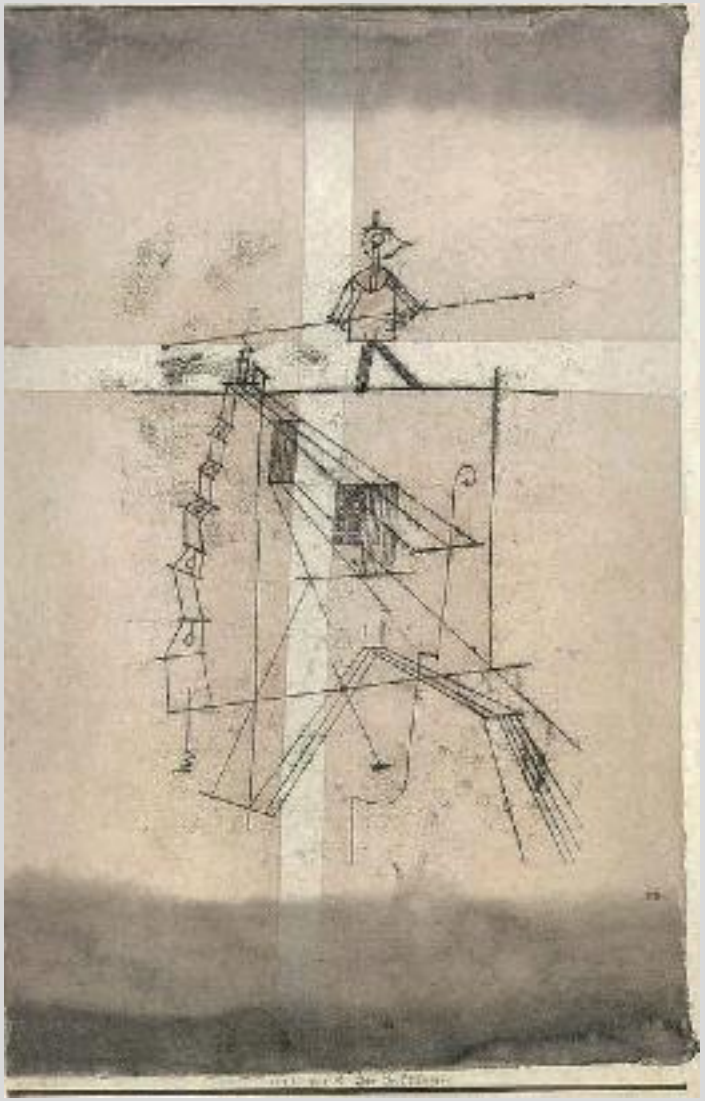


La valutazione del bambino con paralisi cerebrale infantile: problemi nutrizionali

Milano, 22 settembre 2015

Nadia Cerutti
Dietologia e Nutrizione Clinica
A.O. Fatebenefratelli e Oftalmico, Milano

Good nutrition is the cornerstone of health end well-being for all children,

whether affected by CP or not

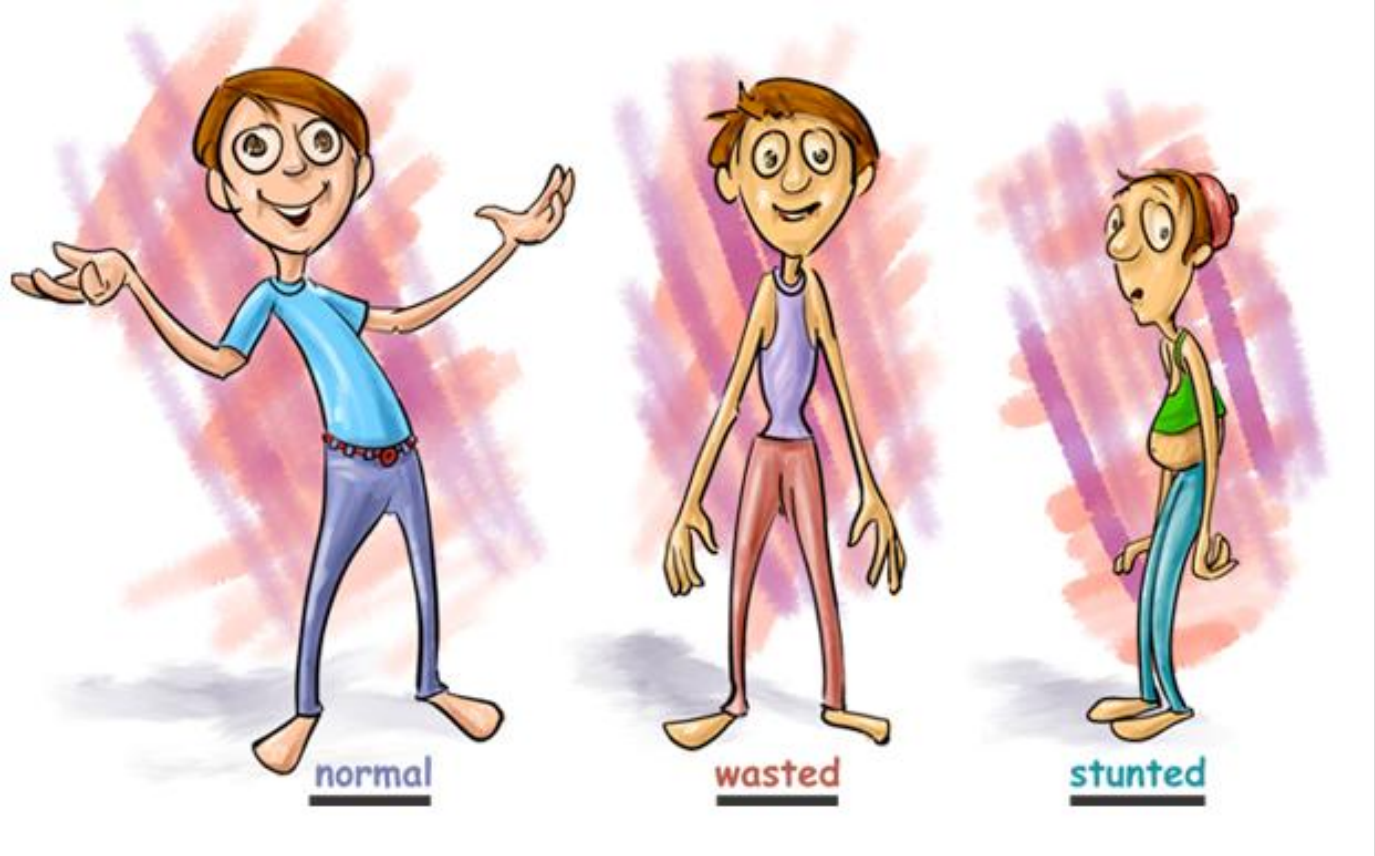
Paediatric Malnutrition

'Imbalance between nutrient requirements and intake that results in cumulative deficits of energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes'

OVER-NUTRITION

Metha NM, et al., J Pen 2013; 4 : 460-81

UNDER-NUTRITION



Stunting: It is a form of growth failure in which the height of children is shorter than average/normal for their age.

