NUTRITION SCREENING TOOLS IN PAEDIATRICS AND THEIR IMPLEMENTATION IN PRACTICE

- Inpatients
- Outpatients
- Special conditions

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WITH THANKS TO NUTRICIA AND DIETITIAN CONNECTION
PAEDIATRIC NUTRITION SCREENING

Inpatients

➤ Reasons to screen inpatients
➤ Determine what makes a good nutrition screening tool
➤ Determine what screening tools are available for paediatric inpatients
➤ Implement the nutrition screening process in hospitals
➤ Manage patients who are screened as at nutritional risk

Outpatients and Screening Tools for Specific Clinical Conditions

➤ Determine nutrition screening options for paediatric outpatients
➤ Nutrition screening for specific clinical conditions
➤ Considerations in designing a nutrition screening tool for children with cerebral palsy
REASONS TO SCREEN

Directs clinical nutrition care

- Incidence of malnutrition in Australian Paediatric Inpatients is 15% and 44% are at risk of malnutrition (White et al, *Journal of Pediatrics and Child Health*, 2014)
- A large tertiary paediatric hospital
  - 100% occupancy 330 patients, 40 inpatients per Dietitian FTE/day
  - 50 inpatients have a BMI z score of ≤ -2
  - 145 patients are at risk of malnutrition.

Increases awareness of nutrition and improves nutrition practices e.g. anthropometry and intake monitoring (Rub et al, *JPGN*, 2015).

Predicts length of stay important with the current emphasis on ‘expected date of discharge’ estimated on admission (Galera-Martinez et al, *JPGN*, 2016)

Predicts weight loss during admission and the requirement for nutrition support, PeDiSMART (Ksrsgiozoglou-Lampoudi et al, 2015)

Provides a link to clinical coding to identify patients with malnutrition and feeding difficulties.


New National Safety and Quality Health Services Standards DRAFT, Standard CC: Comprehensive Care, CC5 Screening and Assessment of Risk.
REASONS TO SCREEN: REGIONAL HOSPITAL EXPERIENCE

- Improves relationships with paediatric wards.

- Enhances communication with nurses and paediatricians
  - provides in servicing opportunities
  - working together on implementation processes.

- Provides a gateway to nutrition services on the paediatric wards

- Provides reportable data on nutrition related activities to hospital executive
  - relatively simple and quick audits of malnutrition risk prevalence rates, missed coding opportunities, anthropometrics measures and length of stay.
REASONS **NOT** TO SCREEN

- Increased requirements for resources (nurses, dietitians, nutrition assistants, food services)
- Increased governance and auditing requirements
- Does screening prevent malnutrition from occurring
- The direct effect of screening on improved clinical outcome has not been established
- Does nutrition screening add value and make economic sense?
WHAT MAKES A GOOD NUTRITION SCREENING TOOL

- High degree of sensitivity, specificity, validity and reliability.
- Simple and easy implementation without the need for user training.
- Quick, inexpensive and non invasive
- Developed for ALL paediatric patients, universal
- Screen for patients “AT RISK” of malnutrition, need nutrition assessment to determine if patients require intervention.
Systematic review to identify the evidence on clinical performance and diagnostic accuracy.

Eight articles were included in the review.

Identified 5 Nutrition Screening Tools which had good mythological performance using Quality Assessment of Diagnostic Accuracy Studies.

- STRONGkids Nutritional risk screening tool (Hulst, 2010)
- Paediatric Yorkhill Malnutrition Score (PYMS) (Gerasimidis, 2010)
- Screening Tool for Assessment of Malnutrition in Paediatrics (STAMP) (McCarthy, 2012)
- Paediatric Nutrition Screening Tool (PNST) (White, 2014)
- Subjective Global Nutritional Assessment (SGNA), (Seeker and Jeejeebhoy, 2007)
SCREENING TOOL FOR RISK ON NUTRITIONAL STATUS AND GROWTH    STRONGKIDS

- Hulst et al 2010, N=424, 3-18 years
- Had the highest number of secondary validation studies (Huysentruyt et al, 2016; Spagnuolo et al, 2013; Wonoputri et al, 2014)
- Secondary Validation showed high sensitivity (81%), moderate specificity (37%)
- Good agreement between nurses and paediatricians (Moeeni et al, 2014)
- Most nurses found the tool easy to understand
- Takes 1-5 minutes to complete
- 7/15 nurses found the tool harder to complete during busy shifts.
● Subjective Clinical Assessment (1) diminished subcutaneous muscle mass and/or hollow face.

● High Risk Disease (2) refer to table

● Weight loss or poor weight gain? (1) weight loss or no weight gain (infants < 1 year) during the last few weeks/months?

● Nutritional intake and losses (1)
  > Excessive diarrhoea ≥ 5 per day and /or vomiting (>3 times per day) the last few days?
  > Reduced food intake during the last few days before admission
  > Pre-existing dietetically advised nutritional intervention?
  > Inability to consume adequate intake because of pain?

