Using Evidence To Support Practice: Diagnosing Malnutrition

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Objectives

• Examine the tenets of evidence based practice related to pediatric nutrition

• Identify sources of evidence that support accurate diagnosis of malnutrition

• Utilize case studies to illustrate accurate diagnosis of malnutrition
“Those who cannot remember the past are condemned to repeat it”

- George Santayana
Malnutrition: A Brief History

• 1898 - Florence Nightingale
• 1926 – Marasmus defined
• 1935 – Kwashiorkor defined
• 1935 - Discussions of malnutrition
• 1974 - Skeletons and closets
• 2015 – Finally, we define pediatric malnutrition?

http://likesuccess.com/topics/25459/skeletons
“Every careful observer of the sick will agree in this that thousands of patients are annually starved in the midst of plenty, from want of attention to the ways which alone make it possible for them to take food.”

“But in chronic cases... where the fatal issue is determined at last by mere protracted starvation, I had rather not enumerate the instances... where a little ingenuity.... have averted the result.”

Nightingale F. Notes on Nursing: What it is, and What it Isn’t. 1898
Marasmus Defined

- Characteristics
  - “Old and pinched look”
  - “Skin is wrinkled and toneless, and hangs in folds”
  - “Body is devoid of fat...... old mummified appearance”
- Causes
  - Improper feeding
  - Infection
  - Congenital weakness of disease
  - Defective hygiene
Kwashiorkor

  - From the Ga language – “disease of the deposed baby when the next one is born”
  - “Mother is sick, old, and malnourished or has become pregnant again…”
  - History always involves defective feeding
  - Early diagnosis responds well to improved diet
Discussions in the Royal Society

“Malnutrition is a word which occurs very frequently in current medical and non-medical publications, but knowledge of its meaning would appear to be in inverse ratio to its occurrence.”

“Disordered nutrition may also arise indirectly from existing disease... and from organic change caused by pre-existing disease.”

“The correct treatment of primary malnutrition is a well-balanced diet, but additional therapeutic measures are needed for malnutrition of secondary origin.”

Magee HE. Discussion on the assessment of the state of nutrition. Proc Royal Soc Med. 28:713. 1935
Finally!

Indicators for Identification of Pediatric Malnutrition

• Food/nutrient intake
• Assessment of energy and protein needs
• Growth parameters
• Weight gain velocity
• Mid-upper arm circumference
• Handgrip strength
• Proxy measures
• Tanner stage
Defining the Problem - Etiology

Primary Malnutrition
Disordered nutrition caused by faulty diet

Secondary Malnutrition
Disordered nutrition arising from existing disease or condition

When was this published?
- a. 1935
- b. 1975
- c. 2000
- d. 2011
Evidence Based Practice

A Brief Review

Truth

Knowledge

Belief

Wikimedia Commons
What Is Evidence-Based Practice?

Figure from: Introduction to evidence based practice. Duke University Medical Center. http://guides.mclibrary.duke.edu/c.php?g=158201&p=1036021
## Evidence Based Practice 101

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Begin with the patient</td>
<td>A question arises regarding the care of a patient</td>
</tr>
<tr>
<td>What is the question</td>
<td>Formulate a search question</td>
</tr>
<tr>
<td>Find evidence</td>
<td>Decide where to search – then search</td>
</tr>
<tr>
<td>Evaluate the evidence</td>
<td>Is the information valid (truthful)? Does it apply to this patient?</td>
</tr>
<tr>
<td>Apply the evidence</td>
<td>What are patient/caregiver wishes?</td>
</tr>
<tr>
<td>Evaluate the results</td>
<td>What happened?</td>
</tr>
</tbody>
</table>

It Starts With The Question

<table>
<thead>
<tr>
<th>P</th>
<th>Patient or population</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Intervention or issue of interest</td>
</tr>
<tr>
<td>C</td>
<td>Comparison intervention or issue</td>
</tr>
<tr>
<td>O</td>
<td>Outcome</td>
</tr>
<tr>
<td>T</td>
<td>Time for intervention to reach outcome</td>
</tr>
</tbody>
</table>

In **children** who have lost weight, what is the predictive value of **weight loss** in **diagnosis of malnutrition**?
Define the levels of evidence

Expert consensus “they locked us in a room until we came up with something that made sense”

“We’ve had good luck when we do (whatever)”

https://commons.wikimedia.org/wiki/File:Research_design_and_evidence.svg
Systematic Reviews

• Stepwise process used to develop guidelines
  • Define the question
  • Search for relevant data
  • Extract relevant data
  • Assess the quality of the data
  • Analyze and combine the data
  • (Optional) meta-analysis
Clinical Practice Guidelines

Should use rigorous methodology – Systematic Review
• Identify how search was conducted
• Ask specific clinical questions
• Include rating of the quality of evidence
• Process for developing recommendations described
• Recommendations are useful, specific, and rated
Whose Guideline Is It Anyway?

www.guidelines.gov
Whose Guideline Is It Anyway?