Wasting: It is a form of growth failure in which the weight of children is less than average /normal for their height.

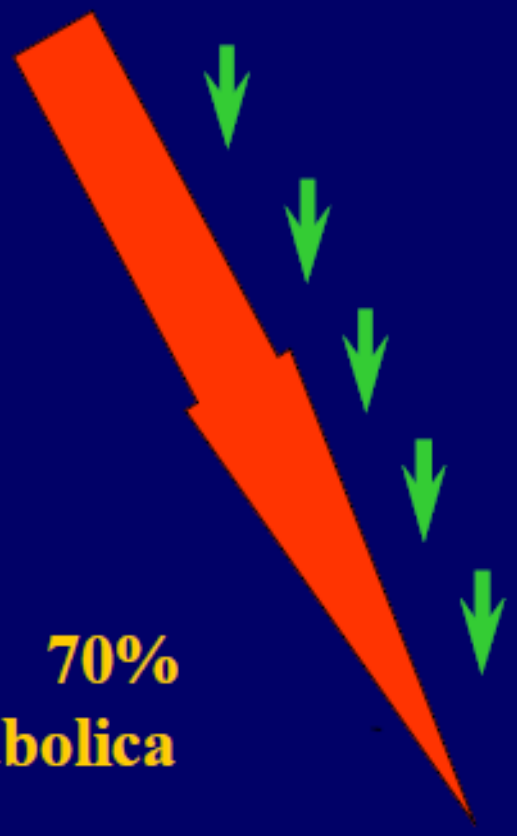
Understanding when a child' nutritional status is faltering is important because poor nutrition has serious consequences and is potentially remediable

Perdita di massa magra

Stato di salute
100%

Massa magra

70%
Morte metabolica



massa muscolare

proteine somatiche

risposta immunitaria

cicatrizzazione ferite

Risposta di adattamento

Insuff. d'organo: cuore, fegato, rene

Consequences of the micronutrient deficiencies

- **Iron: Fatigue, anemia, decreased cognitive function, headache, glossitis, and nail changes**
- **Iodine: Goiter, developmental delay, and mental retardation**
- **Vitamin D: Poor growth, rickets, and hypocalcemia**
- **Vitamin A: Night blindness, xerophthalmia, poor growth, and hair changes**
- **Folate: Glossitis, anemia (megaloblastic), and neural tube defects (in fetuses of women without folate supplementation)**
- **Zinc: Anemia, dwarfism, hepatosplenomegaly, hyperpigmentation and hypogonadism, acrodermatitis enteropathica, diminished immune response, and poor wound healing**

Physical findings that are associated with PEM in children

- Decreased subcutaneous tissue: Areas that are most affected are the legs, arms, buttocks, and face
- Edema: Areas that are most affected are the distal extremities and anasarca (generalized edema)
- Oral changes: Cheilosis, angular stomatitis, and papillar atrophy
- Abdominal findings: Abdominal distention secondary to poor abdominal musculature and hepatomegaly secondary to fatty infiltration
- Skin changes: Dry, peeling skin with raw, exposed areas; hyperpigmented plaques over areas of trauma
- Nail changes: Fissured or ridged nails
- Hair changes: Thin, sparse, brittle hair that is easily pulled out and that turns a dull brown or reddish color

Factors affecting nutrition and growth in children with CP

Children with CP who are at the greatest risk of having nutritional problems are those with

1) **Poor weight gain at young age**
2) **Significant motor impairments**
3) **Feeding and swallowing problems**

TABLE 1 Study Population

	GMFCS Level					
	I	II	III	IV	V-NT[a]	V-TF[b]
No. of assessments	14 030	31 808	13 994	24 744	11 919	5668
Male, %	61	57	55	57	54	54
Age, median (interquartile range), y	4.5 (1.7–6.8)	4.5 (2.7–6.4)	4.6 (3.2–6.5)	4.4 (2.6–6.4)	3.9 (2.2–6.3)	4.1 (2.4–6.4)
Has a feeding tube, %	1	2	5	9	0	100
Orally fed by others, %	1	2	11	33	85	0
Has severe (IQ 20–34) or profound (IQ < 20) mental retardation, %	11	22	34	50	68	84
Low birth weight (<2500 g) or preterm labor (<37 wk), %	25	28	35	31	23	22
Weight, median (interquartile range), kg	28 (16–50)	27 (19–44)	26 (18–39)	21 (15–32)	18 (13–26)	23 (16–31)

Brooks JD et al, Pediatrics 2011; 128: 299.307

Nutritional Factors

1) Inadequate intake primarily related to feeding dysfunction
2) Increased calorie losses
3) Increased calorie use

Non Nutritional Factors

1) Age
2) Genetic factors
3) Physical factors realted to child's neurologic condition
4) Endocrine factors

Nutritional Factors

1) **Inadequate intake primarily related to feeding dysfunction**
2) Increased calorie losses
3) Increased calorie use

Common feeding problems in children with CP

Oral motor/food processing problems

Cheewing and swallowing difficulties

Anorexia or vomiting due to GER and/or constipation

Position difficulties

Requiring assistance with feeding

Prolonged feeding times

Caregiver's inadequate awareness of the child's needs

Other factors that may result in inadequate energy and nutrient intake

Sensory factors

Fatigue

Prolonged mealtimes

Disturbances in the sensation of hunger and satety

Inability to communicate nutritional needs

Secondary health conditions

Dental caries and dental malocclusion

Nutritional Factors

1) Inadequate intake primarily related to feeding dysfunction
2) **Increased calorie losses**
3) Increased calorie use

From GER -emesis and regurgitation

-food refusal

Nutritional Factors

1) Inadequate intake primarily related to feeding dysfunction
2) Increased calorie losses
3) **Increased/decreased calorie use**

