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.
- EQuIP National Standards Standard 12:Provision of Care, 2013

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.

NUTRITIONAL SCREENING IN HOSPITALISED PAEDIATRIC PATIENTS: A SYSTEMATIC REVIEW

TEIXERISA AND VIANA, 2015, JOURNAL DE PEDIATRIA, DOI.PRG/10.1016/J.JPED.2015.08.011

- Systematic review to identify the evidence on clinical performance and diagnostic accuracy.
- Eight articles where 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.

STRONGKIDS

- 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

PYMS

Paediatric Yorkhill Malnutrition Score (PYMS)

NHS Greater Glasgow and Clyde

Name:	**Hospital No:**	**Date**				
Surname:	**CHI:**	**Nurse Signature**				
DoB:		**Weight**				
Age:	**Sex: F / M**	**Height**				
Ward:	**Consultant:**	**BMI**				
Step 1	**Is the BMI below the cut-off value in the table overleaf?**	NO	**0**			
		YES	**2**			
Step 2	**Has the child lost weight recently?**	NO	**0**			
		YES • Unintentional weight loss • Clothes looser • Poor weight gain (if <2yrs)	**1**			
Step 3	**Has the child had a reduced intake (including feeds) for at least the past week?**	NO Usual intake	**0**			
		YES Decrease of usual intake for at least the past week	**1**			
		YES No intake (or a few sips of feed only) for at least the past week	**2**			
Step 4	**Will the child's nutrition be affected by the recent admission/condition for at least the next week?**	NO	**0**			
		YES For at least the next week • Decreased intake and/or • Increased requirements and/or • Increased losses	**1**			
		YES No intake (or a few sips of feed only) for at least the next week	**2**			
Step 5	**Calculate total score** (total of steps 1-4)	**Total PYMS Score**				

PYMS must be completed by a registered nurse

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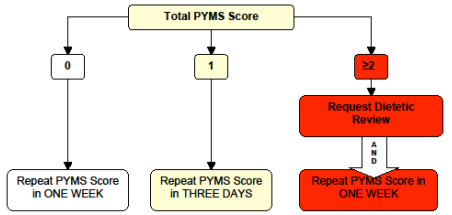
PYMS Dietetic Management Pathway



****NB: Regardless of PYMS score if you have any nutritional concerns about this patient please refer to dietitians following initial screening.****

Body Mass Index (BMI) Scoring Guide

(If the BMI calculated is less than that shown for age and gender, answer Yes for Step 1)

Age (years)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Boys	15.0	14.5	14.0	13.5	13.5	13.5	13.5	13.5	13.5	14.0	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.0
Girls	15.0	14.0	13.5	13.5	13.0	13.0	13.0	13.0	13.0	13.5	14.0	14.5	15.0	15.5	16.0	16.5	17.0	17.0

Notes – Comments

	Date: ___/___/____	Date: ___/___/____	Date: ___/___/____
Nursing Comments (including reason unable to complete PYMS step)			
Health Professional Request made to:	Dietitian □ Dentist □ SALT □ Other □ Specify.....	Dietitian □ Dentist □ SALT □ Other □ Specify.....	Dietitian □ Dentist □ SALT □ Other □ Specify.....
Health Professional Comments			

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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				
Does the child have a diagnosis that has any nutritional implications?	Score	1st screening	2nd screening	3rd screening
Definite nutritional implications	3			
Possible nutritional implications	2			
No nutritional implications	0			
Step 2 – Nutritional intake				
What is the child's nutritional intake?	Score	1st screening	2nd screening	3rd screening
No nutritional intake	3			
Recently decreased or poor nutritional intake	2			
No change in eating patterns and good nutritional intake	0			
Step 3 – Weight and height				
Use a growth chart or the centile quick reference tables to determine the child's measurements	Score	1st screening wt: ht:	2nd screening wt: ht:	3rd screening wt: ht:
> 3 centile spaces/≥ 3 columns apart (or weight < 2nd centile)	3			
> 2 centile spaces/= 2 columns apart	1			
0 to 1 centile spaces/columns apart	0			
Step 4 – Overall risk of malnutrition				
Add up the scores from the boxes in steps 1–3 to calculate the overall risk of malnutrition	Score	1st screening	2nd screening	3rd screening
High risk	≥4			
Medium risk	2–3			
Low risk	0–1			
Step 5 – Care plan				
What is the child's overall risk of malnutrition, as calculated in step 4?	Use management guidelines and/or local nutrition policies to develop a care plan for the child			
High risk	• Take action • Refer the child to a Dietitian, nutritional support team, or consultant • Monitor as per care plan			
Medium risk	• Monitor the child's nutritional intake for 3 days • Repeat the STAMP screening after 3 days • Amend care plan as required			
Low risk	• Continue routine clinical care • Repeat the STAMP screening weekly while the child is an in-patient • Amend care plan as required			