0 points low risk, 1-3 points medium risk, 4 or more points high risk
PAEDIATRIC YORKHILL MALNUTRITION SCORE: PYMS

- For children 1-16 years N=247.
- Validated by Nurse screening compared to full paediatric SGNA by a dietitian.
  - Sensitivity 85%
  - Specificity 87%
- Information and users guide
- PYMS body mass index calculator
- Nurse quick reference guide to PYMS
Paediatric Yorkhill Malnutrition Score (PYMS)

Name:
Surname:
Hospital No.:
Date:
Nurse Signature:
Weight:
Sex: F / M
Height:
Consultant:
BMI:

1. Is the BMI below the cut-off value in the table overleaf?
   - NO
   - YES

2. Has the child lost weight recently?
   - NO
   - YES
   - Unintentional weight loss
   - Clothes become too loose
   - Poor weight gain (if <2sd)

3. Has the child had a reduced intake (excluding feeds) for at least the past week?
   - NO
   - YES
   - Decreased usual intake
   - No intake for a few days of food intake

4. Will the child's nutrition be affected by the recent admission/condition for at least the next week?
   - NO
   - YES
   - Decreased intake at night
   - Increased bowel movements
   - No intake for a few days of bed rest

Total PYMS Score

Pyms must be completed by a registered nurse

Body Mass Index (BMI) Scoring Guide

Regardles of PYMS score if you have any nutritional concerns about this patient please refer to dietitian following initial screening.

Total PYMS Score

Notes – Comments

© Scottish Health Service, Women and Children's Directorate, West District Glasgow and Clyde, 2001
SCREENING TOOL FOR ASSESSMENT OF MALNUTRITION IN PAEDIATRICS: STAMP

- Medical and Surgical inpatients 2-17 years
- Development (n=122) via structured questionnaire Vs full dietetic nutrition assessment
- Validation (n=238) full dietetic nutrition assessment vs STAMP
- Secondary validation 82% sensitivity and 54% specificity (McCarthy et al, 2012; Larna More et al, 2012; Wonoputri et al, 2014)

- www.stampscreeningtool.org
- Screening form and diagnosis table
- STAMP instructions
- Step by Step Guide to Using STAMP
- Child centile quick reference tables
- Weighing and measuring guide
# STAMP screening form

This form can be used to screen a child up to three times – please date, sign and initial the space at the bottom of this sheet every time you do so.

## Step 1 – Diagnosis

<table>
<thead>
<tr>
<th>Does the child have a diagnosis that has any nutritional implications?</th>
<th>Score</th>
<th>1st screening</th>
<th>2nd screening</th>
<th>3rd screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite nutritional implications</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible nutritional implications</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No nutritional implications</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Step 2 – Nutritional Intake

<table>
<thead>
<tr>
<th>What is the child’s nutritional intake?</th>
<th>Score</th>
<th>1st screening</th>
<th>2nd screening</th>
<th>3rd screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>No nutritional intake</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recently decreased or poor nutritional intake</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No change in eating patterns and good nutritional intake</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Step 3 – Weight and height

<table>
<thead>
<tr>
<th>Use a growth chart or the centile quick reference tables to determine the child’s measurements</th>
<th>Score</th>
<th>1st screening</th>
<th>2nd screening</th>
<th>3rd screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3 centile spaces/2 centiles apart (or weight &lt; 2nd centile)</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 2 centile spaces/2 centiles apart</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 1 centile space/centiles apart</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Step 4 – Overall risk of malnutrition

<table>
<thead>
<tr>
<th>Add up the scores from the boxes in steps 1–3 to calculate the overall risk of malnutrition</th>
<th>Score</th>
<th>1st screening</th>
<th>2nd screening</th>
<th>3rd screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk</td>
<td>≥4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium risk</td>
<td>2–3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low risk</td>
<td>0–1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Step 5 – Care plan

<table>
<thead>
<tr>
<th>What is the child’s overall risk of malnutrition, as calculated in step 4?</th>
<th>Use management guidelines and/or local nutrition policies to develop a care plan for the child</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk</td>
<td>Take action • Refer the child to a Dietitian, nutritional support team, or consultant • Monitor as per care plan</td>
</tr>
<tr>
<td>Medium risk</td>
<td>Monitor the child’s nutritional intake for 3 days • Repeat the STAMP screening after 3 days • Amend care plan as required</td>
</tr>
<tr>
<td>Low risk</td>
<td>Continue routine clinical care • Repeat the STAMP screening weekly while the child is an in-patient • Amend care plan as required</td>
</tr>
</tbody>
</table>

Please complete after each screening

<table>
<thead>
<tr>
<th>Date</th>
<th>Signature</th>
<th>Initials</th>
<th>Child’s name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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MALNUTRITION RISK IN HOSPITALIZED CHILDREN: USE OF 3 SCREENING TOOLS IN A LARGE EUROPEAN POPULATION