Intensive therapy sessions

Increased respiratory rate and effort

Fidgety movements,writhing

Spasticity

Decubitus lesions

Hypotonia

Inactivity

Aging

Stallings VA et al. Am J Clin Nutr 1996; 64: 627-34

Prevalence and severity of feeding and nutritional problems in children with neurological impairment

Oxford Feeding Study : 89 % needed help with feeding
56 % choked with food
59 % constipated
22 % vomiting
28 % prolonged feeding times (>3h)

20 % parents described feeding as stressfull
38 % considered their child to be underweight

64 % never had their nutrition assessed

Sullivan PB et al, Dev Med Child Neurol 2000; 42: 674-80

UNDER NUTRITION

IS A REMEDIABLE CONDITION

↓ MUSCLE STRENGHT

↓ IMMUNE FUNCTION

↓ WOUND HEALING

↑ Respiratory muscle

↑ Resolution of infections

↑ Best surgical outcome

Good nutrition improves general health and participation

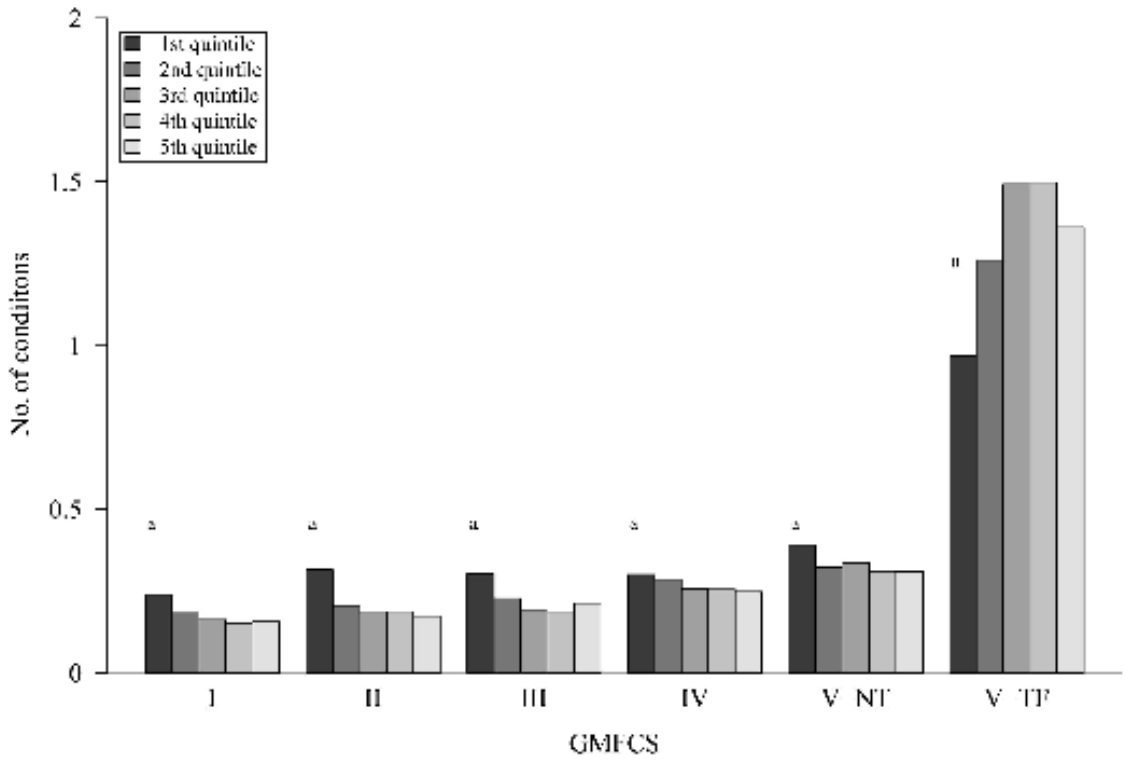


FIGURE 3
Mean number of chronic major medical conditions according to weight quintile. [a] Significant difference from the middle 3 quintiles ($P < .01$).

Brooks JD et al, Pediatrics 2011; 128: 299.307

Good nutrition improves brain growth and neurodevelopmental outcomes

Double blinded randomized study of 120% vs 100% protein/calorie intake in preterm and term infants with brain injury

“The study was terminated when the 16 subjects had completed the protocol, due to >1 SD difference in OFC at 12 months' corrected age in those receiving the higher-energy and -protein diet had been demonstrated. Axonal diameters in the corticospinal tract, length, and weight were also significantly increased”

High-Energy and Protein Diet Increases Brain and Corticospinal Tract Growth in Term and Preterm Infants After Perinatal Brain Injury
Dabydeen I., Pediatrics 2008; 121: 148-56

Good nutrition impacts bone health

Increased risk of osteopenia and osteoporosis

Inadequate intake of calcium and vitamin D

Decreased exposure to sunlight

Phenytoin, phenobarbitone, and carbamazepine can interfere with vitamin D metabolism

