Nutrition in children with special needs

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Factors affecting growth and nutrition in children with special – nutritional factors

- Inadequate intake primarily related to feeding dysfunction
- Food processing and swallowing problems affect 30% to 40% of children with CP
- Children with more significant motor impairments have more challenges with oral feeding and have poorer nutritional outcomes
- Increased losses - GER in children with CP is in part related to foregut motility problem and to positioning challenges, increased intra-abdominal pressure secondary to chronic constipation, spasticity, or musculoskeletal deformity.
- GER can result in oesophageal inflammation and dental erosions, and can increase the risk of aspiration
Factors affecting growth and nutrition in children with special – nutritional factors

- Energy expenditure - those who are marginally ambulant or non-ambulant have significantly lower energy expenditures. This is largely due to decreased activity levels.
- There has been considerable debate about the influence of muscle inefficiency, spasticity, and dyskinesia on the energy requirements of children with CP
- Energy requirements in children with CP may increase if their activity levels increase during intensive therapy sessions or if they have an increased respiratory rate and effort.
- Nutritional factors have a greater impact on children’s weight, whereas non-nutritional factors have a larger influence on their stature.
Effects of nutrition on various functions

- Cerebral function
- Reduced potential, Reduced responsivity and Withdrawal/irritability
- Immune function Infection (chest, UTI)
- Circulation time
- \(\downarrow\) Healing (esp. pressure sores)
- Respiratory muscle strength \(\downarrow\) Weak cough\(\uparrow\) More chest infections
- Micronutrient deficiencies \(\uparrow\) Growth failure
Undernutrition

• Undernutrition/low fat stores in NI children
• ↑ hospital admissions and doctor’s visits
• ↓ participation in school activity and family activities
• ↓ quality of life
Multiple reasons for **inadequate intake** can be present in children with CP

- **Oro-motor dysfunction**
  - Jaw instability, thrust and retraction
  - Over-bite
  - Tonic biting
  - Abnormalities of tone in lips, cheek and tongue
  - Tongue thrust
  - Poor tongue lateralisation

- **Neurological impairment**
  - Reduced mobility level
  - Abnormal muscle tone, spasm, contracture
  - Head control
  - Movement control/dystonia
  - Uncoordinated swallow

- **Developmental profile**
  - Gross and fine motor ability
  - Cognitive ability
  - Receptive and expressive language delay
  - Social communication difficulties
  - Visual impairment

- **Inappropriate seating**
  - Poor trunkal support
  - Sub-optimal head position

- **Gastrointestinal problems**
  - Gastro-oesophageal reflux
  - Delayed gastric emptying
  - Chronic constipation

- **Pain**
  - Gastro-oesophageal reflux
  - Constipation
  - Uncomfortable seating

- **Behavioural and emotional factors**
  - Fear, sensory issues, negative past feeding experiences
  - Frustration

- **Environmental factors**
  - Distracting visual/auditory stimuli
  - Limited communication opportunities

- **Parental stress**
  - Parent-child interaction
  - Family relationships

- **Poor general health**
  - Respiratory illness
  - Hospital admissions

- **Poor growth**
  - Weight
  - Height
  - Head circumference

- **Sub-optimal fat deposition**
  - Decreased triceps skinfold thickness

**Erasmus MC**
Andrew, Parr, Sullivan, ADC 2011
Etiology of feeding problems

• Oro-pharyngeal incoordination
• Slow rate of feeding, Prolonged feeding times, Spillage (>50%) Unsafe swallow
• Vomiting, Early satiety, Behavior disturbance, Food refusal
• Other problems contributing to feeding difficulties
• Visual or other sensory impairments
• Dental problems (up to 90%)
What do you assess?