- Chourdakis et al Am J Clin Nutr 2016; 103:1301-10
- PYMS, STAMP, STRONGkids.
- 2567 patients, 14 hospitals, 12 European countries
- Moderate agreement of high nutrition risk between tools (STRONGkids 10% high risk vs PYMS 25%)
- Children identified at high nutrition risk had longer LOS and lower MUAC and Tricep Skinfolds.
- 19%-23% of children identified as at risk had a BMI z score ≤2
- Could not conclude that ‘one tool superior over the other’
PAEDIATRIC NUTRITION SCREENING TOOL (PNST)


• Performed as part of a routine admission process by Nurses
• Simple
• Quick
• Takes limited printing space
• Avoids anthropometric measures and reference to standards
• Applies to all inpatients and ages
• Cheap
• Valid
Paediatric Nutrition Screening Tool

The Paediatric Nutrition Screening Tool (PRST) is the first nutrition screening tool for paediatric inpatients which is quick, simple and effective. The PRST has been validated for use for its paediatric inpatients in tertiary and regional hospitals.

Date completed: [dd - month - yyyy]

Nutrition screening questions

1. Has the child unintentionally lost weight lately? [Yes] [No]
2. Has the child had poor weight gain over the last few months? [Yes] [No]
3. Has the child been eating/feeding less in the last few weeks? [Yes] [No]
4. Is the child obviously underweight? [Yes] [No]

If "Yes" to two or more of the above:
- refer the child for further nutrition assessment (see contact details)
- check if child is known to a dietitian
- measure weight and length/height
- commence food and fluid intake record.

Contact details

Division / service name: [__________]
Hospital / health facility: [__________]
Phone: [__________] Email: [__________]

Produced by
Dietetics and Food Services, Lady Cilento Children’s Hospital
593 Stanley Street, South Brisbane, Queensland 4101, Australia
m: LCNH-D&F@health.qld.gov.au

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PAEDIATRIC NUTRITION SCREENING TOOL (PNST): VALIDATION

• A convenience sample of paediatric inpatients from three hospitals n=295.
• Two tertiary paediatric hospitals and one regional hospital
• Infants term age to 16 years
• Exclusion criteria
  • Patients who could not be weighed
  • Patients admitted for less than 24 hours
  • Patients who had conditions which affected hydration
  • Patients who were clinically unstable
  • Patients who had non-English speaking parents or caregivers
RESULTS

• PNST identified 37.6% of patients as at nutritional risk

• Paediatric SGNA identified 34.2% of patients as at nutritional risk.

• 9.8% of patients had a BMI z score of ≤-2

• 30% of children had unintentionally lost weight

• 27% of children had poor weight gain over the last few months

• 52% of children had been eating/feeling less in the last few weeks.

• 19% of children were obviously underweight.

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNST vs Paed SGNA</td>
<td>77.8</td>
<td>82.1</td>
</tr>
<tr>
<td>PNST vs BMI z score ≤-2</td>
<td>89.3</td>
<td>66.3</td>
</tr>
<tr>
<td>Paed SGNA vs BMI z score ≤ -2</td>
<td>96.5</td>
<td>72.5</td>
</tr>
<tr>
<td>PNST vs BMI z score ≤ - 3</td>
<td>100</td>
<td>62.8</td>
</tr>
<tr>
<td>PNST vs ≥85th percentile</td>
<td>45.5</td>
<td>64.1</td>
</tr>
<tr>
<td>PYMS vs Paed SGNA</td>
<td>85</td>
<td>87</td>
</tr>
</tbody>
</table>
QUESTIONS FROM BOSTON CHILDREN’S HOSPITAL

- Why did you choose to create your own screening tool over using STRONGkids, as it does not require anthropometrics?

- How were dietitians in the study trained in performing the SGNA?

- Can the PNST be used for children in intensive care?

- Can you use the tool for 2-3 day old infants?

- Were other questions considered and eventually excluded?

- What are the expectations for nurses to use clinical data to complete the PNST questions?

- Were nurses trained to review growth standards/charts and perform physical assessment to look for malnutrition?

- For Q1 ‘Has the child unintentionally lost weight lately?’
  - How was the term lately chosen?
  - Were more specific time frames tested?
  - Do nurses have any difficulty answering the question with a vague timeframe in the absence of weight history.
IMPLEMENTATION

• Embedded into the nursing admission process
• Referral process
• Training
• Triage of screening referrals
• Time frames to review at risk patients.
• Nutrition assessment methodology
• Rescreening
• Auditing
• Promotion
• Should weights and length measures be performed, documented and compared to standards in addition to screening
SCREENING ON ADMISSION

- Embedded in the nursing admission process.

