Paediatric specificities of nutritional assessment

Nutritional screening and assessment in children

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Nutritional assessment and screening in children

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Conflicts of Interests
Mead Johnson/Nestle/Nutricia: Speaker’s Fees/Travel Grants/Research Grants
Malnutrition is not new!

“The flesh is consumed and becomes water, the abdomen fills with water. The shoulders, clavicles, chest, and thighs, melt away. This illness is fatal.”

Hippocrates (460 BC)
Malnutrition Matters
Meeting Quality Standards in Nutritional Care

Ailsa Brotherton, Nicola Simmonds
and Mike Stroud
on behalf of the BAPEN Quality Group

2,500 years later...

Prevalence of malnutrition

Home
General population (adults)
BMI <20kg/m²: 5%\(^{30}\)
BMI <18.5kg/m²: 1.8%\(^{31}\)
Elderly: 14%\(^{22}\)

Sheltered Housing
10-14% of tenants\(^{20,21}\)

Secondary Care
• ↑ complications\(^{3,4}\)
• ↑ length of stay\(^{3,4,32}\)
• ↑ readmissions\(^{33,34}\)
• ↑ mortality\(^{3,32}\)

Hospital
28% of admissions\(^{18,19}\)

Care Homes
30-42% of residents recently admitted\(^{18,19}\)

Primary Care\(^{4,35}\)
• ↑ dependency
• ↑ GP visits
• ↑ prescription costs
• ↑ hospital

Figure 1: Prevalence and consequences of malnutrition in the UK
Suboptimal anthropometry at hospital admission

<table>
<thead>
<tr>
<th>Prevalence of malnutrition and demographic aspects (n = 2410).</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Total group</td>
</tr>
<tr>
<td>Moderate</td>
</tr>
<tr>
<td>(-2 to -3 SDS)</td>
</tr>
<tr>
<td>Severe (-3 SDS)</td>
</tr>
</tbody>
</table>

**Age groups**
- 31 days–0.9 years: 49 (10.8%), \(<0.001\), 44 (9.7%), 79 (17.4%)
- 1–1.9 years: 24 (8.3%), 31 (10.7%), 49 (17.0%)
- 2–5.9 years: 24 (4.1%), 52 (8.8%), 73 (12.4%)
- 6–12.9 years: 45 (6.9%), 42 (6.4%), 81 (12.4%)
- 13–17.9 years: 25 (5.8%), 24 (5.6%), 40 (9.3%)

**Sex**
- Female: 67 (6.1%), 0.188, 81 (7.4%), 136 (12.5%)
- Male: 100 (7.6%), 112 (8.5%), 186 (14.1%)

**Ethnic background**
- Caucasian: 142 (6.5%), 0.005, 164 (7.4%), 280 (12.7%)
- Non-caucasian: 25 (11.8%), 29 (13.7%), 42 (19.9%)

**Admission**
- Acute: 100 (7.9%), 0.038, 103 (7.6%), 184 (13.7%)
- Elective: 67 (5.7%), 90 (8.3%), 138 (12.9%)
- Chronic disease: 99 (9.2%), \(<0.001\), 123 (11.4%), 195 (18.1%)
- No: 68 (5.1%), 70 (5.3%), 127 (9.6%)

**Ward**
- Surgical: 33 (7.1%), 0.897, 33 (7.1%), 59 (12.7%)
- General: 134 (6.9%), 160 (8.9%), 263 (13.5%)

\(^a\) Defined as body mass index \(<-2\) standard deviation scores (SDS).

\(^b\) Chi\(^2\)-test; comparison between the malnourished and not malnourished patients.