Increased risk of fractures

Increased fat mass and enteral nutrition

Good nutritional status improves survival

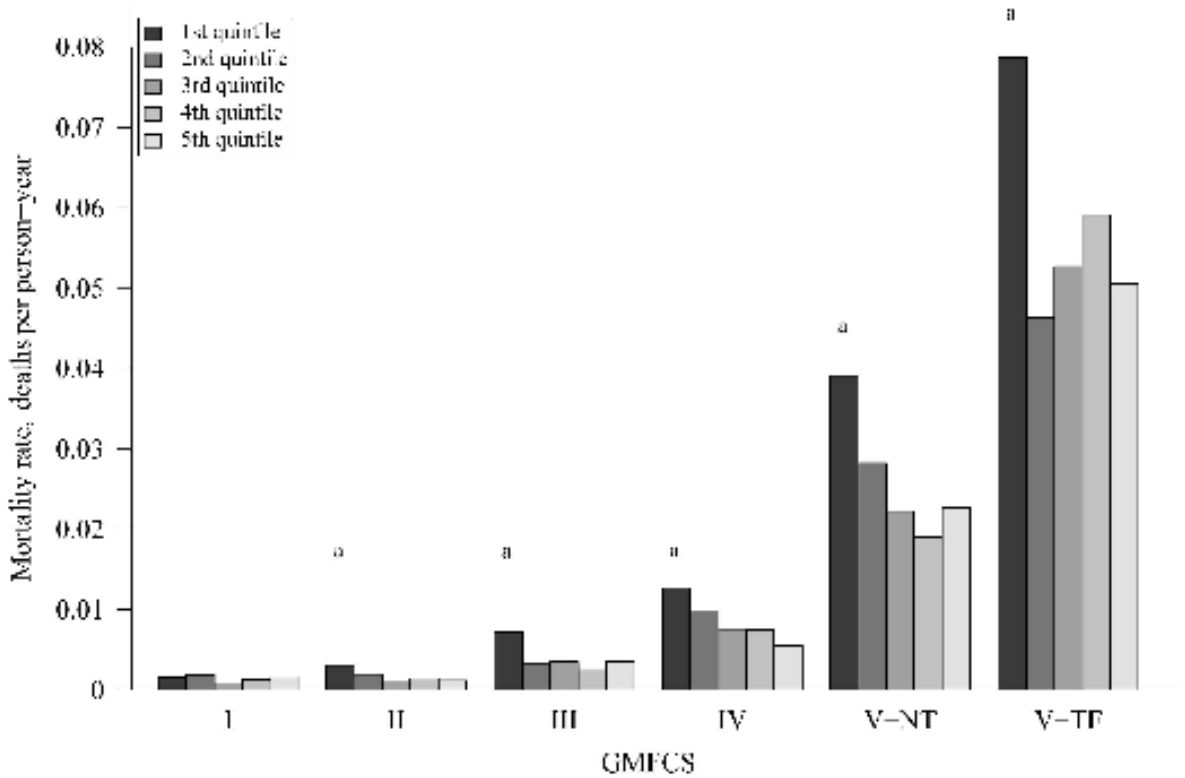


FIGURE 4
Crude mortality rates according to weight quintile. [a] Significant difference from the middle 3 quintiles ($P < .05$).

Brooks JD et al, Pediatrics 2011; 128: 299.307

Assessment of nutritional status

1) **WHO** (differences in feeding styles)
2) **WHAT** (type, texture, viscosity, quantity, quality)
3) **WHEN** (timing, frequency, duration of meals)
4) **WHERE** (environment, distractions)
5) **HOW** (feeding routine, technique, adaptive equipment, position)

Observation of a typical meal

Anthropometric measurements in children with CP

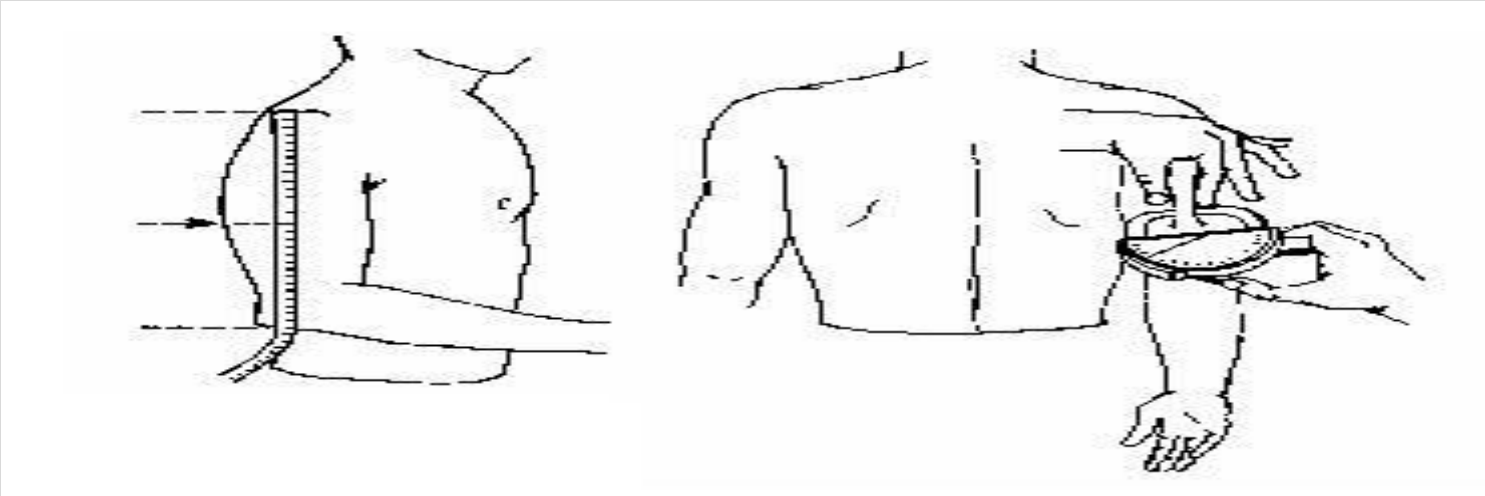
1) WEIGHT

2) HEIGHT

Segmental measurements of height in children with CP who are unable to stand

Measurement	Age	Equipment	Technique	Calculation
KH	All ages	KH calipers	With the child seated , the flat blade of the caliper is placed under the child's heel. With the knee and ankle joint at 90˚, the top blade of the caliper is positioned 2 cm behind the patella over femoral condyles. The KH (cm) is the distance between the blades of the caliper.	For children 12 y and younger Estimated height= (2.69) x KH (cm) + 24.2
TL	2-12 yr	Tape measure	The tibia is measured on the medial side. With the child sitting or supine, find and mark the joint space between the tibia and femour. Then mark the distal edge of the medial malleolus. The TL is the distance between these points in cm.	Estimated height = 3.26 x TL (cm) + 30.8

Triceps skin fold measurement

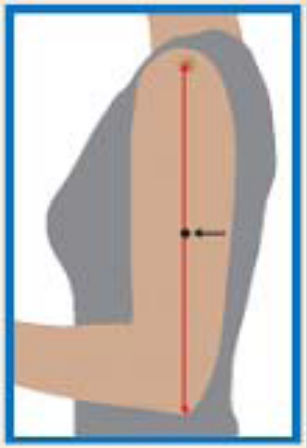


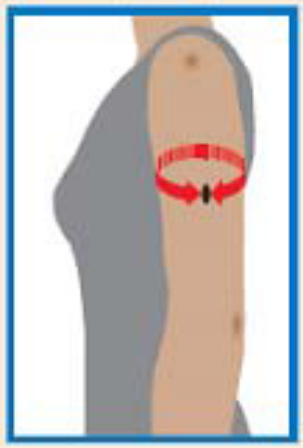
Position Statement of the Canadian Paediatric Society 2000:
-skinfold measurement is the most useful method for assessing nutritional status
-the comparison of TSF measurement with population norm is sufficient