- Consider oropharyngeal dysfunction in all children with disabilities even when no obvious clinical signs are present
- Assessment of comorbidity
- Assessment of eating, drinking and swallowing difficulties
- Necessary for deciding route and type of feeding
- Determine safety, efficiency and enjoyment of eating, drinking
- Observation in a normal mealtime setting - oral resistance, lack of energy and endurance to do the work of eating? Any oral-motor disabilities present?
Sometimes additional investigations needed

- e.g. Videofluoroscopy or fibroscopic endoscopy in specialized center

Oral-motor function
  - Poor lingual function
  - Delayed swallow reflex
  - Poor pharyngeal peristalsis

Swallow safety
  - Aspiration
  - Penetration

*Role of videofluoroscopy in swallowing dysfunction*

*NICE guideline, Cerebral palsy in under 25s: assessment and management, 25.1.2017*
Predictors of nutritional status: I. Growth

- Growth = sensitive indicator of whether energy needs are being met
- CP specific charts – WFA, HFA, BMI-FA
Growth charts specific to disabilities
Anthropometry

Assessment of nutritional status: anthropometry

- Weight
  - Difficult to perform
  - Methods: wheelchair scales, sitting and hoist scales
Anthropometry - height

Assessment of nutritional status:

**anthropometry**

- Height
- Alternative height measurements – segmental length
- Sliding calipers

Knee-heel length (KH)  
Tibia length (TL)

Skin fold interpretation

Skinfolds interpretation

SFT in CP
- Altered distribution
- More stored centrally
- May not reflect total body fat

Slaughter equation (1988):

% Body fat = 1.21(tsf+ssf) - 0.008(tsf+ssf)^2 - 1.7

CP specific equations (Gurka):
- Overall correction +12.2
- Additional correction for males, severe GMFCS,
- Black race, Pubertal status

Oeffinger DJ, et al DMCN 2014;56(5):475-8
Importance of skin field thickness in assessment of nutritional status

Assessment of nutritional status in CP: more than weight (and height)

- Nutritional status should not only be based on weight and height
- SFT measurements should be a routine component of NA
- Include routine measurements of knee height or tibia length to assess linear growth
- CP-specific growth charts should not be used to identify undernutrition
Red flags warning signs of undernutrition in children with special needs

- WFA z-score < -2
- TSF thickness < 10th centile for age/sex
- Mid-upper arm fat or muscle area <10th percentile
- Faltering weight and/or failure to thrive
- Physical signs of undernutrition such as decubitus, skin problems, poor peripheral circulation,
- LOE moderate, GoR strong
Bone health: aspects of nutritional care

- GMFCS IV/V at risk for low serum Vitamin D
- Need 800-1000 IU/day Vitamin D
- Rickets is infrequent, but fracture rate is high (4% annual incidence)
- BMD measurement by DXA difficult in CP: Joint contractures, Scoliosis, Hip dysplasia, Metallic implants.
Monitoring micronutrients and bone health

- Use of DXA scans to measure bone mineral density as part of nutritional assessment in NI children (LoE moderate, GoR weak)
- Assessment of micronutrient status (e.g. vitamin D, iron status, calcium, phosphorus) as part of nutritional assessment of NI children (LoE moderate, GoR strong)
Calculation of energy needs in neurologically impaired children

<table>
<thead>
<tr>
<th>Method</th>
<th>Formula</th>
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<tbody>
<tr>
<td>Krick method kcal/ per day</td>
<td>(BMR x muscle tone factor x activity factor) + growth factor</td>
</tr>
<tr>
<td>Muscle tone factor</td>
<td>0.9, if decreased, 1 if normal, 1.1 if increased</td>
</tr>
<tr>
<td>Activity factor</td>
<td>1.15 if bed ridden, 1.2 if dependent, 1.25 if crawling, 1.3 if ambulatory</td>
</tr>
<tr>
<td>Growth factor</td>
<td>5kcal/g of desired weight gain</td>
</tr>
<tr>
<td>Height based method</td>
<td>14.7 cal/cm in children without motor dysfunction</td>
</tr>
<tr>
<td></td>
<td>13.9 cal/cm in ambulatory patients with motor dysfunction</td>
</tr>
<tr>
<td></td>
<td>11.1 cal/cm in non-ambulatory patients</td>
</tr>
<tr>
<td>REE based method</td>
<td>1.1 x measured resting energy expenditure</td>
</tr>
</tbody>
</table>
Interventions to improve eating, drinking and swallowing in children with special needs.

**Interventions to improve eating, drinking and swallowing: possible steps (1)**

- Modify food and fluid texture and flavours
  - Thickeners
  - Pureeing

- Improve positioning when eating

- Optimize feeding techniques
  - Pacing
  - Spoon placement
Interventions to improve eating, drinking and swallowing in children with special needs.