<table>
<thead>
<tr>
<th>Nutrition Risk: Paediatric Malnutrition Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has child unintentionally lost weight lately?</td>
</tr>
<tr>
<td>□ No □ Yes</td>
</tr>
<tr>
<td>Has child had poor weight gain over the last few months?</td>
</tr>
<tr>
<td>□ No □ Yes</td>
</tr>
<tr>
<td>Has child been eating/feeding less in the last few weeks?</td>
</tr>
<tr>
<td>□ No □ Yes</td>
</tr>
<tr>
<td>Is child obviously underweight/overweight?</td>
</tr>
<tr>
<td>□ No □ Yes</td>
</tr>
</tbody>
</table>

*If yes to 2 or more of the above – Implement actions as listed*

- Double-click the Patient Flow Manager icon
- Go to ‘EDU’ section
- In the ‘Paed Nutrition Risk’ section
- Add ‘At Risk (Yes) x 2’

**Actions**

- All children to have height & weight recorded on Medication Chart and % Chart
- Strict food intake record
- Weigh twice weekly
- Complete ‘Paed Nutrition Risk’ section in Patient Flow Manager
- Instructions

**Formula Goals**

- Pt Wt (kgs): 18kg
- Date Weighted: 
- Pt Ht (cm): 
- Paed Nutrition Risk: At Risk (Yes) x 2
- BMI: X
- Percentile: 
- Glamorgan: >15 (High Risk)
- Falls Risk: 

**Patient Data**

- Name Alert: 
- Diagnosis: 
- Patient Of Concern: 
- Diet: Select options
- Diet Comments: 
- Additional Meal: 
- Food Allergens: Select options
- Feeds: Select options
- Formula Species: 
- Pt Wt (kgs): 18kg
- Date Weighted: 
- Pt Ht (cm): 
- Paed Nutrition Risk: At Risk (Yes) x 2
- BMI: X
- Percentile: 
- Glamorgan: >15 (High Risk)
- Falls Risk: 

**Diagram**

- Screen capture of a patient flow chart with fields for patient data and nutrition screening.
SCREENING VIA ELECTRONIC MEDICAL RECORDS

- Interactive View section in the patient chart
- Enter ‘Paediatric Risk Assessment’
- Fill out the PNST
- If patients are ‘at risk’ of malnutrition, flag in the Alerts and Problems section.
Charlyn Ooi
Implementing the Paediatric Nutrition Screening Tool

Breanne Hosking et al
Validating Adult and Paediatric Nutrition Screening and Assessment Tools in Vietnamese Language in Tow Acute Hospitals in Ho Chi Minh City, Vietnam.
TRAINING

• Website
Has the child unintentionally lost weight lately?

This question identifies if the child has lost weight in any period of time. This can be weight loss within the past 2 days or past two years.

Has the child had poor weight gain over the last few months?

In order to answer this question the child’s weight needs to be checked against a growth standard or growth chart. This will give you an indication of what percentile the child is on. It is important to compare current percentiles for weight with previous growth records (red book, parenteral reports, and previous admissions).

Has the child been eating/feeding less in the last few weeks?

It is important to check if the child has been eating less than usual. Children that are admitted with the following are likely to be eating less:

- NGT feeding
- NBM
- Vomiting
- Diarrhoea
- Pain
- Viral Illness
- Febrile
Is the child obviously underweight?

It is important to check if the child is exhibiting physical signs of malnutrition. These can include;

- Wasting (lack of muscle mass)
- Stunting
- Protruding or prominent bones
- Brittle hair or nails
- Dark circles under eyes
- Narrow and hollow face
- Pallor

Referrals can be sent to Dietetics via Patient Flow Manager. Phone ….., or Email …..
RESCREENING

- Part of daily care plan
- Performed weekly
- **Has the patient lost weight in the last 7 days**
- **Has the patient been eating/feeding less in the last 7 days.**

**Validation of Rescreening Questions**

- **Aim:** To determine the sensitivity and specificity of nutrition rescreening questions in identifying nutritional deterioration.
- **Subjects:** children with a predicted LOS of greater than 1 week.
- **Design:** prospective, observational, comparative
- **Comparison measures:** anthropometry and nutritional intake as a % predicted requirements.
MANAGING PATIENTS WHO ARE SCREENED AS AT RISK

• How many?
  • A ward of 20 inpatient 40% are screened as at risk of malnutrition n=8
  • At least 5 patients per day on that ward as part of your routine clinical care.
  • That leaves 3 patients to assess
  • There is a 20% error in screening tools therefore likely that 2 patients will require intervention.

• Type of assessment
  • Anthropometry
  • Nutrition assistant review
  • Mini assessment
  • Paediatric subjective global assessment

• Type of treatment
  • Develop a guideline for the treatment of malnutrition
  • Oral supplements
  • Food service modification
  • Formula fortification
  • Tube feeds.