Please complete after each screening	Date	Signature	Initials
1st screening			
2nd screening			
3rd screening			

Child's name: _____

_____

DOB: _____

Hospital no.: _____

Supported by an educational grant from Abbott Nutrition

Central Manchester University Hospitals NHS Foundation Trust

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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)

WHITE M, LAWSON K, RAMSEY R, DENNIS N, HUTCHINSON Z, XIN YING S, MATSUYAMA M, DOOLAN A, TODD A, ELLIOTT A, BELL K, LITTLEWOOD R.
JOURNAL OF PARENTERAL AND ENTERAL NUTRITION. 2016;40:392-398. DOI: 10.1177/0148607114544321

- 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 (PNST) is the first nutrition screening tool for paediatric inpatients which is quick, simple and effective. The PNST has been validated for use for in paediatric inpatients in tertiary and regional hospitals.

Date completed: da - month - - year -

Hospital No:
Surname:
Forename(s):
Sex: Male Female
DOB: da - month - - year -

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:

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Queensland Government

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/feeing less in the last few weeks.
- 19% of children were obviously underweight.

	Sensitivity (%)	Specificity (%)
PNST vs Paed SGNA	77.8	82.1
PNST vs BMI z score ≤-2	89.3	66.3
Paed SGNA vs BMI z score ≤ -2	96.5	72.5
PNST vs BMI z score ≤ - 3	100	62.8
PNST vs ≥85th percentile	45.5	64.1
PYMS vs Paed SGNA	85	87

QUESTIONS FROM BOSTON CHILDREN'S HOSPITAL

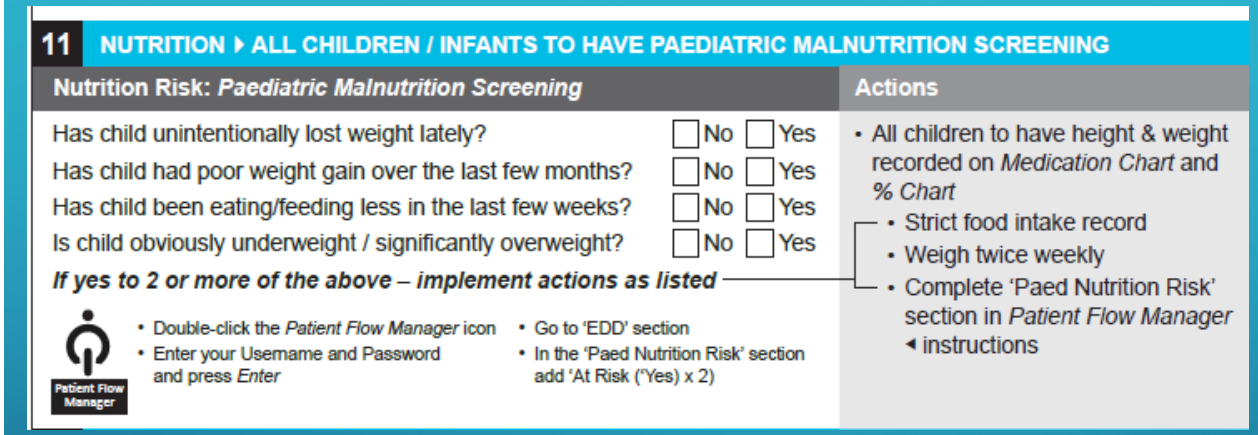
- Why did you choose to create your own screening tool over using STRONGkids, as it does not require anthropometrics?
- How were dietitians in the study trained in performing the SGNA?
- Can the PNST be used for children in intensive care?
- Can you use the tool for 2-3 day old infants?
- Were other 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.