-TSF < 10th percentile for age identify malnourished children and screen for depleted fat store in children with CP

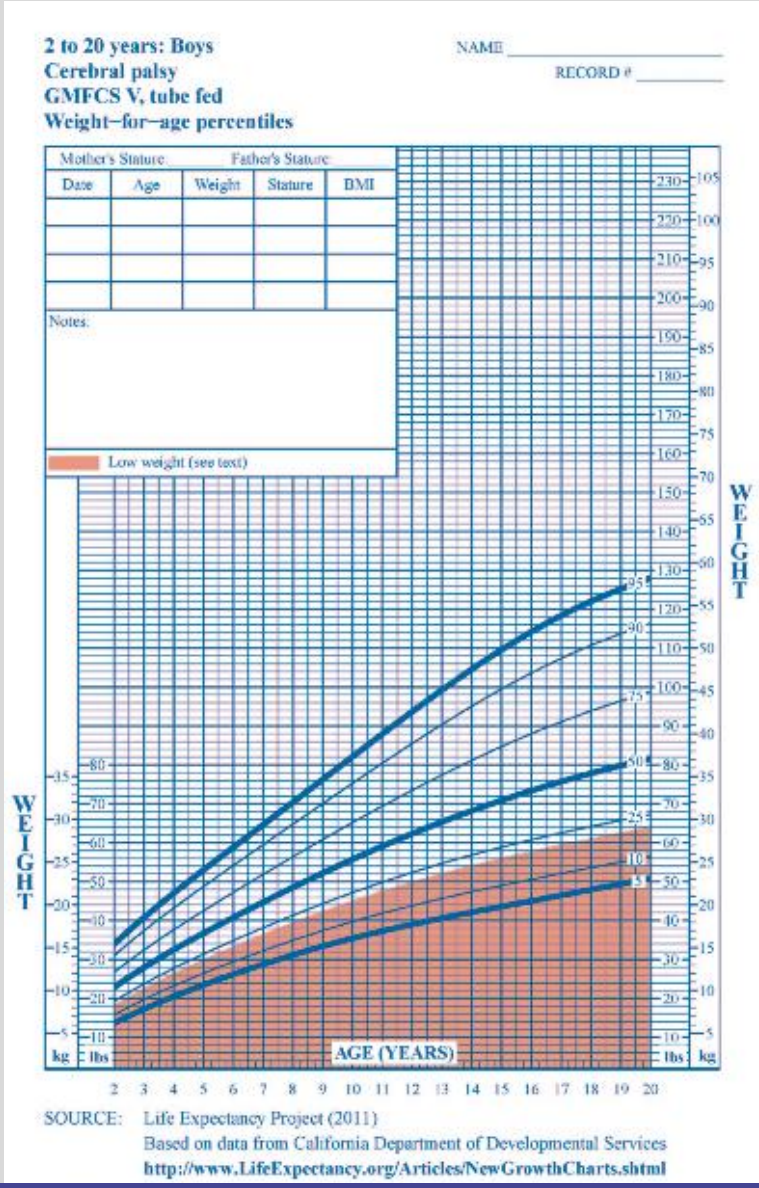
-targeting goal 10th >TSF < 25th

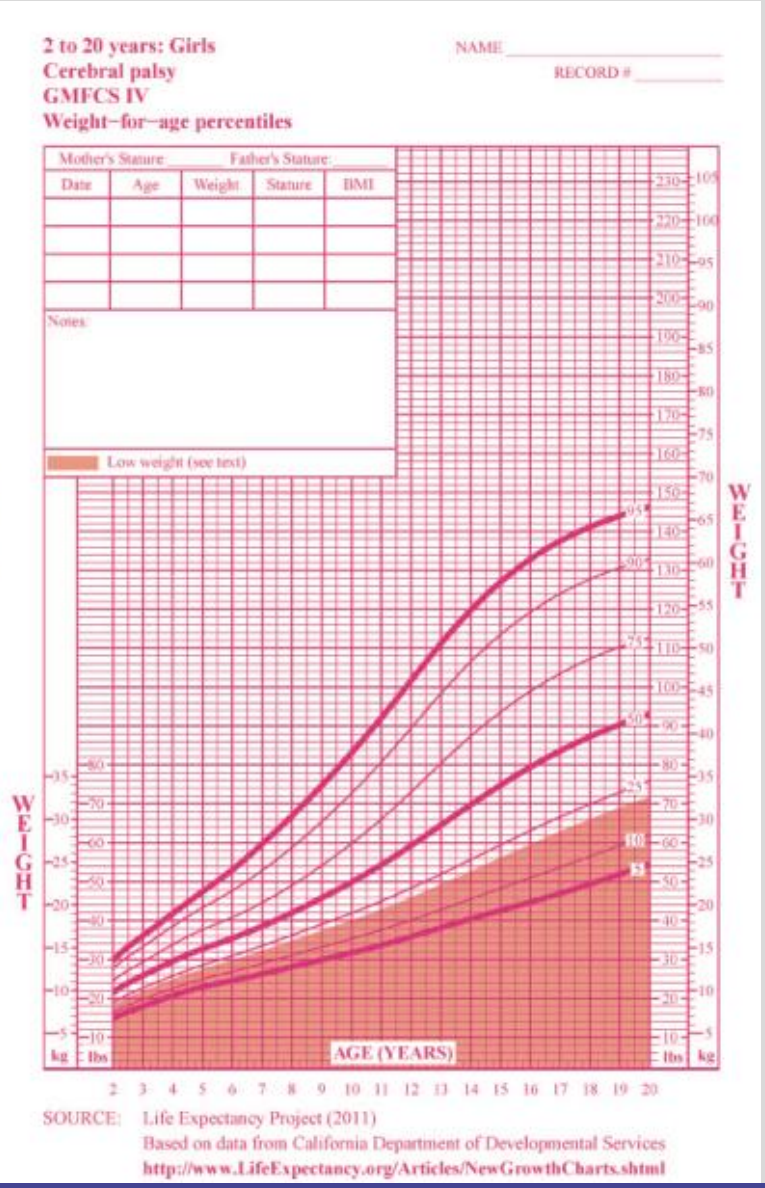
Mid Arm Circumference





SPECIFIC GROWTH CHARTS



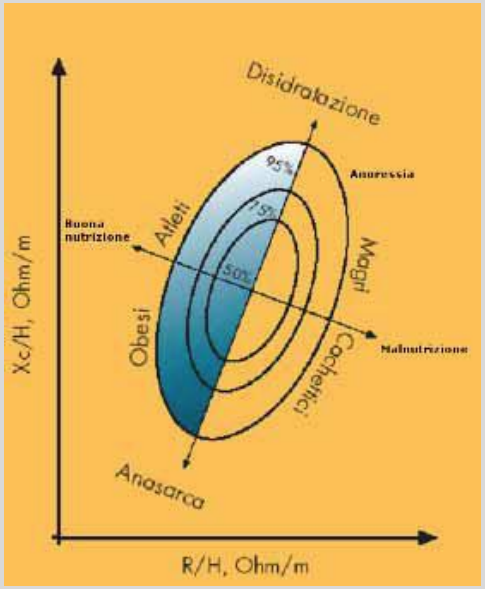


Classification

	Stunting (Chronic)	Underweight (Both)	Wasting (Acute)
Index	Height for Age (HA)	Weight for Age (WA)	Weight for Height (WH) or MUAC
Moderate	< -2 SD	< -2 SD	< -2 SD
Severe	< - 3 SD	< - 3SD	< - 3SD

BODY COMPOSITION

DEXA gold standard



BIA **Non invasive technique**

Ease of use

Goals of nutrition rehabilitation

Nutrients	Protein and micronutrients similar to requirements of age-matched peers Meet age-appropriate calcium and vitamin D requirements Starting with increasing the caloric intake by 10%
Triceps skin folds	Aim to 10°-25° percentile for age
Weight	Monitor weight at 2-4 wk intervals
Weight gain velocity	Aim for 4-7 g per day in children>1y (adjust as needed depending on degree of malnutrition)
