Nutritional status and body composition of Flemish children with cerebral palsy

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Onderzoekssymposium Wetenschappelijk onderbouwde zorg voor kinderen met cerebrale parese
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Overview

- Introduction
- Nutrition and cerebral palsy (CP)
- The ESPGHAN guidelines have arrived !
- Nutritional status of children with CP in Flanders
- Conclusion

Definition

- Cerebral palsy is a group of clinical syndromes that range in severity and are characterized by:
  - Abnormal muscle tone
  - Abnormal posture
  - Abnormal movement
- Due to a variety of causes, but acquired early in life
- Static, but clinical expression may change over time as the brain matures

 Blair E, Watson L Epidemiology of cerebral palsy. Seminars in Fetal and Neonatal Medicine 2006;11(2):117-25.

CP is here to stay...

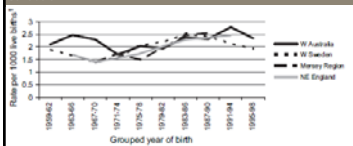


Figure 1 Trends in cerebral palsy I

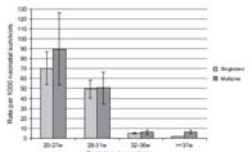


Figure 3 Cerebral palsy rates by length of gestation and plurality of birth, Western Australia, 1980–1998.

 Blair E, Watson L Epidemiology of cerebral palsy. Seminars in Fetal and Neonatal Medicine 2006;11(2):117-25.

Classification

- Spastic syndromes
  - Diplegia, hemiplegia or quadriplegia
  - Increased tone
  - Signs of upper motor neuron syndrome
  - Contractures of affected muscles
- Dyskinetic syndromes
  - Involuntary movements
  - Contractures not common
- Ataxic syndromes
  - Hypotonia & incoordination
  - Ataxic movements

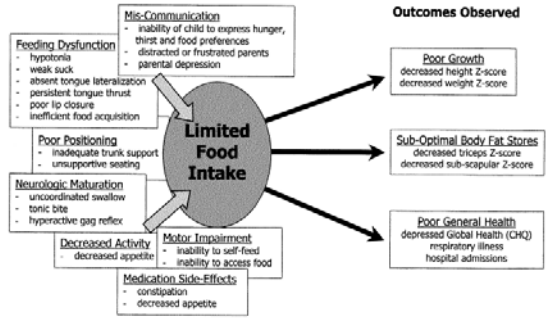
 Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. Surveillance of Cerebral Palsy in Europe (SCPE). Dev Med Child Neurol 2000;42(12):816-24.

Classification

- Gross Motor Function Classification System (GMFCS)
  - Level I – walks without limitations
  - Level II – walks with limitations
  - Level III – walks using hand-held mobility device
  - Level IV – self-mobility with limitations, may use powered mobility
  - Level V – transported in manual wheelchair
- Modified Ashworth Scale
  - Assessment of muscle tone

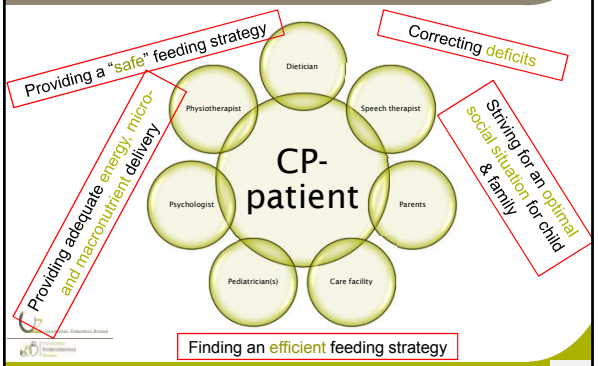
 Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. Surveillance of Cerebral Palsy in Europe (SCPE). Dev Med Child Neurol 2000;42(12):816-24.