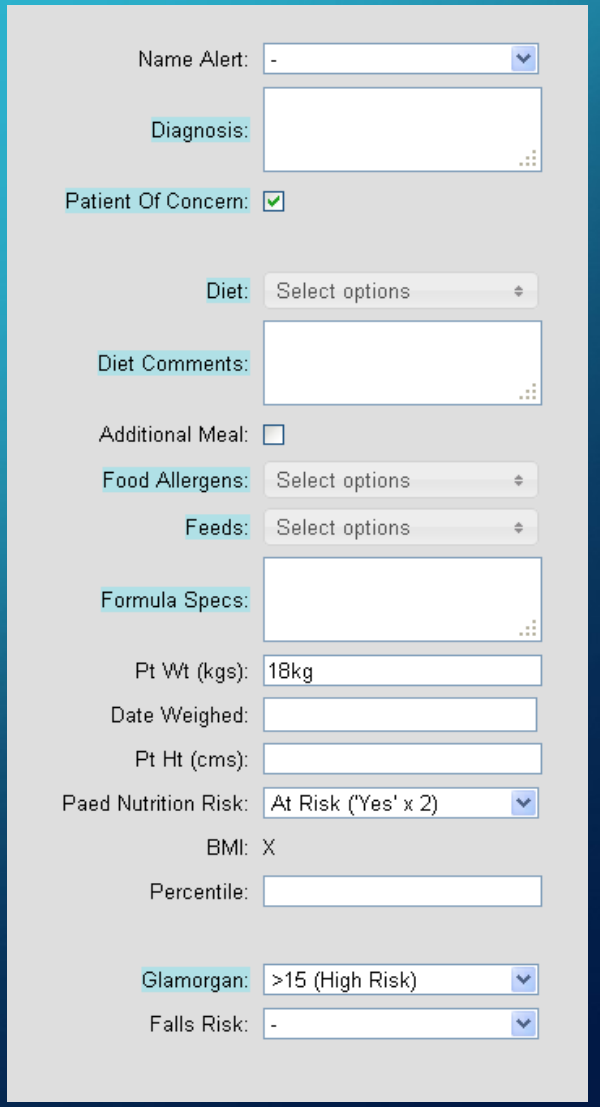


11 NUTRITION ▸ ALL CHILDREN / INFANTS TO HAVE PAEDIATRIC MALNUTRITION SCREENING

Nutrition Risk: *Paediatric Malnutrition Screening*	Actions
Has child unintentionally lost weight lately? ☐ No ☐ Yes	• All children to have height & weight recorded on *Medication Chart* and *% Chart*
Has child had poor weight gain over the last few months? ☐ No ☐ Yes	• Strict food intake record
Has child been eating/feeding less in the last few weeks? ☐ No ☐ Yes	• Weigh twice weekly
Is child obviously underweight / significantly overweight? ☐ No ☐ Yes	• Complete 'Paed Nutrition Risk' section in *Patient Flow Manager* ◂ instructions
If yes to 2 or more of the above – implement actions as listed	