- Includes systematically developed statements
- Produced by a specialty association, government agency, or relevant professional society – not an individual
- Based on systematic review of the evidence
- Includes assessment of benefits and harms
- Full text is available on request
- Most recent published version – less than 5 years old
Evaluating The Evidence

• Recommendations are quickly outdated and should be updated at least every 3 years
• May need to extend search into the grey literature
• Potential for bias
• Criteria for inclusion often not strict enough
• What happens if included study is retracted later?
“The potential benefits of practice guidelines are only as good as the quality of the guidelines themselves”

• Assess the quality of guidelines
• Provide strategy for development of guidelines
• Inform what information and how information ought to be reported in the guidelines

*Appraisal of Guidelines for Research and Evaluation*
# AGREE Enterprise

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope and purpose</td>
<td>Developers’ overall goal for writing the guideline</td>
</tr>
<tr>
<td>Stakeholder involvement</td>
<td>Appropriateness of stakeholders involved</td>
</tr>
<tr>
<td>Rigor of development</td>
<td>Process and methods used to gather and synthesize evidence</td>
</tr>
<tr>
<td>Clarity of presentation</td>
<td>Language, structure, and format of the document</td>
</tr>
<tr>
<td>Applicability</td>
<td>Identification of barriers and facilitators to implementation</td>
</tr>
<tr>
<td>Editorial independence</td>
<td>Recommendations formulated without competing interests</td>
</tr>
</tbody>
</table>

GRADE Working Group

• Grading of Recommendations Assessment, Development, and Evaluation
• Goal is to develop a sensible approach to grading quality (or certainty) of evidence and strength of recommendations
• Criteria that guideline developers should meet in order to state that the GRADE approach was used to assess evidence or develop guidelines
## GRADE Approach

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Quality Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomized trial or double upgraded observational study</td>
<td>High</td>
</tr>
<tr>
<td>Downgraded randomized trial or upgraded observational study</td>
<td>Moderate</td>
</tr>
<tr>
<td>Double-downgraded randomized trial or observational study</td>
<td>Low</td>
</tr>
<tr>
<td>Triple-downgraded randomized trial or downgraded observational study or case series/case report</td>
<td>Very low</td>
</tr>
</tbody>
</table>

**Limitations That Might Result In Downgrading**
- Limitations in the design that suggest high likelihood of bias
- Indirectness of evidence or inconsistency of results
- Imprecision of results (wide confidence intervals)
- High probability of publication bias
Quality Assessment of Clinical Practice Guidelines

Systematic quality assessment of clinical practice guidelines

• Focus on guidelines used to guide care of critically ill adults
• Used AGREE II evaluation tools
• Identified 9 guidelines
  • 4 were recommended
  • 3 were recommended with revisions
  • 2 were not recommended
If we didn’t have a definition for all these years, what have we been diagnosing and describing?
Present Status - Adults

“Malnutrition Syndromes”

- Starvation-associated malnutrition
  - Chronic starvation without inflammation
  - Examples – anorexia nervosa, major depression

- Chronic disease-associated malnutrition
  - Inflammation present, chronic and mild – moderate
  - Organ failure, pancreatic cancer, rheumatoid arthritis

- Acute disease or injury-associated malnutrition
  - Inflammation present, acute and severe
  - Major infection, burns, trauma
Present Status

Malnutrition

“An imbalance between nutrient requirement and intake, resulting in cumulative deficits of energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes”

ASPNEN
Adult Malnutrition Syndromes - Marasmus

- Pure starvation with reduced food intake
- Clinical and laboratory evidence for reduced intake of energy and protein
- Loss of body cell mass without inflammation
- Extracellular fluid not increased
- Clinical hallmark is weight loss

Adult Malnutrition Syndromes - Cachexia

- Underlying persistent cytokine-mediated inflammatory condition
- Loss of body cell mass
- Visceral proteins decline
- Usually increased extracellular fluid
- May have change in body compartment composition
- Most often seen in chronic conditions that result in sustained inflammation of mild to moderate intensity

Adult Malnutrition Syndromes – Protein-Energy Undernutrition (PEU)

- Clinical and laboratory evidence for reduced intake of protein and energy
- Visceral protein reduced
- Extracellular fluid may be increased
- Acute metabolic derangements driven by proinflammatory states
- Spontaneous energy and protein intake compromised
- Moderate to severe but often self-limited inflammation with reduced intake of protein and energy

Inflammation Is The Key

Nutrition risk identified
Compromised intake or loss of body mass

Inflammation?