• Monitoring frequency

• Discharge planning: Duty of Care
MANAGING PATIENTS WHO ARE SCREENED AS AT RISK

• Consider a systems approach to treatment and assessment i.e. time frames for assessment

• Determine governance around screening i.e. nutrition care committee

• Determine who is responsible for triaging referrals

• Prioritise, develop a clinical prioritisation guideline for your department

• Manage professional anxiety over several unactioned flags in electronic systems.
NUTRITION ASSESSMENT METHODOLOGY

- Historical, symptomatic and physical parameters
- Validated in identifying malnutrition and the risk of malnutrition in paediatric surgical patients (Secker and Jeejeebhoy, 2007)
- Subjective
- Experience helps (being familiar with healthy children)
- Physical assessment
- Gives an over ranking normal, moderate and severe

The Academy of Nutrition and Dietetics training for Pediatric/Adult nutrition focused physical exam [http://www.eatrightpro.org/resource/career/professional-development face-to-face-learning/nfpe-workshop](http://www.eatrightpro.org/resource/career/professional-development face-to-face-learning/nfpe-workshop)
Paediatric Specific Workshops
[http://www.eatrightpro.org/~/media/documents/events/pediatricnfpeagendasample.ashx](http://www.eatrightpro.org/~/media/documents/events/pediatricnfpeagendasample.ashx)
PART 2: PAEDIATRIC NUTRITION SCREENING TOOLS IN
OUTPATIENT SETTINGS
AND SPECIFIC CONDITIONS
NUTRITION SCREENING IN SPECIFIC CONDITIONS

• Majority of Paediatric Nutrition Screening tools:
  • Inpatient settings
  • Non-disease specific

• More recently validation studies in:
  • Outpatient settings - STAMP
  • Community: special schools - STRONGkids
  • Inflammatory bowel disease: STAMP, STRONGkids, PNRS, PYMS
  • Oncology – population specific: SCAN
  • Spinal cord injury - STAMP
  • Cystic fibrosis – Nutrition Assessment not screening

• Future work:
  • Feeding and nutrition screening for cerebral palsy
## Sensitivity and Specificity

<table>
<thead>
<tr>
<th>Nutrition screening result</th>
<th>Moderate to severe malnutrition</th>
<th>Well nourished</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes Nutritional Risk</td>
<td>True positive</td>
<td>False positive</td>
</tr>
<tr>
<td></td>
<td>High Sensitivity</td>
<td>Low Specificity</td>
</tr>
<tr>
<td>No Nutritional Risk</td>
<td>False negative</td>
<td>True negative</td>
</tr>
<tr>
<td></td>
<td>Low Sensitivity</td>
<td>High Specificity</td>
</tr>
</tbody>
</table>

### The Truth (Gold Standard) e.g. Ped SGNA

Aim to have high sensitivity and specificity to avoid:

- Missing children who malnutrition but are not identified by the screening tool
- Including children who do not have malnutrition causing unnecessary referrals and assessments
Participants
- 60 children
- 1 – 6yrs old
- Child health clinic

Measures
- STAMP
- Modified STAMP
- Full Nutrition Assessment

Nutrition Risk
- Low weight percentile compared to height
- Poor dietary intake unlikely to improve in 3 – 5 days
- Increased metabolic stress or nutrient losses

35% considered at medium to high nutritional risk by dietetic assessment
### MODIFIED STAMP FOR OUTPATIENTS

<table>
<thead>
<tr>
<th>Level of Risk</th>
<th>Standard STAMP</th>
<th>Modified STAMP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scoring system</td>
<td>Number</td>
</tr>
<tr>
<td>Low Risk</td>
<td>0 – 1</td>
<td>37</td>
</tr>
<tr>
<td>Medium Risk</td>
<td>2 – 3</td>
<td>10</td>
</tr>
<tr>
<td>High Risk</td>
<td>4 or more</td>
<td>0</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Specificity</td>
<td>95%</td>
<td></td>
</tr>
</tbody>
</table>

Increased awareness and documentation of nutritional status variables in the general clinic following the study:

- Documentation of anthropometry, appetite and dietary intake
NUTRITION SCREENING COMMUNITY SETTING: SPECIAL SCHOOLS

Joosten et al Qaul Life Res 2016 Netherlands

- Descriptive study design
- 642 children from 9 special schools (mean age 9.8yrs)
- Nutritional “risk” STRONGkids
- Nutritional assessment:
  - acute malnutrition: weight for height Z-score ≤ -2
  - chronic malnutrition: height Z-score ≤ -2
- Subjective health status using a questionnaire (generic EQ-5D)
NUTRITION SCREENING COMMUNITY SETTING: SPECIAL SCHOOL

- 59% low risk
- 38% moderate
- 2% high risk

**Nutritional Risk**
- 16% malnourished (anthropometry alone)

**Nutritional Status**
- Lower health status in those with:
  - Higher nutrition risk
  - Malnutrition

**Health Status**

- Validity not examined
- Nutritional risk was associated with health status
INFLAMMATORY BOWEL DISEASE

• Wiskin et al 2012 J Hum Nutr Diet, UK
• 46 children, 27 Crohn’s disease; 16 Ulcerative colitis; 3 indeterminate
• 3 – 17 years of age
• Combination of outpatients and inpatients
• STAMP, STRONGkids, PNRS, PYMS
• Malnutrition classified using weight Z-score:

<table>
<thead>
<tr>
<th>None or mild</th>
<th>&gt; -2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>-2 to -3</td>
</tr>
<tr>
<td>Severe</td>
<td>≤ -3</td>
</tr>
</tbody>
</table>
INFLAMMATORY BOWEL DISEASE

Anthropometry

• Moderate to severe malnutrition: \( n = 3 \)
• None or mild malnutrition: \( n = 43 \)

Nutrition Screening

• IBD considered a high nutritional risk diagnosis
• No child scored low risk on STAMP, STRONGkids, PNRS
• Children with moderate to severe malnutrition all scored high risk on all tools

Overall poor agreement with anthropometry for all tools

• No modifications / changes to scoring made

➢ Nutritional assessment and indicators for intervention are more than anthropometry alone
### NUTRITION SCREENING IN CHILDHOOD CANCER (SCAN)  

#### Study 1
- N = 32 inpatients SCAN
- SGNA

#### Study 2
- N = 58 Inpatients
- SCAN
- Anthropometry Z-scores
- Fat mass / fat free mass by BodPod

#### SCAN questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the patient have high risk cancer</td>
<td>1</td>
</tr>
<tr>
<td>Is the patient currently undergoing intensive treatment</td>
<td>1</td>
</tr>
<tr>
<td>Does the patient have any symptoms relating to the GI tract?</td>
<td>2</td>
</tr>
<tr>
<td>Has the patient had poor intake over the past week?</td>
<td>2</td>
</tr>
<tr>
<td>Has the patient had any weight loss over the past month?</td>
<td>2</td>
</tr>
<tr>
<td>Does the patient show signs of undernutrition</td>
<td>2</td>
</tr>
<tr>
<td>( \geq 3 ) At risk of malnutrition</td>
<td></td>
</tr>
</tbody>
</table>
NUTRITION SCREENING IN CHILDHOOD CANCER (SCAN)

Study 1 100% sensitivity, 39% specificity
• SCAN identified 100% of children with moderate to severe malnutrition on Pediatric SGNA
• Included a number of children who weren’t malnourished

Study 2
Those considered “at nutritional risk” using SCAN had:
• Lower weight Z-score
• Lower BMI Z-score
• Lower body fat stores
• Similar fat free mass
PAEDIATRIC NUTRITION SCREENING TOOLS IN NEUROLOGICAL CONDITIONS

Wong, Spinal Cord 2013;51:424-429

• STAMP

• 51 children with spinal cord injury

• Compared to:
  - Full dietitian assessment and
  - Paediatric Yorkhill Malnutrition Score (PYMS)
PAEDIATRIC NUTRITION SCREENING TOOLS IN NEUROLOGICAL CONDITIONS

32 undernourished by dietetic assessment
30 at risk by STAMP (including 12 at high risk)

Overall agreement of 76.5% with full nutrition assessment

83% sensitivity: correctly classified as at risk using STAMP
67% specificity: correctly classified as not at risk using STAMP
CURRENT WORK:
DEVELOPMENT OF A FEEDING AND NUTRITION SCREENING TOOL FOR CHILDREN WITH CEREBRAL PALSY

Dr Kristie Bell¹,², Dr Katherine Benfer¹, Dr Kelly Weir³,⁴, Dr Robert Ware³, Prof Peter Davies¹, Prof Roslyn Boyd¹, Prof Joan Arvedson⁵

Supported by Danone, Nutricia Research
WHAT DO WE KNOW ABOUT NUTRITION FOR CHILDREN WITH CEREBRAL PALSY

• Undernutrition is common
• Children with CP are shorter, lighter and thinner than children with typical development
• Undernutrition is more common in children with:
  • More severe gross motor impairment
  • More severe feeding and swallowing difficulties
• Feeding and swallowing difficulties are prevalent in 19 – 99% of children with CP
• 85% of preschool aged Queensland children with CP have feeding difficulties (Benfer 2013)
WHEN IS A PROBLEM A PROBLEM

• Impact on nutritional status
  • Dietary intake
  • Poor weight gain, growth, nutritional stores and micronutrient status
• Impact on respiratory health
  • Aspiration of food and/or fluids into the lungs
  • Recurrent chest infections
• Impact on quality of life
  • Stress associated with meals times
• Impact on health
Feeding and swallowing difficulties in children at 18 – 24 months of age was related to outcomes at 3 years of age (Benfer 2016)

- Weight Z-score,
- BMI Z-score and
- Parental stress when feeding their child

Children with more severe feeding and swallowing difficulties

- Had lower dietary intakes of energy, protein and carbohydrate, but not fat
- Were shorter and have less lean mass
- Were more likely to be malnourished

Feeding and swallowing difficulties were highly related to dietary intake and nutritional status
UNDERNUTRITION RELATED TO POORER HEALTH OUTCOMES

Weight < 20th percentile on CP charts associated with increased
• Number of major medical conditions
• Mortality (Brookes 2011)

North American Growth in Cerebral Palsy Project 2002
• 44% of children had low body fat stores
• Low fat stores and low arm muscle area were related to:
  ➣ Global health scores
  ➤ Health care utilisation
  ➣ Child participation
  ➣ Family participation
RED FLAGS SCREENING TOOL