Weight for age on CP growth charts	Aim for weight >20° percentile which is above the 'zone of concern'

Treatment when?

1) Poor weight gain
2) Depleted fat reserves
3) Faltering growth

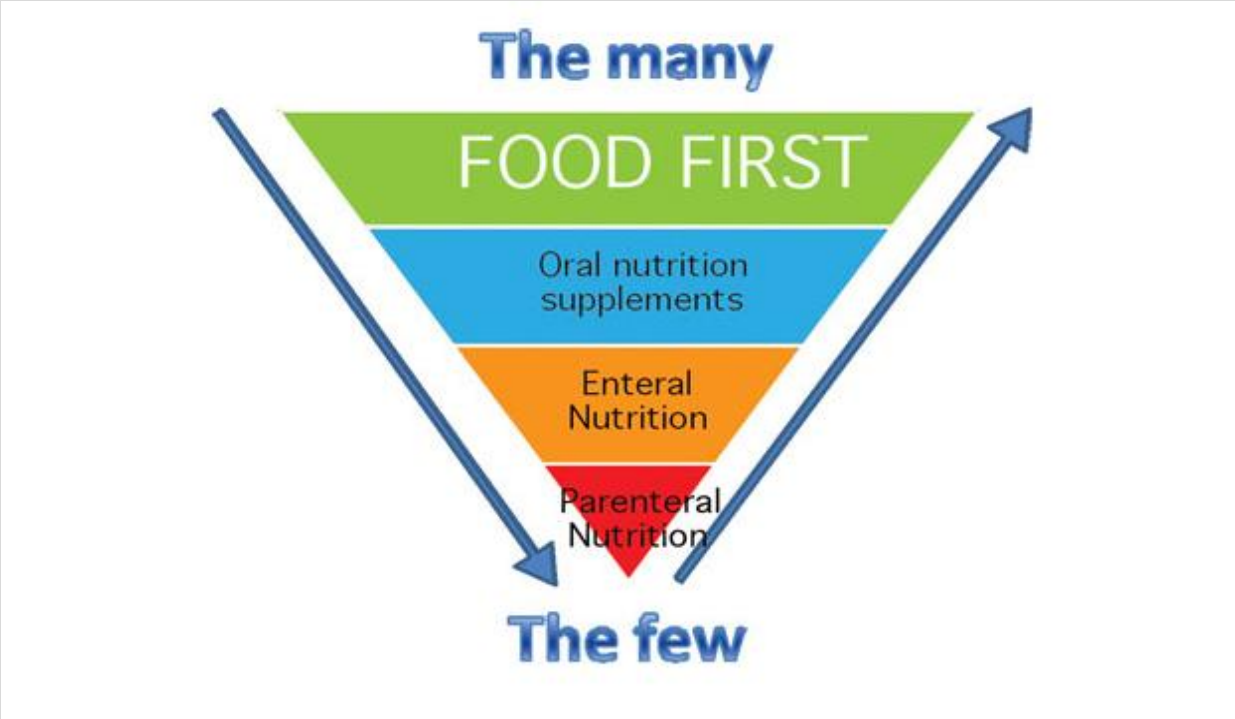
Dysphagia in children with severe generalized cerebral palsy and intellectual disability

Calis E. et al.

Developmental Medicine & Child Neurology 2008, 50: 625–630

mealtime duration. Of all 166 participating children, 1% had no dysphagia, 8% mild dysphagia, 76% moderate to severe dysphagia, and 15% pro[illegible] dysphagia (receiving nil by mouth), resulting in a prevalence of dysphagia of 99%. Dysphagia was positively [illegible] impairment, and, surprisingly, to a higher weight for height. Low frequency of parent-reported feeding problems indicated that actual severity of dysphagia tended to be underestimated by parents. Proactive identification of dysphagia is warranted in this population, and feasible using a structured mealtime observation. Children with problems in the pharyngeal and esophageal phases, apparent on the DDS, should be referred for appropriate clinical evaluation of swallowing function.