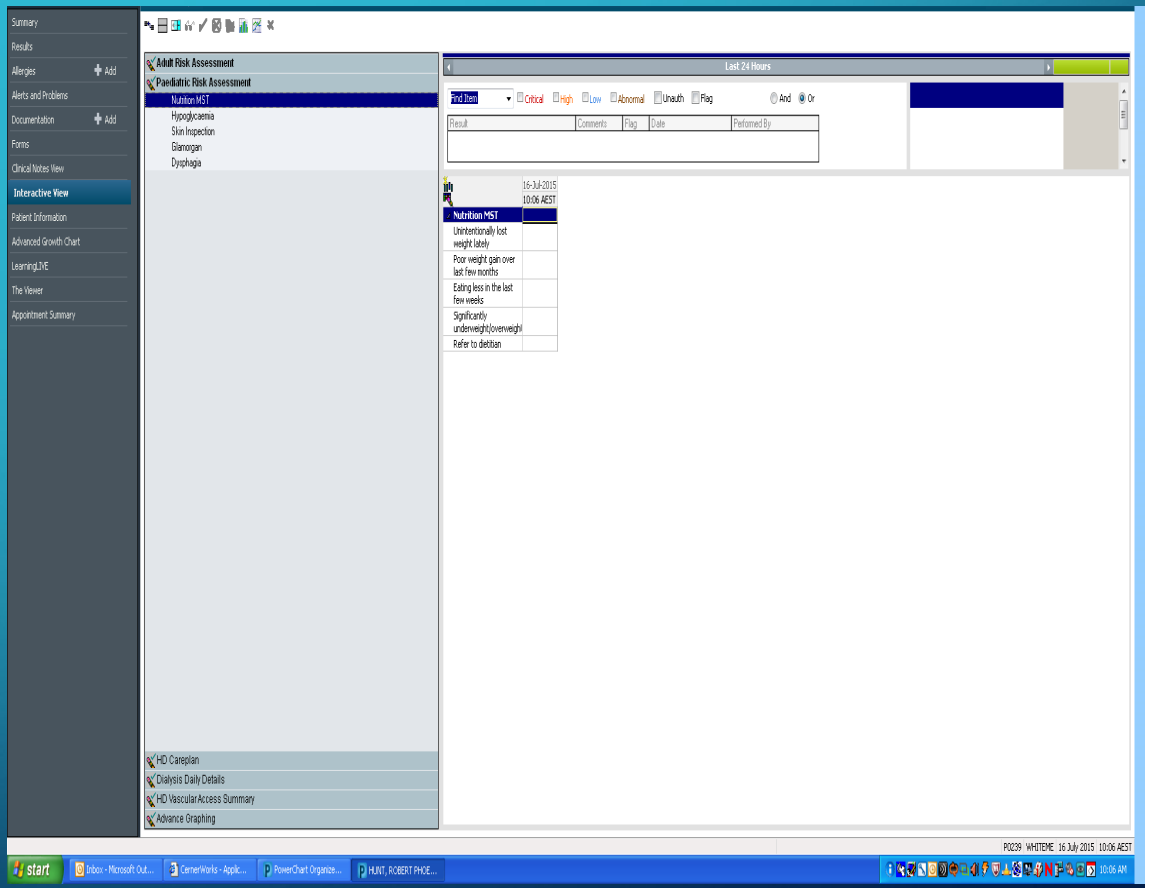
Patient Flow Manager

- Double-click the *Patient Flow Manager* icon
- Enter your Username and Password and press *Enter*
- Go to 'EDD' section
- In the 'Paed Nutrition Risk' section add 'At Risk ('Yes) x 2)



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.



FORMATTING

JOONDALUP HEALTH CAMPUS

PAEDIATRIC NUTRITION SCREENING TOOL

URN: .....

Surname: ..... AFFIX LABEL HERE

Forename(s): .....

Sex: ..... DOB: .....

NUTRITION SCREENING QUESTIONS

To be completed for all paediatric patients (including short-stay)

Date of screening: .....

Admission weight: ..... *(All patients should be weighed on admission)*

If patient unable to be weighed, state reason: .....

Nursing staff to ask patient/parents/guardian:	Circle applicable answers	
Has child unintentionally lost weight lately?	**Yes**	**No**
Has child had poor weight gain over the last few months?	**Yes**	**No**
Has child been eating or feeding less in the last few weeks?	**Yes**	**No**
Nursing staff to complete based on clinical judgement:		
Does child appear obviously underweight/significantly overweight?	**Yes**	**No**
Note: Overweight/obese patients with unintentional weight loss and illness can also become malnourished.		

If 2 or more 'Yes' responses are circled,
(1) refer to Dietetics Department on extension 9196 and
(2) commence Food and Fluid Intake Record (HR540-0).
For afterhours referral, please leave a message on the voicemail.

Referral Required: ❒ Yes ❒ No If Yes, Referral Date: .....

Additional comments: .....

.....