• The first screening tool of its kind with 2 possible outcomes

• Aim: to develop a brief list of questions that accurately detect those children “AT RISK” of:
  1. feeding and swallowing difficulties and/or
  2. undernutrition
RED FLAGS FEEDING AND NUTRITION SCREENING TOOL DEVELOPMENT

• 4 questions first described by Joan Arvedons 2013 EJCN
• “Red Flags” to indicate risk of feeding and swallowing problems

Expert advisory panel in Vienna, Austria in May 2016
• Health professionals from throughout Europe, UK, Australia and USA.
• Expanded to 5 key areas, (plus 1)
  1. Respiratory health
  2. Feeding Duration
  3. Stress associated with feeding
  4. Nutritional status
  5. Gastrointestinal factors
  6. Overall difficulties with feeding
CRITERIA FOR THE DEVELOPMENT OF QUESTIONS

• Be simple and easy to understand
• Able to be completed by a parent/caregiver without assistance from a health professional
• Use information known to the parent/caregiver
• No measurements required
• Cover the 5 key areas
• Suitable for adaption into multiple languages after the validation study

Result: 23 questions to test
Aim to identify the questions or combination of questions with the highest sensitivity and specificity
DEVELOPMENT AND VALIDATION OF THE SCREENING TOOL

Two step process:

1. Development of the screening tool
   a. Determine which of the screening questions, or which combination of questions are best able to identify children with
      - Under nutrition
      - Feeding and swallowing difficulties
   b. Combine these to produce the final “Red Flags” screening tool

2. Secondary validation
   a. Compare the final screening tool score with the gold standard to determine how well it identifies children “at risk”
   b. Independent sample of children
### Example: Initial Nutrition Screening Questions

**Adult inpatients:** Ferguson et al. Nutrition 1999;15;458-464

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Chi-square</th>
<th>P value</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you have any allergies or intolerances for food?</td>
<td>404</td>
<td>0.06</td>
<td>0.80</td>
<td>16.7</td>
<td>84.6</td>
</tr>
<tr>
<td>Do you have tooth, mouth, or swallowing problems that make it hard for</td>
<td>408</td>
<td>4.53</td>
<td>0.06</td>
<td>18.3</td>
<td>90.8</td>
</tr>
<tr>
<td>you to eat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you wear dentures?</td>
<td>408</td>
<td>1.45</td>
<td>0.23</td>
<td>41.0</td>
<td>53.0</td>
</tr>
<tr>
<td>Are you on any special diets?</td>
<td>408</td>
<td>2.24</td>
<td>0.13</td>
<td>19.7</td>
<td>73.0</td>
</tr>
<tr>
<td>What is your appetite/food intake like usually?</td>
<td>408</td>
<td>53.08</td>
<td>&lt;0.001</td>
<td>48.3</td>
<td>82.2</td>
</tr>
<tr>
<td>Has your appetite/food intake been less than usual lately?</td>
<td>408</td>
<td>172.24</td>
<td>&lt;0.001</td>
<td>83.3</td>
<td>90.5</td>
</tr>
<tr>
<td><strong>Have you been eating poorly because of a decreased appetite?</strong></td>
<td>408</td>
<td>207.58</td>
<td>&lt;0.001</td>
<td>86.6</td>
<td>92.5</td>
</tr>
<tr>
<td>Is your current appetite:</td>
<td>408</td>
<td>151.10</td>
<td>&lt;0.001</td>
<td>59.0</td>
<td>95.2</td>
</tr>
<tr>
<td>Do you have an illness or condition that has made you change the kind</td>
<td>408</td>
<td>162.44</td>
<td>&lt;0.001</td>
<td>78.3</td>
<td>91.4</td>
</tr>
<tr>
<td>and/or amount of food you eat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In general, would you say your health is:</td>
<td>405</td>
<td>92.10</td>
<td>&lt;0.001</td>
<td>78.0</td>
<td>72.5</td>
</tr>
<tr>
<td>Compared to 1 year ago, how would you rate your health in general now?</td>
<td>405</td>
<td>54.59</td>
<td>&lt;0.001</td>
<td>69.5</td>
<td>67.1</td>
</tr>
<tr>
<td>Have you had an illness that kept you in bed during the past month?</td>
<td>405</td>
<td>60.05</td>
<td>&lt;0.001</td>
<td>52.5</td>
<td>88.7</td>
</tr>
<tr>
<td><strong>Have you had nausea, vomiting or diarrhea for the past 3 days or longer?</strong></td>
<td>408</td>
<td>80.24</td>
<td>&lt;0.001</td>
<td>43.3</td>
<td>95.1</td>
</tr>
<tr>
<td>Have you been in a hospital overnight or longer in the past 12 months?</td>
<td>406</td>
<td>26.49</td>
<td>&lt;0.001</td>
<td>78.0</td>
<td>58.2</td>
</tr>
<tr>
<td>If yes, how many different times did you stay in a hospital overnight or</td>
<td>405</td>
<td>32.3</td>
<td>&lt;0.001</td>
<td>46.7</td>
<td>86.9</td>
</tr>
<tr>
<td>longer in the past 12 months?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How many medications prescribed by your doctor or bought over the</td>
<td>403</td>
<td>4.07</td>
<td>0.04</td>
<td>21.3</td>
<td>86.3</td>
</tr>
<tr>
<td>counter are you taking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you always physically able to shop, cook, and/or feed yourself?</td>
<td>408</td>
<td>70.14</td>
<td>&lt;0.001</td>
<td>45.0</td>
<td>93.4</td>
</tr>
<tr>
<td>Do you eat alone most of the time?</td>
<td>408</td>
<td>0.84</td>
<td>0.36</td>
<td>30.0</td>
<td>75.6</td>
</tr>
<tr>
<td>Do you regularly skip meals?</td>
<td>408</td>
<td>5.69</td>
<td>0.02</td>
<td>30.0</td>
<td>83.0</td>
</tr>
<tr>
<td>Have you had surgery in the past 6 months?</td>
<td>405</td>
<td>13.34</td>
<td>&lt;0.001</td>
<td>35.6</td>
<td>84.4</td>
</tr>
<tr>
<td><strong>Have you lost weight recently without trying?</strong></td>
<td>408</td>
<td>195.85</td>
<td>&lt;0.001</td>
<td>98.4</td>
<td>83.1</td>
</tr>
</tbody>
</table>
## Malnutrition Screening Tool