CP patients are at increased nutritional risk



Fung EB, Samson-Fang L, Stallings VA, et al. Feeding Dysfunction is Associated with Poor Growth and Health Status in Children with Cerebral Palsy. Journal of the American Dietetic Association 2002;102(3):361-73.

Multidisciplinary approach



Arvedson JC Feeding children with cerebral palsy and swallowing difficulties. Eur J Clin Nutr 2013;67 Suppl 2:S9-12.

Importance of good nutrition

- Poor nutritional status in CP children is associated with:
  - Increased health care utilization
  - Limitation in social activities for both the child and the parents
  - Stunting
  - Decreased motor function
  - Poor healing from infections and decubitus ulcers
  - Increased severity of gastro-esophageal reflux
  - Diminished bone health

American Academy of Pediatrics. Pediatric Nutrition Handbook, 6th edition. Chapter 36: Nutritional support for children with developmental disabilities

ESPGHAN guidelines

ESPGHAN WG recommends that the assessment of nutritional status in children with NI **should not** be based **solely** on weight and height measurements

ESPGHAN WG recommends that measurements of knee height or tibial length in children with NI **should be performed routinely** to assess linear growth, when height cannot be measured

ESPGHAN WG recommends that measurement of fat mass by skin fold thickness **should be a routine** component of the nutritional assessment in children with NI

Romano C, van Wynckel M, Hulst J, et al. ESPGHAN Guidelines for the Evaluation and Treatment of Gastrointestinal and Nutritional Complications in Children With Neurological Impairment. JPGN 2017;65(2):242-264

ESPGHAN guidelines

ESPGHAN WG suggests that the **identification** of children with NI as **undernourished** should be based on the interpretation of anthropometric data

ESPGHAN WG does **not recommend** the use of CP-specific growth charts to identify undernutrition

ESPGHAN WG suggests the use of **1 or more of the following red flag warning signs** for the **identification of undernutrition** in children with NI:

1. Physical signs of undernutrition such as decubitus skin problems and poor peripheral circulation
2. Weight for age z score < -2 SD
3. Triceps skinfold thickness <10th centile for age and sex
4. Mid-upper arm fat or muscle area <10th centile
5. Faltering weight and/or failure to thrive

Study aims

1. To evaluate the **nutritional status** of Flemish children with CP using different anthropometric indicators
2. To identify **nutritional risk factors** in a cohort of Flemish children with CP
3. To assess how many CP children had **nutritional red flags** according to recent ESPGHAN guidelines and if these red flags improved at follow up

Participant recruitment

Patient recruitment:

- Children with CP attending 9 specialized centres in Flanders:
  Kwatrecht, Gentbrugge, Diepenbeek, Antwerpen, Brugge, Huldenberg, Brasschaat, Gits and Viezenbeek
- Children with CP presenting at consultation in UZ Leuven

Inclusion criteria
- Confirmed diagnosis of CP
- Attending one of the participating centres
- Age 2-20 years old at moment of first measurements

Exclusion criteria
- No informed consent
- Impossibility to acquire weight measurments

Study methods

- ✓ Anthropometric measurements at baseline (t_1), 6 months (t_2) and 12 months (t_3)
- ✓ Supplementary questionnaire on medical background, medication use and nutritional history completed by primary caregiver (t_1)

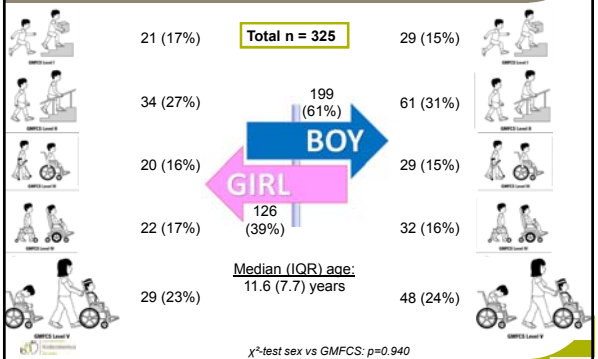
WFA: z-scores based on Flemish growth charts