\(^c\) Defined as height/length for age \(<-2\) SDS.
Current standards and guidelines in nutritional care

Over recent years there has been increasing interest in nutritional care with the publication of numerous initiatives, standards and nutritional indicators referred to in many service frameworks and commissioning guidelines. However there has been no overall approach or analysis of the evidence. Some of the published documents are listed below:

- Patient Environment Action Teams (PEAT), 2000 annual assessment
- Better Hospital Food, 2001
- Essence of Care, 2001
- National minimum standards, 2001
- Nutrition and Patients: A doctor's responsibility, 2002
- Council of Europe Resolution on food and nutritional care in hospitals, 2003
- The cost of oral nutritional supplements
- NICE guidance
- Delivering Nutritional Care in Hospitals
- Malnutrition
- Malnutrition, 2005
- Good Practice, 2006
- Improving nutritional care. A joint action plan from the Department of Health and Nutrition Summit stakeholders, 2007
- Nutrition Now, 2007
- Organisation of Food and Nutritional Support in Hospitals (OFNoSH), 2007
- Care Services Improvement Partnership factsheet 22; Catering arrangements in Extra Care Housing, 2007
- NICE Guidance on maternal and child nutrition, 2008
- NPSA factsheets on the 10 key characteristics of good nutritional care, 2009
- Social Care Institute for Excellence Guide 15: Dignity in Care; Nutritional Care and Hydration, 2009
- Combating Malnutrition: Recommendations for Action, 2009
- Improving nutritional care and treatment. Perspectives and recommendations from population groups, patients and carers, 2009
- Appropriate Use of Oral Nutritional Supplements in Older People, 2009
Process of identification and treatment of malnutrition
Which type of malnutrition?

**Starvation-Associated Malnutrition**

- Food security is the major cause
  - Food availability & access
  - Equal food provision
  - Hygiene
  - Inflammation secondary effect

**Disease-Associated Malnutrition**

- Food security not a major issue

The impact of disease on:

- Appetite & food intake
- Energy/nutrient requirements
- Absorption/losses
- Inflammation primary effect

Jensen et al, JPEN 2010 156-159
Aetiology & Presentation of Malnutrition in IBD

Gerasimidis et al JHND 2011
How to assess/screen nutrition risk in routine clinical practice?
Selection of the best approach to screen nutrition

- What exactly are you looking for?
  - What is malnutrition?

- How accurate you want to be?
  - screen vs assess?

- Which are the characteristics patients you want to identify?
  - How malnourished (“existing malnutrition” vs risk)?

- Which is the most effective and efficient way to do it?
Malnutrition is not a measurement of anthropometry.

Malnutrition is the **condition** of prolonged imbalanced nutrition resulting in impaired body cellular function.
Impaired body cellular function due to energy/nutrient deficits

MALNUTRITION
Impaired body cellular function due to energy/nutrient deficits

MALNUTRITION

Clinical Insult

↑Requirements
↑↑Metabolism
↓Intake

Prolonged deficits in energy/nutrients

Causes

↑Losses

Impact on clinical outcomes

↑↓Metabolism

Loss of normal body function

Short-term consequences

Changes in body size/shape/composition

Medium-term consequences

Long-term consequences
Assessment of Malnutrition is Probabilities

Outcome of a number of factors associated either the aetiology or consequences of malnutrition

- Clinical examination
- Anthropometric measurements
- Body composition
- Dietary intake
- Weight loss
- Laboratory measurements
- Clinical condition
Anthropometry & growth charts

- The first, the foremost and the least screening approach to have
- Growth trajectory more informative than a single/spot measurements
- Anthropometric measurements are opportunistic in hospitals
- It will not identify those “at risk”

Milani et al JHND 2013
Dietetic/Nutritional Assessment

- Comprehensive approach
- Best approach as it has clinical relevance
- Identifies nutrition risk
- Needs dietitians/trained HPs
- But dietitians are a scarce resource
- Cannot be used for screening
Nutrition Screening Tool (NST)

- Questionnaire; abstract of nutritional assessment
- Outline predictors of past, current, future nutrition risk
- Each step bears a numeric score
- The overall score reflects the nutrition risk of the patient
- An explicit action plans follows
  - No action, observation, clinical referral
Between 2002-2008 we had no paediatric NST... in 2017 we have too many!