Nurse Signature	Print Name	Designation

02/15

Charlyn Ooi

Implementing the Paediatric Nutrition Screening Tool

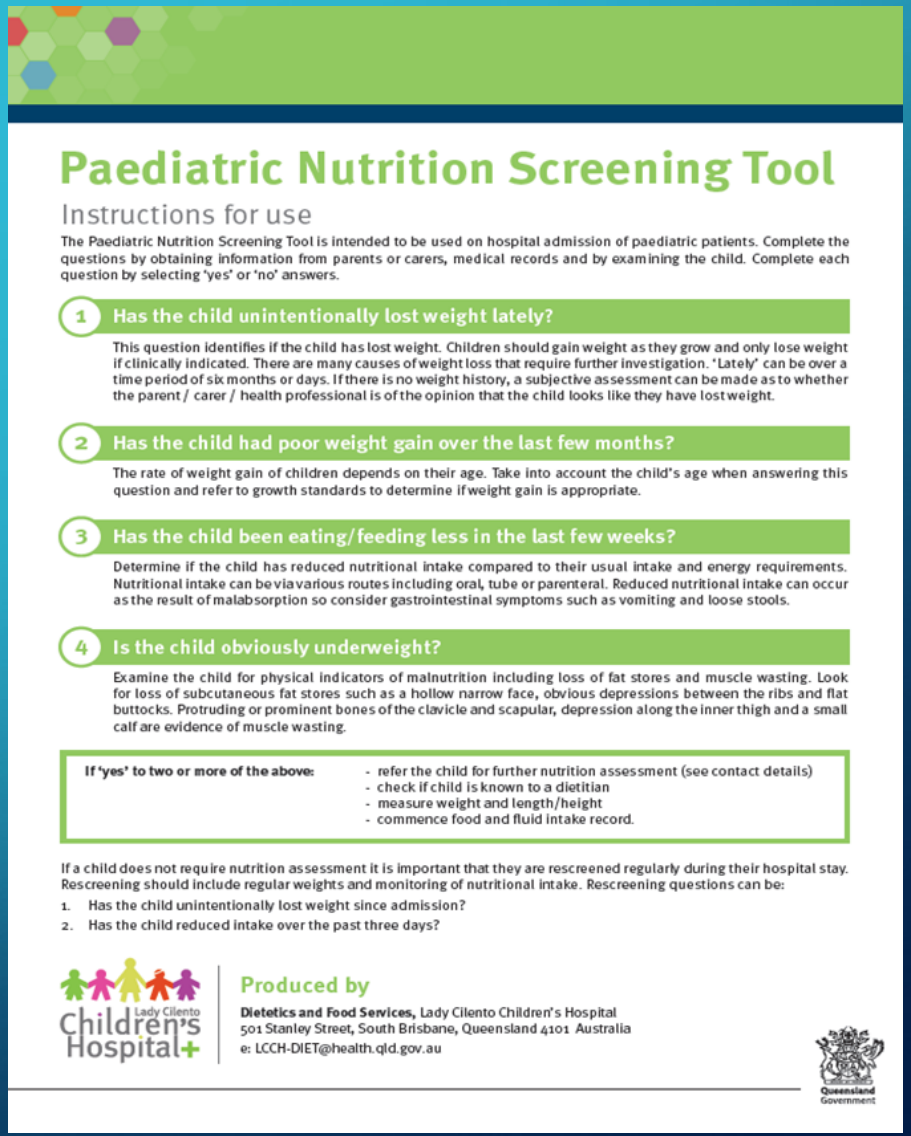
Breanne Hosking et al

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

Trẻ có giảm cân không chủ đích sau đó?	☐ Không	☐Có
Trẻ có tăng cân chậm trong một vài tháng qua?	☐ Không	☐Có
Hiện trẻ có ăn ít/biếng ăn trong một vài tuần qua?	☐ Không	☐Có
Có thể nhận biết trẻ nhẹ cân/thừa cân?	☐ Không	☐Có

TRAINING

- Website
  http://
  www.childrens.health.qld.gov.au/
  paediatric-nutrition-screening-
  tool/



Paediatric Nutrition Screening Tool

Instructions for use

The Paediatric Nutrition Screening Tool is intended to be used on hospital admission of paediatric patients. Complete the questions by obtaining information from parents or carers, medical records and by examining the child. Complete each question by selecting 'yes' or 'no' answers.