**Adult inpatients:** Ferguson et al. *Nutrition* 1999;15;458-464

<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you lost weight recently without trying?</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Unsure</td>
<td>2</td>
</tr>
<tr>
<td>If yes, how much weight (kilograms) have you lost?</td>
<td></td>
</tr>
<tr>
<td>1-5</td>
<td>1</td>
</tr>
<tr>
<td>6-10</td>
<td>2</td>
</tr>
<tr>
<td>11-15</td>
<td>3</td>
</tr>
<tr>
<td>&gt;15</td>
<td>4</td>
</tr>
<tr>
<td>Unsure</td>
<td>2</td>
</tr>
<tr>
<td>Have you been eating poorly because of a decreased appetite?</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
</tbody>
</table>

Total 408

- 64 true positives
- 315 true negatives
- 24 false positives
- 5 false negatives

= 93% correctly classified
**RED FLAGS STUDY PLAN**

### Participants
- 100 children with CP
- 2 to 18 years old
- All GMFCS
- Excluding those with feeding tubes

### Measures
- Questionnaire (29 test Qs)
- Ped SGNA
- Z scores: weight, height/length, TSF, SSSF, MAC
- Clinical Feeding Assessment
- Videofluoroscopic study

### Outcome
- Screening tool for feeding difficulties and under nutrition in children with CP.
PEDIATRIC SUBJECTIVE GLOBAL NUTRITION ASSESSMENT

- Comprehensive structured approach to nutrition assessment
- Clinical judgment - allows subjective interpretation of data

Nutrition focused medical history:
- Current and historical weight and height/length
  - Comparison to growth standards
  - Appropriateness of linear growth based on mid-parental height
- Dietary intake compared to estimated requirements
- GI symptoms and duration
- Impact of nutrition on functional capacity
- Metabolic demands of the condition

Physical examination - physical signs of malnutrition
- Subcutaneous fat and muscle stores with consideration of impact of neuropathy or myopathy rather than nutritional depletion
CLINICAL FEEDING EVALUATION/ VFSS

• Completed by a speech pathologist

• Standardised presentation of food of 3 textures (puree, chewable and fluid)

• Rated using a standard protocol - Dysphagia Disorders Survey (Shephard 2014; Benfer 2013)

• Rating of clinical signs of aspiration/ pharyngeal phase difficulty
  • Coughing, gagging, choking, multiple swallows per bolus, wet/gurgly voice, wet breathing/rattly chest, snuffly nose, wheezing, stridor and vomiting

• Referral for videofluroscopy (modified barium swallow) if $\geq 1$ clinical sign on $\geq 2$ occasions during the protocol
SIGNIFICANCE

• Can be completed independently by parents/caregivers to identify if their child with CP is “at risk” of:
  • Undernutrition
  • Feeding and swallowing difficulties.

• Final tool will be translated into various languages and made widely available to increase uptake

• Can be self initiated by concerned parents/caregivers

• Established validity
SUMMARY

• Numerous screening tools available
  • Different aims
  • Established validity in different populations
  • Variable clinical utility

• Generic tools are useful to screen large inpatient populations

• Often identify all children with high risk underlying diagnosis (e.g., oncology, IBD, cystic fibrosis)

• Population specific screening tools can improve accuracy in certain populations
Effective nutrition screening tools allow quick and simple identification of children at risk of poor nutrition who may benefit from nutrition intervention.