No, Marasmus

Yes, moderate to severe and self-limited Protein-energy undernutrition (PEU)

Yes, mild to moderate and sustained Cachexia
Consensus Statement

• ASPEN and Academy definition of pediatric malnutrition

• Acute vs chronic
  • Severe acute
  • Wasting
  • Chronic undernutrition – stunting
    • NCP 2015
# The Final Eight

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Evidence Cited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food/nutrient intake</td>
<td>Cites a review paper</td>
</tr>
<tr>
<td>Energy and protein needs</td>
<td>Cites numerous reviews, WHO report</td>
</tr>
<tr>
<td>Growth parameters</td>
<td>Cites reviews, CDC, WHO reports</td>
</tr>
<tr>
<td>Weight gain velocity</td>
<td>Cites reviews, population research</td>
</tr>
<tr>
<td>Mid-upper arm circumference</td>
<td>Cites recommendation, research (adult)</td>
</tr>
<tr>
<td>Handgrip strength</td>
<td>Cites review, old study*</td>
</tr>
<tr>
<td>Tanner stage</td>
<td>Cites guidelines, research</td>
</tr>
<tr>
<td>Proxy measures</td>
<td>Up to you!</td>
</tr>
</tbody>
</table>

*Not validation of hand grip as marker of nutrition status*
# Primary Indicators – Single Data Point

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight/height z score</td>
<td>-1 to -1.9 z score</td>
<td>-2 to -2.9 z score</td>
<td>-3 or greater z score</td>
</tr>
<tr>
<td>BMI-for-age z score</td>
<td>-1 to -1.9 z score</td>
<td>-2 to -2.9 z score</td>
<td>-3 or greater z score</td>
</tr>
<tr>
<td>Length/height for age z score</td>
<td>No data</td>
<td>No data</td>
<td>-3 z score</td>
</tr>
<tr>
<td>Mid upper arm circumference</td>
<td>Greater than or equal to -1 to -1.9 z score</td>
<td>Greater than or equal to -2 to -2.9 z score</td>
<td>Greater than or equal to -3 z score</td>
</tr>
</tbody>
</table>

Becker et al. NCP 2015.
Primary Indicators When 2 or More Data Points Available

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain velocity</td>
<td>Less than 75% of norm expected</td>
<td>Less than 50% of norm expected</td>
<td>Less than 25% of the norm expected</td>
</tr>
<tr>
<td>Weight loss</td>
<td>5% usual body weight</td>
<td>7.5% usual body weight</td>
<td>10% usual body weight</td>
</tr>
<tr>
<td>Deceleration in weight for length/height z score</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 nutrient intake</td>
<td>51 – 75% estimated energy/protein need</td>
<td>26 – 50% estimated energy/protein need</td>
<td>&lt;/= 25% estimated energy/protein need</td>
</tr>
</tbody>
</table>

Becker et al. NCP. 2015
Cases – Can You Diagnose?

• 12 year old male
• Student athlete
• Collapsed at school
• In ED blood glucose noted to be 854
• New diagnosis Type 1 diabetes
• Admitted to ICU
• NPO – after 24 hours intake is 50% of usual
• Grip strength reduced (hasn’t slept for 24 hours)
• Is this patient malnourished?
Making the Diagnosis

• What is a diagnostic thought process?

• Taking responsibility for diagnosis represents transformational change for some

• Correct diagnosis of nutrition problems can only be done following thorough nutrition assessment and critical evaluation of information

• Hypothetico-deductive reasoning and other thought processes
Making the Diagnosis

Communicating the diagnosis

- Clarity is vital
- Is “risk” over used?
We’re Almost Done!

• We’ve always been able to define malnutrition
• Consensus definitions provide some clarity
  • Caveat lector*
• Subjective global assessment – validated assessment tool
• Once diagnosed, pediatric RDs must communicate to others what was found

*Let the reader beware
Resources


• Dowhan L et al. Comparison between handgrip dynamometry and manual muscle testing performed by registered dietitians in measuring muscle strength and function of hospitalized patients. JPEN. 2015;40(7):951-958.