1 Has the child unintentionally lost weight lately?

This question identifies if the child has lost weight. Children should gain weight as they grow and only lose weight if clinically indicated. There are many causes of weight loss that require further investigation. 'Lately' can be over a time period of six months or days. If there is no weight history, a subjective assessment can be made as to whether the parent / carer / health professional is of the opinion that the child looks like they have lost weight.

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

The rate of weight gain of children depends on their age. Take into account the child's age when answering this question and refer to growth standards to determine if weight gain is appropriate.

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

Determine if the child has reduced nutritional intake compared to their usual intake and energy requirements. Nutritional intake can be via various routes including oral, tube or parenteral. Reduced nutritional intake can occur as the result of malabsorption so consider gastrointestinal symptoms such as vomiting and loose stools.

4 Is the child obviously underweight?

Examine the child for physical indicators of malnutrition including loss of fat stores and muscle wasting. Look for loss of subcutaneous fat stores such as a hollow narrow face, obvious depressions between the ribs and flat buttocks. Protruding or prominent bones of the clavicle and scapular, depression along the inner thigh and a small calf are evidence of muscle wasting.

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.

If a child does not require nutrition assessment it is important that they are rescreened regularly during their hospital stay. Rescreening should include regular weights and monitoring of nutritional intake. Rescreening questions can be:

1. Has the child unintentionally lost weight since admission?
2. Has the child reduced intake over the past three days?

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TRAINING: PNST HELPFUL HINTS, CABOOLTURE HOSPITAL

- 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?

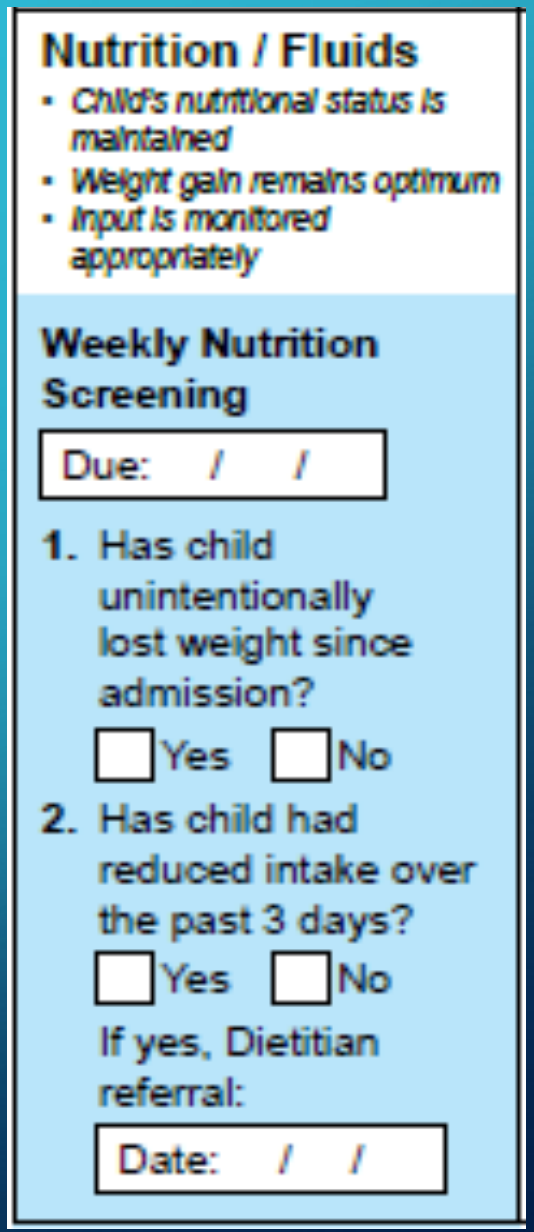
  It is important to check if the child is exhibiting physical signs of malnutrition. These can include;

  - 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.



Nutrition / Fluids

- *Child's nutritional status is maintained*
- *Weight gain remains optimum*
- *Input is monitored appropriately*

Weekly Nutrition Screening

Due: / /

1. Has child unintentionally lost weight since admission?
   ☐ Yes ☐ No
2. Has child had reduced intake over the past 3 days?
   ☐ Yes ☐ No

   If yes, Dietitian referral:

   Date: / /

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

Secker DJ and Jeejeebhoy KN. How to perform Subjective Global Nutritional Assessment in Children. *J Acad Nutr Diet*. 2012;112(3)424-431.