**Interventions to improve eating, drinking and swallowing: possible steps (2)**

- Use of specialized feeding equipment
- Strategies for developing oral motor skills => improve function of lips, cheeks, tongue and pharynx
- Optimise mealtime environment
- Implement strategies for managing behavioural problems & communication
- Train people involved in the care of the child

NICE guideline, Cerebral palsy in under 25s: assessment and management, 25-1-2017
Bell KL J Clin Nutr 2013
Interventions with regard to route of feeding

Route of feeding

Adequate Oral Motor Skills & Low Risk of Aspiration?

- Yes: Oral Feeding
- No: Enteral Tube Feeding

Oral Feeding

- Yes: Adequate Weight Gain, or Linear Growth, or Time to Feed
- No: Enteral Tube Feeding

Enteral Tube Feeding

- Short Duration of Feeding
  - Yes: Nasogastric or Nasojejunal Tube
  - No: Gastrostomy Tube
Long term enteral nutrition

- For long term enteral nutrition support (more than three months), a gastrostomy should be considered.
- Gastrostomies are more invasive, but are more convenient and esthetically acceptable.
- The gastrostomy may be performed by open surgery, laproscopic surgery, endoscopy (percutaneous endoscopic gastrostomy) or interventional radiology.
Anti reflux procedure

- Children with symptoms of reflux who do not respond to medical therapy or with evidence of pulmonary aspiration caused by their reflux should undergo a surgical gastrostomy along with an ARP.
- There is no role for a prophylactic ARP
- The choice between a gastrostomy with or without an ARP has to be carefully evaluated because the failure rate and the incidence of major complications following ARP are high in NI children
Need for jejunal feeds

- Nasojejunal feeds should be used for short term enteral nutrition in patients with gastroesophageal reflux or gastric dysmotility
- Long-term gastrojejunal feeds should only be used in patients with reflux who are poor candidates for ARP
- Gastrojejunal tubes often migrate back into the stomach and need to be repositioned under fluoroscopic guidance
- In addition, these tubes tend to be of smaller calibre and are more likely to get obstructed
- A jejunostomy may be an option in selected cases
Enteral formulas

• Before 12 months of age, an infant formula should be used.
• In patients with high-caloric needs or with poor tolerance to increased formula volume, the formula may be concentrated and/or modular nutrients, such as glucose polymer or lipids, may be added.
• The addition of modular nutrients should be made with the help of a dietician to ensure that the final composition of the diet is adequate, and to avoid preparation errors.
• Casein hydrolysates and amino acid based formulas may be used in selected patients
Enteral formulas

• After 12 months of age, a paediatric 1kcal/mL formula is preferred.
• A 1.5 kcal/mL formula may be used with careful monitoring of hydration status.
• Fibre-containing formulas are often used to alleviate constipation.
• Adult formulas should be avoided because the calorie-to-nutrient ratio is inadequate for children. Their use may result in calcium, phosphorus and vitamin deficiency, especially in patients with low calorie needs.
• Most children will tolerate a polymeric formula, but some children may require a semi elemental or elemental formula
Feeding regimen

- Based on the child’s enteral access, activities, caloric needs and tolerance to feeds.
- In children with poor tolerance to gastric feeds, continuous feeds may be necessary.
- Continuous feeds should always be used when the child has gastrojejunal tube.
- For ambulatory children who have scheduled daily activities, bolus feeds are preferred because they allow more freedom.
- A child with high caloric needs or with poor tolerance to volume may benefit from a combination of daytime boluses and nocturnal continuous feeds.
Monitor response to nutritional intervention

- NI children are unable to communicate hunger and safety.
- Tube fed children – this may lead to overfeeding; becoming overweight is important to avoid excessive weight gain.
- These children often have a decreased lean body mass, and excess weight gain is mostly fat mass.
- In children, younger than three years of age and in children with normal activity level, weight gain for height should be in the 50th percentile.
- For older children who are wheel chair bound but able to accomplish transfers, weight for gain should be in the 25th percentile.
- For the bedridden patient, the 10th percentile may be sufficient.
Thank you