MUAC: z-scores based on Flemish growth charts

TSF: z-scores based on US reference data (NHANES)
SScSF: z-scores based on US reference data (NHANES)
Fat%: using the Slaughter and Gurka fomula's

Slaughter MH et al. Skinfold equations for estimation of body fatness in children and youth. *Human biology*. 1988;60(5):709-723; Gurka MJ et al. Assessment and correction of skinfold thickness equations in estimating body fat in children with cerebral palsy. *Dev medicine neurol*. 2010;52(2):e35-41

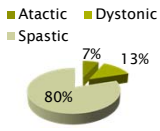
Description of study population



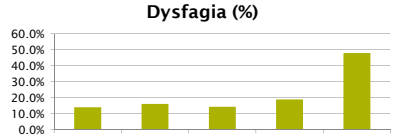
χ^2-test sex vs GMFCS: p=0.940

Clinical characteristics

CP type

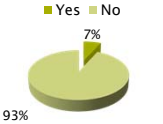


Dysfagia (%)

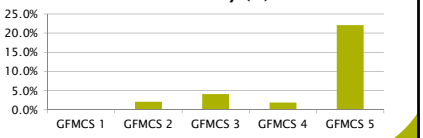


χ^2-test dysfagia vs GMFCS: p<0.001

Gastrostomy



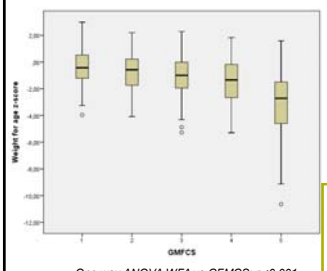
Gastrostomy (%)



χ^2-test gastrostomy vs GMFCS: p<0.001

Nutritional status CP patients
Weight for age

N = 325



One way ANOVA WFA vs GFMCS: p<0.001

WFA < -2 SD
- GMFCS 1: 6 (12%)
- GMFCS 2: 19 (20%)
- GMFCS 3: 12 (25%)
- GMFCS 4: 17 (32%)
- GMFCS 5: 55 (71%)

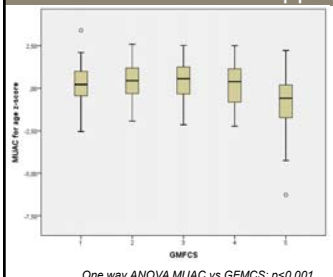
χ^2 test WFA<-2 SD vs GFMCS: p<0.001

Risk factors (OR; 95% CI)
- Anti-epileptic drugs: 1.88 (1.1-3.1)*
- Dysfagia: 4.10 (2.4-7.0)*
- Female Sex: 0.61 (0.4-1.0)
- Gastrostomy: 4.76 (1.9-12.1)*
- Spastic/dyskinetic: 1.8 (0.6-5.0)
- GFMCS>3: 5.18 (3.2-8.5)*

*p≤0.01

Nutritional status CP patients
Mid-upper arm circumference

N = 325



One way ANOVA MUAC vs GFMCS: p<0.001

MUAC < -2 SD
- GMFCS 1: 1 (2%)
- GMFCS 2: 0 (0%)
- GMFCS 3: 2 (4%)
- GMFCS 4: 2 (4%)
- GMFCS 5: 13 (17%)

χ^2 test MUAC<-2 SD vs GFMCS: p<0.001

Risk factors (OR; 95% CI)
- Anti-epileptic drugs: 1.31 (0.5-3.6)
- Dysfagia: 6.85 (2.4-19.2)*
- Female Sex: 0.43 (0.1-1.3)
- Gastrostomy: 6.56 (2.1-20.5)*
- Spastic/dyskinetic: 0.59 (0.1-2.8)
- GFMCS>3: 8.23 (2.3-29.0)*