- 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
Paediatric Specific Workshops
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

		The Truth (Gold Standard) eg Ped SGNA	
		Moderate to severe malnutrition	Well nourished
Nutrition screening result	Yes Nutritional Risk	True positive **High Sensitivity**	False positive **Low Specificity**
	No Nutritional Risk	False negative **Low Sensitivity**	True negative **High Specificity**

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 malnutrition causing unnecessary referrals and assessments

NUTRITION SCREENING IN PAEDIATRIC OUTPATIENTS

Rub, G et al JPGN 2016;62: 771-5, Israel

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

Level of Risk	Standard STAMP		Modified STAMP	
	Scoring system	Number	Scoring system	Number
Low Risk	0 – 1	37	0	32
Medium Risk	2 – 3	10	1 – 3	7
High Risk	4 or more	0	4 or more	0
Sensitivity	48%		76%	
Specificity	95%		82%	

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 $\leq$ -2
  - chronic malnutrition: height Z-score $\leq$ -2
- Subjective health status using a questionnaire (generic EQ-5D)

NUTRITION SCREENING COMMUNITY SETTING: SPECIAL SCHOOL

Nutritional Risk

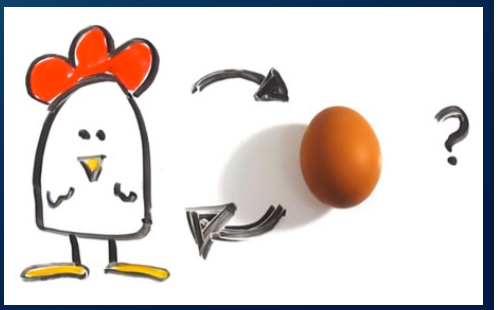
- 59% low risk
- 38% moderate
- 2% high risk

Nutritional Status

- 16% malnourished (anthropometry alone)

Health Status

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



- 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 indeteminate
- 3 – 17 years of age
- Combination of outpatients and inpatients
- STAMP, STRONGkids, PNRS, PYMS
- Malnutrition classified using weight Z-score:

None or mild	**> -2**
Moderate	-2 to -3
Severe	≤ -3

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)

Murphy A, White M, et al. (2015) *Clin Nutr* Brisbane

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	**Score**
Does the patient have high risk cancer	1
Is the patient currently undergoing intensive treatment	1
Does the patient have any symptoms relating to the GI tract?	2
Has the patient had poor intake over the past week?	2
Has the patient had any weight loss over the past month?	2
Does the patient show signs of undernutrition	2
$\geq$ 3 At risk of malnutrition	

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

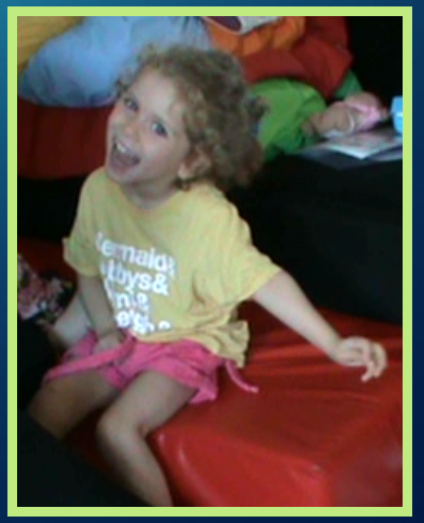
CURRENT WORK: DEVELOPMENT OF A FEEDING AND NUTRITION SCREENING TOOL FOR CHILDREN WITH CEREBRAL PALSY

Dr Kristie Bell[1,2], Dr Katherine Benfer[1], Dr Kelly Weir[3,4], Dr Robert Ware[3], Prof Peter Davies[1], Prof Roslyn Boyd[1], Prof Joan Arvedson[5]

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

QLD CP CHILD: STUDY OF GROWTH, NUTRITION AND PHYSICAL ACTIVITY (BELL 2010)

- Feeding and swallowing difficulties in children at 18 – 24months 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