NUTRITIONAL INTERVENTION



Food Records

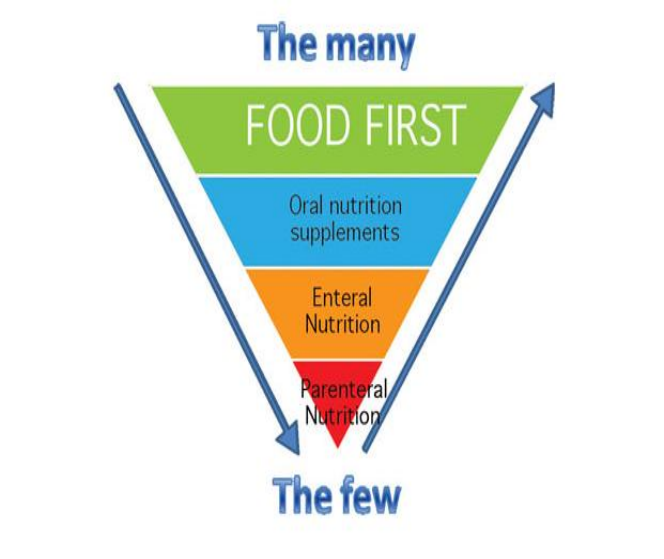
3-7 days

Parents usually overestimate the intake and underestimate the amount of food lost

Opportunities for improving the calorie and nutrient content of food listed with nutrient-dense and high energy food

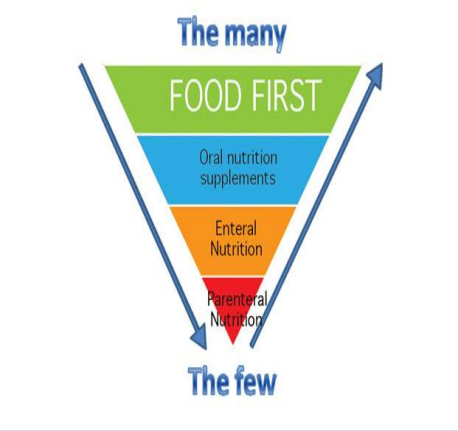
Oral nutritional supplements

VANTAGGI
-valida integrazione della dieta naturale



SVANTAGGI
-scarsa palatabilità
-anoressia e precoce sazietà spesso non ne consentono un'assunzione adeguata per un tempo sufficiente

Enteral nutrition



When?

Aspiration during feeding is interfering with pleasure of eating or is contributing to recurrent respiratory illnesses

Poor weight gain and growth despite attempts at oral nutritional rehabilitation

Prolonged meal (> 3 h/day) and are limiting the children participation

Stress with the oral feeding process in child and family

How?

SND o SNG for short time nutrition

PEG or PEJ for long time nutrition (>3 m)

Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients A.S.P.E.N. 2009

Sede di somministrazione

NUTRIZIONE PREPILORICA
(gastrica)
-migliore digestione
-migliore protezione da contaminazioni batteriche

NUTRIZIONE POSTPILORICA
(digiunale)
-minore rischio di aspirazione

Vie di accesso: SNG

Come: Morbidi, di piccolo calibro, di materiale biocompatibile (poliuretano, silicone)

Quando: NE di durata < 30 gg

VANTAGGI
-facile posizionamento
-basso costo

SVANTAGGI
-discomfort
-facile dislocamento
-rischio inalazione da reflusso

Vie di accesso: SND

Quando: in caso di ritardato svuotamento gastrico

Sonde posizionate sotto guida endoscopica o per autoposizionamento che sfrutta la peristalsi

VANTAGGI
-facile posizionamento
-basso costo

SVANTAGGI
-discomfort
-facile dislocamento

Vie di accesso: PEG

Gastrostomia endoscopica percutanea
Quando: NE di durata > 30 gg (npl capo-collo, traumi facciali, disfagie neurologiche

VANTAGGI
-accesso diretto nella cavità gastrica
-maggior comfort
-utilizzabile si per NE sia per decompressione
-non richiede sala operatoria né anestesia generale

SVANTAGGI
-controindicata in caso di ascite importante, stenosi esofagee, ulcera gastroduodenale in atto,

Vie di accesso: PEJ e digiunostomia chirurgica

Introduzione di sonda a livello della prima o seconda ansa digiunale dopo il Treitz
Quando: gastrostomia non effettuabile, inaccessibilità gastrica

VANTAGGI
-minor rischio di aspirazione e RGE

SVANTAGGI
-ridotto calibro delle sonde (< 7Fr) infusione lenta

NE continua

- Infusione continua mediante nutripompa o per caduta
- VANTAGGI: riduce le manipolazioni delle miscele nutritive, allungando il tempo di assorbimento migliora la capacità intestinale,
- SVANTAGGI: riduce l'autonomia del paziente che spesso tende all'immobilità

In pazienti stabili, con un intestino che tollera i flussi veloci è possibile concentrare la somministrazione nelle 8-10 h notturne