Gerasimidis et al, BJN 2010
Gerasimidis et al, Clin Nutr 2011
Hulst et al, Clin Nutr, 2010

McCarthy et al, JHND 2012
1) Concurrent/criterion validity

PYMS vs STAMP vs STRONGkids vs anthropometry vs body composition vs dietetic assessment
Different NST different outcomes

Chourdakis et al AJCN 2015
Methodological Considerations

- When you want to use or test a NST

- Think about what you want the NST to screen for and set your **appropriate benchmark**!

- “At risk” VS “already malnourished”
  - “Already malnourished”, no reason to use NST
  - If you are interested in the “at risk” then use an appropriate benchmark
% of patients with BMI < 2\textsuperscript{nd} centile

- STRONGkids: 45
- STAMP: 77
- PYMS: 91

Chourdakis et al AJCN 2016
Outcome of nutritional screening in the acute paediatric setting

P C Thomas,¹ L V Marino,² S A Williams,¹ R M Beattie¹

<table>
<thead>
<tr>
<th></th>
<th>STAMP (n=159)</th>
<th>PMST (n=266)</th>
<th>PYMS (n=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (%)</td>
<td>63.2</td>
<td>94.4</td>
<td>26.1</td>
</tr>
<tr>
<td>Specificity (%)</td>
<td>36.3</td>
<td>29.0</td>
<td>67.1</td>
</tr>
<tr>
<td>Positive predictive value (%)</td>
<td>35.6</td>
<td>40.5</td>
<td>34.3</td>
</tr>
<tr>
<td>Negative predictive value (%)</td>
<td>63.8</td>
<td>91.1</td>
<td>58.0</td>
</tr>
<tr>
<td>κ-value</td>
<td>-0.005</td>
<td>0.177</td>
<td>-0.71</td>
</tr>
</tbody>
</table>

κ values >0.6 represents good level of agreement, whereas <0.2 is considered poor. PMST, Paediatric Malnutrition Screening Tool; PYMS, Paediatric Yorkhill Malnutrition Screening; STAMP, Screening Tool for the Assessment of Malnutrition in Paediatrics.

1) WHO-CDC vs UK-WHO charts
2) WFH vs BMI z-scores

Benchmark can not identify risk
2) “Predictive Validity of Outcomes”

- The optimal tool is the one that identifies children in which nutritional intervention will improve their clinical outcomes.
- Current evidence relies on association studies between nutrition risk and clinical outcomes.
## Association with LOS

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>PYMS (N=1669)</th>
<th>STAMP (N=1379)</th>
<th>STRONGKIDS (N=2089)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Medium risk</td>
<td>1.11&lt;sup&gt;b&lt;/sup&gt;  (1.05 - 1.18)</td>
<td>&lt; 0.001</td>
<td>1.08  (1.02 - 1.14)</td>
</tr>
<tr>
<td>High risk</td>
<td>1.38  (1.32 - 1.45)</td>
<td>&lt; 0.001</td>
<td>1.37  (1.29 - 1.46)</td>
</tr>
</tbody>
</table>

**PYMS**: Paediatric Yorkhill Malnutrition Score; **STAMP**: Screening Tool for the Assessment of Malnutrition in Paediatrics; **STRONGKIDS**: Screening Tool for Risk Of Impaired Nutritional Status and Growth; **LOS**: length of stay.

<sup>a</sup> Adjusted for Age, sex and chronic disease status and taking the dependence within centres into account while

*Chourdakis et al AJCN 2015*
Poor outcomes

Illness

Exposure
Malnutrition

Outcome
Poor outcomes

Confounder or mediator?
Yes that’s all fine…but which tool to use in my hospital?
Characteristics of NST

<table>
<thead>
<tr>
<th>Good diagnostic validity</th>
</tr>
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<tbody>
<tr>
<td>- Identifies the majority of patients you want to treat (sensitivity)</td>
</tr>
<tr>
<td>- Equally important good positive predictive value (i.e. low false positive rate)</td>
</tr>
</tbody>
</table>

| Practical, quick, cheap, user friendly |
| Can be implemented and perform well in clinical practice |
| Does not waste resources and does not increase workload substantially |
| Make a difference in patients’ care |
Risk of DAM is prevalent (n>100)