*p≤0.01

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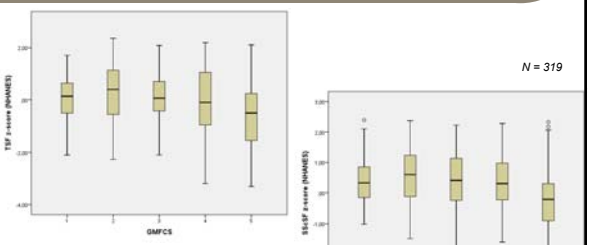
ESPGHAN guidelines
Flemish situation
Conclusion

Nutritional status CP patients
Skin fold measurements



N = 319

One way ANOVA TSF vs GFMCS: p<0.001

N = 320

One way ANOVA SScSF vs GFMCS: p<0.001

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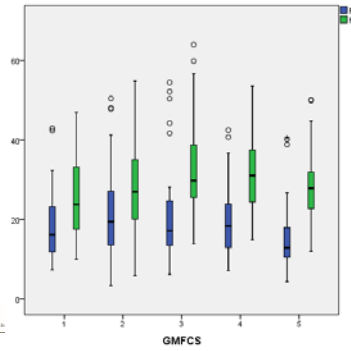
Skin fold measurements

N = 310



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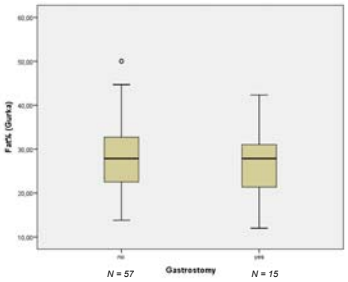
Skin fold measurements

Body fatness in GFMCS 5 children with and without gastrostomy

N = 72



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Nutritional status CP patients
ESPGHAN warning signs (t_1)

N = 189

TSF < 10th centile

AMA < 10th centile

104

17

0

7

8

13

24

16

WFA < -2 SD

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Nutritional status CP patients
ESPGHAN warning signs (t_2)

N = 185

TSF < 10th centile

AMA < 10th centile

62.5% children with red flag at t_1 lost weight at t_2

0

0

0

1

8

4

10

1

24

1

17

WFA < -2 SD

105

3

≥0,5 SD decrease in WFA
<0,5 SD decrease in WFA

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Nutritional status CP patients
ESPGHAN warning signs (t_3)

N = 181

TSF < 10th centile

AMA < 10th centile

53.2% children with red flag at t_2 lost weight at t_3

0

0

0

1

9

2

8

2

23

0

13

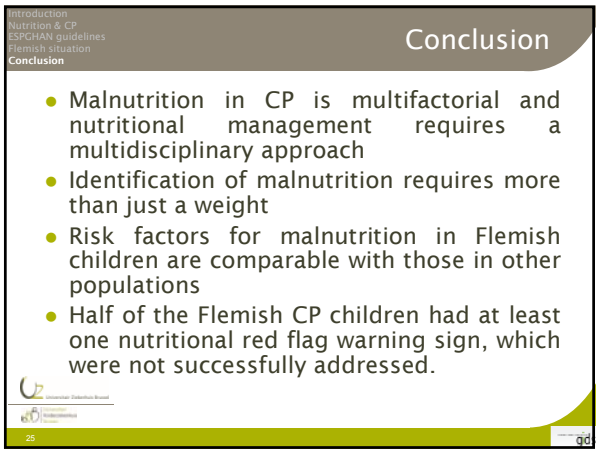
WFA < -2 SD

104

3

≥0,5 SD decrease in WFA
<0,5 SD decrease in WFA

24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Conclusion
Malnutrition in CP is multifactorial and nutritional management requires a multidisciplinary approach
Identification of malnutrition requires more than just a weight
Risk factors for malnutrition in Flemish children are comparable with those in other populations
Half of the Flemish CP children had at least one nutritional red flag warning sign, which were not successfully addressed.
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