td>
</tr>
<tr>
<td>BMI for age</td>
<td>-1 to -1.9</td>
<td>-2 to -2.9</td>
<td>-3 or more</td>
</tr>
<tr>
<td>Length/height</td>
<td>No data</td>
<td>No data</td>
<td>-3</td>
</tr>
<tr>
<td>MUAC</td>
<td>-1 to -1.9</td>
<td>-2 to -2.9</td>
<td>-3 or more</td>
</tr>
</tbody>
</table>
Primary Indicator (2 or more data points available): Pediatric Malnutrition

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain Velocity (&lt;2y of age)</td>
<td>&lt; 75% of norm</td>
<td>&lt; 50% of norm</td>
<td>&lt; 25% of norm</td>
</tr>
<tr>
<td>Weight Loss (2-20y of age)</td>
<td>5% usual body wt</td>
<td>7.5% usual body wt</td>
<td>10% usual body wt</td>
</tr>
<tr>
<td>Deceleration in wt for length/height</td>
<td>Decline of 1 z score</td>
<td>Decline of 2 z score</td>
<td>Decline of 3 z score</td>
</tr>
<tr>
<td>Inadequate protein/energy intake</td>
<td>51-75% estimated needs</td>
<td>26-50% estimated needs</td>
<td>&lt; 25% estimated needs</td>
</tr>
</tbody>
</table>

Evaluation

Initial Documentation
1. Underlying disease/condition + inflammation
   Acute vs chronic (< or > 3 months)
2. Anthropometrics
3. Estimated intake/estimated protein-energy needs
4. Tanner stage (if applicable)
5. Handgrip strength (if applicable)

If criteria met, document malnutrition
GOAL: Prevent complications/improve outcomes

Monitoring

Follow response and reassess
- Monitor and adjust, monitor and adjust...
Continuity of Care???
Monitoring Frequency??
Nutrition Surveillance

**Bright Futures**

(healthy children, malnourished TBD)

**Infancy**
- 2 to 5 Day (First Week) Visit; 1 Month Visit; 2 Month Visit; 4 Month Visit; 6 Month Visit; 9 Month Visit

**Early Childhood**
- 12 Month Visit; 15 Month Visit; 18 Month Visit; 2 Year Visit; 2 1/2 Year Visit; 3 Year Visit; 4 Year Visit

**Middle Childhood**
- 5 Year – 10 Years, Annual Visit

**Adolescence**
- 11 Year – 21 Years, Annual Visit

*http://brightfutures.aap.org/pdfs/Other%203/Bright%20Futures%20Kit%20contents%20&%20development.pdf

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What You/Your Staff Can Do NOW

- Read consensus statement & related documents
- Create awareness and provide literature/discussion/opportunities, encourage uniform implementation by
  - Nutrition staff
  - Medical/Nursing/Pharmacy Staff
  - HIM and coders
- Participate in Academy/A.S.P.E.N. / AAP research networks/registries as they become available for data entry
- Watch for future Academy / A.S.P.E.N. / AAP educational opportunities

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Academy/A.S.P.E.N. Malnutrition Consensus Statements Caveats

**Characteristics/Indicators to Diagnose Malnutrition**

- **Work in progress**
  - Parameters may change over time
  - Evidence to support their appropriateness
    - Must be collected and evaluated in a standardized manner to identify:
      - Diseases/conditions/circumstances routinely associated with MN's development – all settings
      - Resources utilization/revenue generation
      - Human/financial costs of care
References