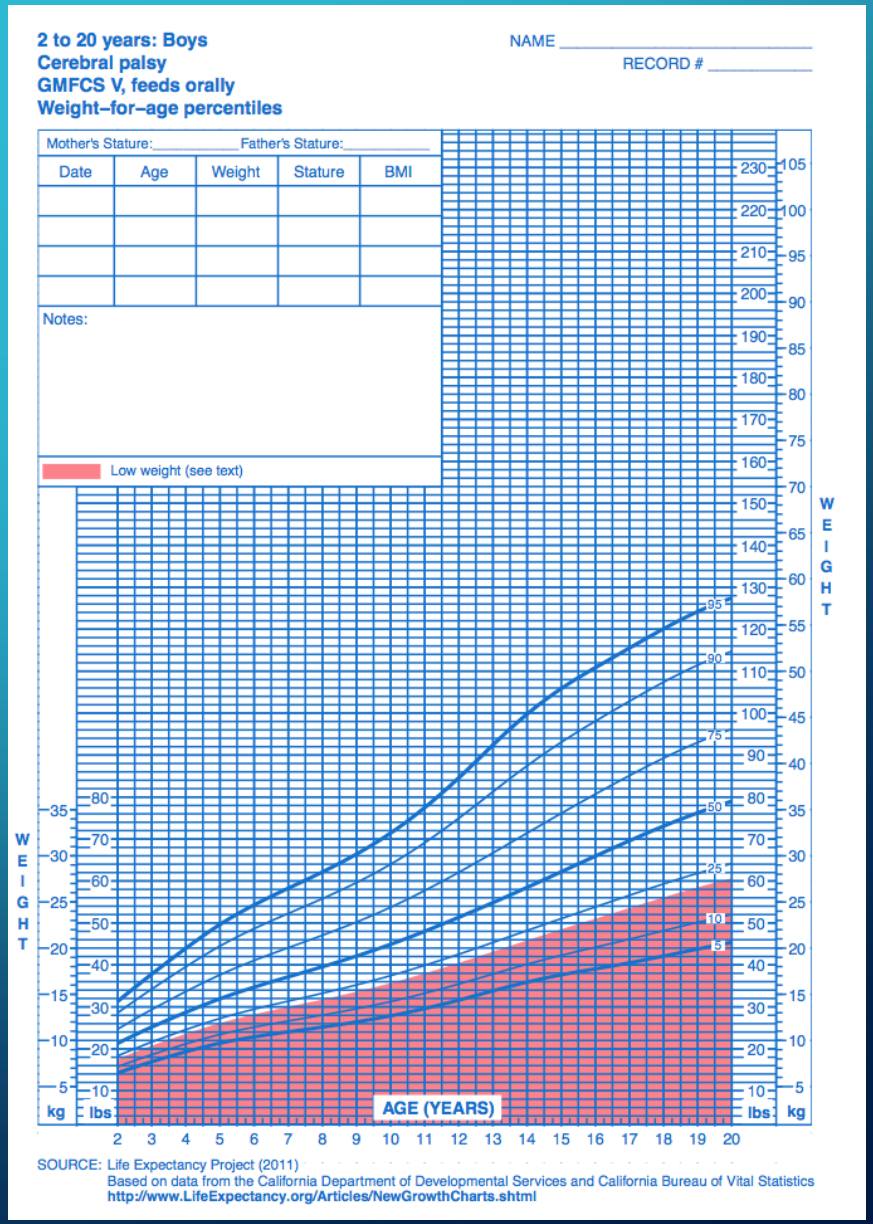
UNDERNUTRITION RELATED TO POORER HEALTH OUTCOMES

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 Nutrition1999;15;458-464

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

Malnutrition Screening Tool

Adult inpatients: Ferguson et al Nutrition1999;15;458-464

Question	Score
Have you lost weight recently without trying?	
No	0
Unsure	2
If yes, how much weight (kilograms) have you lost?	
1-5	1
6-10	2
11-15	3
>15	4
Unsure	2
Have you been eating poorly because of a decreased appetite?	
No	0
Yes	1

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
- Videofluroscopic study

Outcome

- Screening tool for feeding difficulties and under nutrition in children with CP.

PEDIATRIC SUBJECTIVE GLOBAL NUTRITION ASSESSMENT

Secker 2007, AJCN

- 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 chese, 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 (eg 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