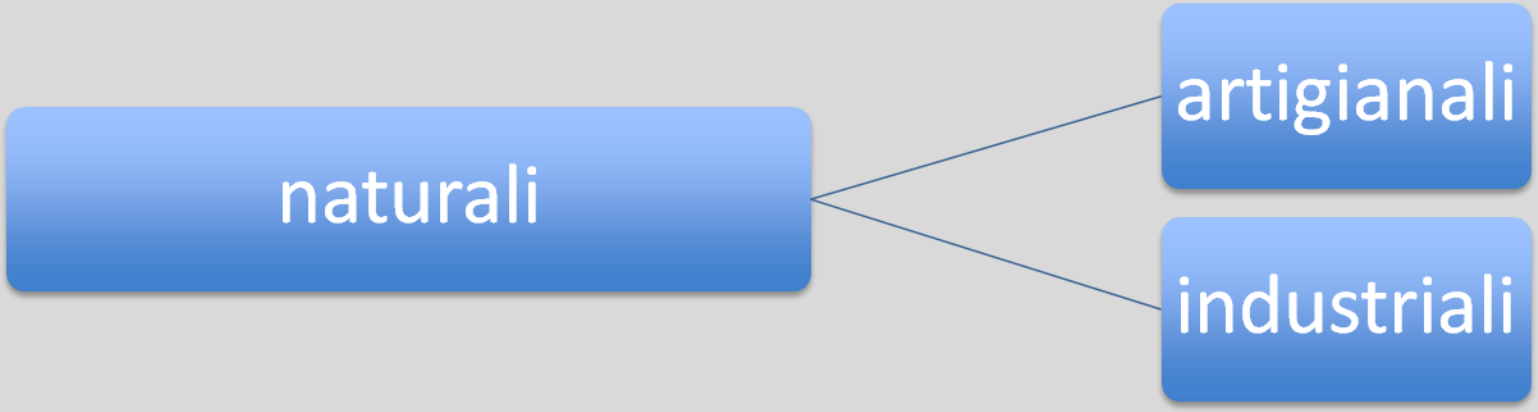
NE intermittente

Somministrare boli unici (100-400 ml) mediante siringa ogni 4-6 ore

Dopo ogni infusione lavare il sondino con 30 ml di acqua

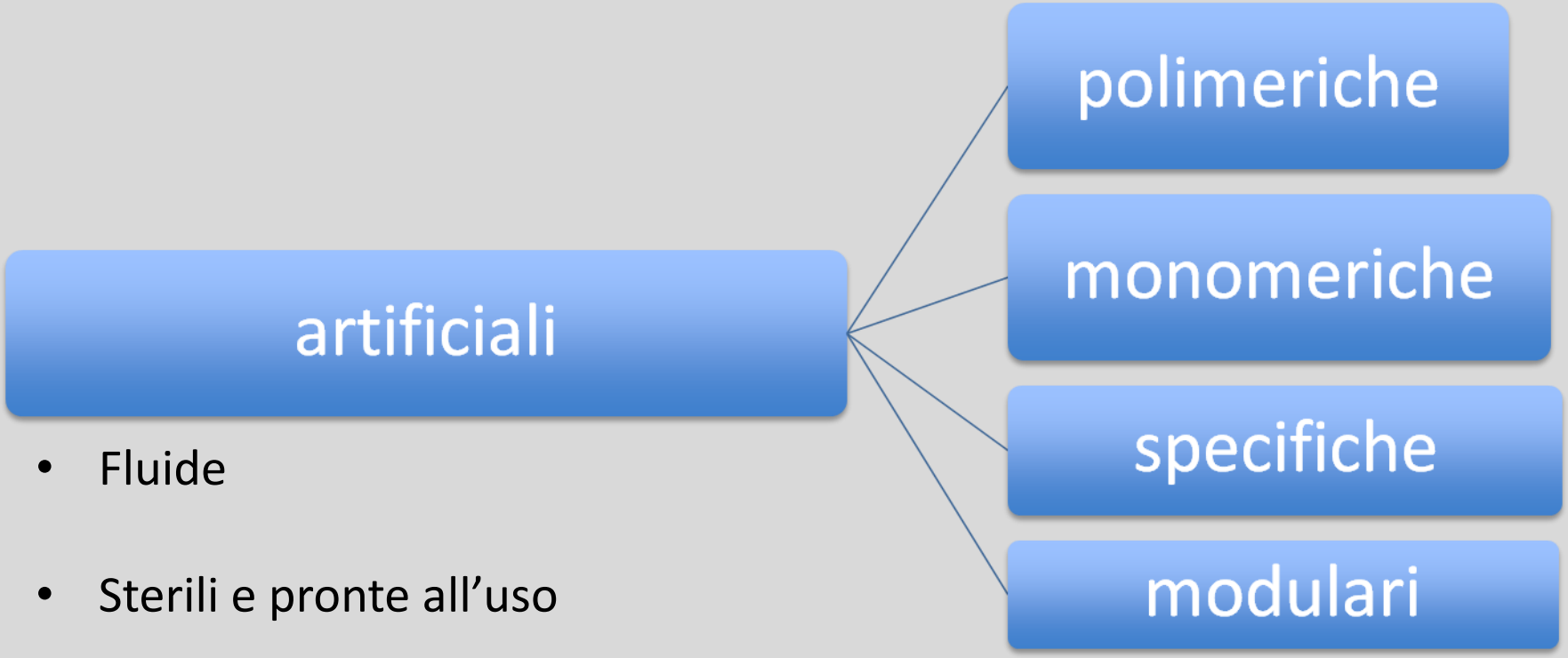
- VANTAGGI: non serve la nutripompa
- SVANTAGGI: maggior rischio di aspirazione nelle vie aeree, maggior rischio di tensione addominale, nausea, vomito, diarrea, maggior rischio di ostruzione della sonda
- **Non va mai attuata nella nutrizione postpilorica**

Miscele nutrizionali



- Scarsa omogeneità e fluidità ➔ ostruzione della sonda
- Contaminazione batterica durante la preparazione
- Ossidazione
- Alterazione enzimatica dei componenti per la lisi delle cellule degli alimenti freschi
- Composizione organolettica non precisabile e incompleta

Miscele nutrizionali



- Fluide
- Sterili e pronte all'uso
- Prive di lattosio e a basso contenuto di sodio e colesterolo
- Sono isosmolari e contengono fibre naturali non digeribili
- Composizione organolettica nota e equilibrata

Composizione bromatologica

Normocaloriche
1 Kcal/ml

Ipocaloriche
0,5-0,75 Kcal/ml

Ipercaloriche
>1,2 Kcal/ml

Iperproteiche
20-25% delle Kcal tot

alto residuo
fibre insolubili

basso residuo
fibre solubili

Factors facilitating decision making regarding GT placement for families

Providing information without exerting pressure

Reassuring parents that some oral feeding can be continue after GT placemet

Education about the GT simply as a adaptive device for facilitating feeding

And after GT placement

High satisfaction rates with enetral feeding

Decreased stress

Decreased time spent feeding

Improved perception of their child's health

Improvement in nutritional indicators

Improved health

Decreased hospitalization rates for pneumonia

Sullivan PS et al, Dev Med Child Neurol 2005; 47: 77-85
Mahant S et al, Arch Dis Child 2009; 94 : 668-73
Sullivan PS et al, Arch Dis Child 2006; 91: 478-82

Journal of Pediatric Gastroenterology and Nutrition
43:123–135 © July 2006 Lippincott Williams & Wilkins, Philadelphia

Medical Position Paper

Nutrition Support for Neurologically Impaired Children: A Clinical Report of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition

*Valerie Marchand, †Kathleen J. Motil, and the NASPGHAN Committee on Nutrition

CONCLUSION

A multidisciplinary team of pediatric specialists, including physicians, nurses, dietitians, occupational and speech therapists, psychologists, and social workers, has the responsibility to monitor the nutritional status of neurologically impaired children and provide early, efficient nutritional intervention to ensure normal growth, optimal functional status, and quality of life. The decision to initiate enteral nutrition may be difficult for the family who perceive this approach as a failure on their part to feed their child. Involvement of the child and the family in the decision-making process is important to ensure successful nutritional intervention. Weight gain, ease of feeding the child, and the stress involved with meals usually improve with nutritional intervention. The multidisciplinary team is obligated to provide ongoing support and education to the family

Grazie!