Associations with outcomes (n~20)

Impact on outcomes (n=0)

Development of NST (n~10)

Comparison validation (n~75)

Clinical performance (n=2)

Implementation in routine practice (n=1)
Choose a “research valid” NST

Introduce a NST in routine admission
Choose a “research valid” NST

Introduce a NST in routine admission

- Impact/Need resources
- Staff to screen
- Staff to intervene
- Infrastructure
- Training
- Local Support
A guide to assess the clinical Performance of an NST

✓ Select your valid NST
✓ Train your users
✓ Roll out in clinical practice and support this process
✓ Evaluate completion rates (feasible within current resources/practice)
✓ Evaluate yield (% true positive screens)
✓ Measure impact on dietetic referrals patterns/workload
✓ Collect end user feedback
✓ Reflect on the results and decide

Gerasimidis et al Clin Nutr 2011
Training should not be undermined
Support during implementation (n~2,600) consecutive admissions

Gerasimidis et al Clin Nutr 2011
Audit effectiveness (research free.....)

**Ward nurses referring to ward dietitians**

<table>
<thead>
<tr>
<th></th>
<th>TPH (n = 57)</th>
<th>DGH (n = 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td>29 (51)</td>
<td>5 (55)</td>
</tr>
<tr>
<td><strong>Age (years) mean (SD)</strong></td>
<td>7.3 (5.1)</td>
<td>7.8 (5.7)</td>
</tr>
<tr>
<td><strong>New identified patients</strong></td>
<td>52% (29)</td>
<td>56% (5)</td>
</tr>
<tr>
<td><strong>Patients at true risk</strong></td>
<td>86% (49)</td>
<td>89% (8)</td>
</tr>
<tr>
<td>Acute receiving wards</td>
<td>78% (28)</td>
<td>N/A</td>
</tr>
<tr>
<td>Specialist wards</td>
<td>100% (21)</td>
<td>N/A</td>
</tr>
<tr>
<td>New cases at true risk</td>
<td>76% (22)</td>
<td>80% (4)</td>
</tr>
<tr>
<td>Acute receiving wards</td>
<td>73% (19)</td>
<td>N/A</td>
</tr>
<tr>
<td>Specialist wards</td>
<td>100% (3)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

N/A: not applicable; TPH: Tertiary paediatric hospital; DGH: District general hospital.

Gerasimidis *et al* Clin Nutr 2011
Impact/Impression of the end users (nurse)

- Practical for all patients
- Workload increase
- Easy to integrate
- Completed on admission
- Time to complete (5 min)
- Easy to use

% of respondents

Gerasimidis et al. JCN 2012
How do health professionals screen?

International survey of Paediatric gastroenterologists and Paediatric dietitians in 7 countries (n~1,000)
Barriers of screening for DAM

- Nutrition is not as important as other aspects of patients' care
- Lack of time to screen
- Inadequate management strategies to intervene for undernourished children
- Not many dietitians to intervene in undernourished children
- Lack of staff
- No method in place to screen for undernutrition
- Lack of nutrition support teams
- No training on how to assess/screen for undernutrition
- Inadequate equipment to assess nutritional status
- Low staff awareness on the role of nutrition on patient care
- No local policy or guidelines to screen for undernutrition
- There are no barriers
Take Home Messages & Research Aspirations

• NST can help to screen for children at nutrition risk

• NST are not malnutrition diagnostic methods; but “nutrition warning scores”/“dietetic referral tools”

• Testing the clinical performance of a tool against an appropriate benchmark is important

• The NST which identifies the patients that clinical staff want to treat and can be used routinely is the best tool for you

• The benefit of NST on clinical outcomes and health economics need to be tested formally within well-designed RCT
K. Joosten
K. Gerasimidis
J. Hulst
K. Huysentruyt
B. Koletzko
S. Raanan
M. Chourdakis
S. Kolacek
THANK YOU

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