Growth, Nutrition & Health in Young Children with Cerebral Palsy

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Comments from Parents about Nutrition in CP

- “I didn’t know that there are no growth curves for infants with CP under the age of 2 or that there are special curves for CP.”
- “It bothers me when people tell me that my baby needs to put on weight because of prematurity or BPD but I know that this is different for children with CP. Could providers work together on this?”
- “Don’t tell me to put a heart attack waiting to happen on my child’s food (gravy, butter, oil, whipped cream). This is not a good lifetime choice.”

Objectives

- Review methods for monitoring growth in children with CP
- Review growth and nutrition status among children with CP
- Discuss the relationship between growth, nutrition and health outcomes
- Discuss ideas for implementation of best practice regarding identification of malnutrition in children with CP

Growth in Children

The measurement of physical growth of children and the comparison of obtained values to reference data are fundamental aspects of health surveillance in children

Pediatrics 109: 45-60, 2002

WHO Growth Charts: BMI, Girls Birth to 5 years

http://www.who.int/childgrowth/en/

CDC versus WHO Charts

- Single country (USA)
- Descriptive charts
- Cross-sectional design
- 5 surveys 1963-1994
- 50% ever breast-fed, 29% past 3m

- Multiple countries
- Prescriptive standard
- Mixed longitudinal and cross-sectional
- Study 1997–2003
- All breast fed at least 3m, many past 12m
How do children with CP look on typical growth charts?

- Growth in CP is different
- The essential question is whether this growth is unhealthy and modifiable?

Clinical growth charts for children with cerebral palsy.

How do you measure this child?
North American Growth in CP Project

Knee Height Measurement


Tibial Length Measurement

Tibial Length NAGCPP Chart

Linear Growth Curves: Boys

Triceps Skinfold Measurement

- Direct measure of “fatness”
- Highly reliable
- Requires some training
- Requires caliper
Mid-Upper Arm Circumference

- Reliable
- Measure of lean and fat mass
- Requires some training
- Requires tape measure (cheap)

Anthropometrics vs. DXA

- 58 children with CP (GMFCS III-V)
- 8-18 years
- Height (knee height)
- DXA, BMI, MUAC, TSF, MUAFA z scores
- Reference group (29%) and CP (30%) group similar body fat by DXA
- BMI and MUAC showed low to moderate correlation with DXA
- BMI and MUAC did not correlate in TDC either
- TSF and MUAFA correlated with % body fat

Kapetanovic et al. Dev Med Child Neurol. 2010;52:824-830

What about growth in CP?

Summary of Growth in CP

- Children w/ CP are shorter, lighter, thinner
- Nutritional factors play a role in growth
- Non-nutritional factors (severity-dependent)
- Growth falls further from the norm with age, independent of nutritional factors
- Some children w/ CP are GH deficient
- Children with CP grow more slowly than healthy children


Queensland Preschool Growth in CP Study: Methods

- Longitudinal population-based cohort
- 364 assessments in 161 children
- GMFCS: I-48%; II-11%; III-15%; IV-11%; V-15%
- Measured weight gain and growth
- FFM and % Body Fat by deuterium dilution or bioelectric impedance (BIA)
- Measured energy intake & physical activity

Queensland Preschool Growth in CP Project: Results

- Malnutrition not prevalent in this cohort
- Excess body fat and below average FFM at all GMFCS levels compared to TD peers; evident at early age
- Birth weight was a strong predictor of weight status (WZ), more so than GA
- But WZ and BMI were similar
- BMI poor job in identifying excess body fat

Queensland Preschool Growth in CP Project: Conclusions

- Preschool children with CP have altered body composition (excess body fat and lower FFM) across the spectrum of functional capacity
- BW strong predictor of weight status
- All children had managed nutrition (excellent public health services)


Is good growth equal to good health?

- How “good” does growth have to be for good health? Does it have to be “normal”? 
- Can we change both growth and health?

Mid-upper Arm Fat Area, Health Care Utilization and Participation

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<th>Mean</th>
<th>Est</th>
<th>CI</th>
<th>P-value</th>
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<tr>
<td>Hospital Days</td>
<td>0.13</td>
<td>1.92</td>
<td>0.97, 3.85</td>
<td>0.06</td>
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<td>Doctor visits</td>
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<td>1.25</td>
<td>1.11, 1.59</td>
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<td>1.35</td>
<td>0.94, 2.78</td>
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<td>Days unable to do usual activities</td>
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<td>1.37</td>
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<td>Days family unable to do usual activities</td>
<td>0.61</td>
<td>1.47</td>
<td>1.16, 2.00</td>
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Conclusions: Growth & Health in CP

- Anthropometric clusters correlated with measures of health care utilization and social participation of child and family
- Bigger children with cerebral palsy had better health and social participation than similar smaller children


Cluster Means and Standard Errors

- California CP Charts
- Reference data stratified by severity
- Children with CP will be small adults

What’s a Clinician to Do?

What measurements?
- Weight
- Head circumference
- Length or height if possible
- If length or height not possible, then segmental length with conversion to estimate of stature
- Triceps (and subscapular) skinfold
- Beware of BMI

What growth charts?
- World Health Organization for children birth to 5 years
- CDC growth charts okay
- “California” CP Growth Charts for 2 to 20 years
- Consider segmental charts, but need more research
- Skinfold charts

How should they grow?
- Children with CP should grow steadily in length/height and weight throughout childhood and adolescence
- Should follow expectations for length or height and progress through puberty
- Weight gain should be not too much and not too little...but “just right”
- Skinfolds should be “adequate” for health and not too “fat”

Implementation & Decision-making
- Monitor linear growth and weight gain on WHO/CDC charts looking for trajectory
- Sometimes consult CP growth charts or segmental growth charts
- Consider endocrine evaluation in some
- Monitor triceps skinfold for adequacy (> 5-10th%) and excess fatness (< 50-75th%)
- When growth complete, establish a target weight (skinfolds 10-25th%)

Body Weight & Mortality Risk?
Future Studies

- Development of growth and “fatness” standards for children with CP linked to health, function & well being
- Evaluation of different treatments for growth management that lead to improved health

Thank you!

“Nothing on earth can stop the man (or woman) with the right mental attitude from achieving his goal, nothing on earth can help the man with the wrong mental attitude.”

- Thomas Jefferson