Optimizing Pediatric Nutrition & Growth in Practice

Part 2 (of 2)

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Overview

The Tools (part 1)

- Free Water
- Calories
- Growth & Gain

Practice (part 2)

- Cases

Growth Charts - WHO

- WHO (World Health Organization) charts 2006
  - Data collected 1997-2003
  - Healthy children living under optimal conditions, likely to achieve full genetic growth potential
  - Exclusively breastfed for 4 mo—almost all
  - Sample from 6 regions: USA, Brazil, Ghana, Norway, Oman, India
  - Longitudinal data: birth, 1 week, q2wk x 2mo, q mo to 12 mo, q 2mo 14-24 mo
  - * Slower growth among breastfed infants during ages 3-18 months is normal

NHANES

- "American Indian or Alaska Native (AIAN) children make up about half (51.9%) of the state's school districts" (1)
- "NHANES datasets are not large enough to provide estimates for this relatively small and geographically specific population and do not offer an AIAN race/ethnicity category" (2)

1. District enrollment by ethnicity as of October 1, 2013: FY 2014. Juneau (AK): Alaska Dept. of Education and Early Development; 2014.
2. National Health and Nutrition Examination Survey: 2011–2012 data documentation, codebook, and frequencies. Atlanta (GA): Centers for Disease Control and Prevention; 2015.

PREVENTING CHRONIC DISEASE
PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY
Volume 13, E40 MARCH 2016

SPECIAL TOPIC

Estimating the Prevalence of Childhood Obesity in Alaska Using Partial, Nonrandom Measurement Data

Erik Everson, MPH; Myde Boles, PhD; Karol Fink, MS; Rebecca Topol, SM; Andrea Fenaughty, PhD

- Weight and height, K-7th grade
- 8 (of 52) Alaska school districts; 2013–2014 yr
  - 62.8% of the state's K–7 student population
- Race/ethnicity (white, black, Asian, Pacific Islander or Native Hawaiian, American Indian, Alaska Native, multiracial, and Hispanic)
- Sex, grade, and age in months
- Socioeconomic status

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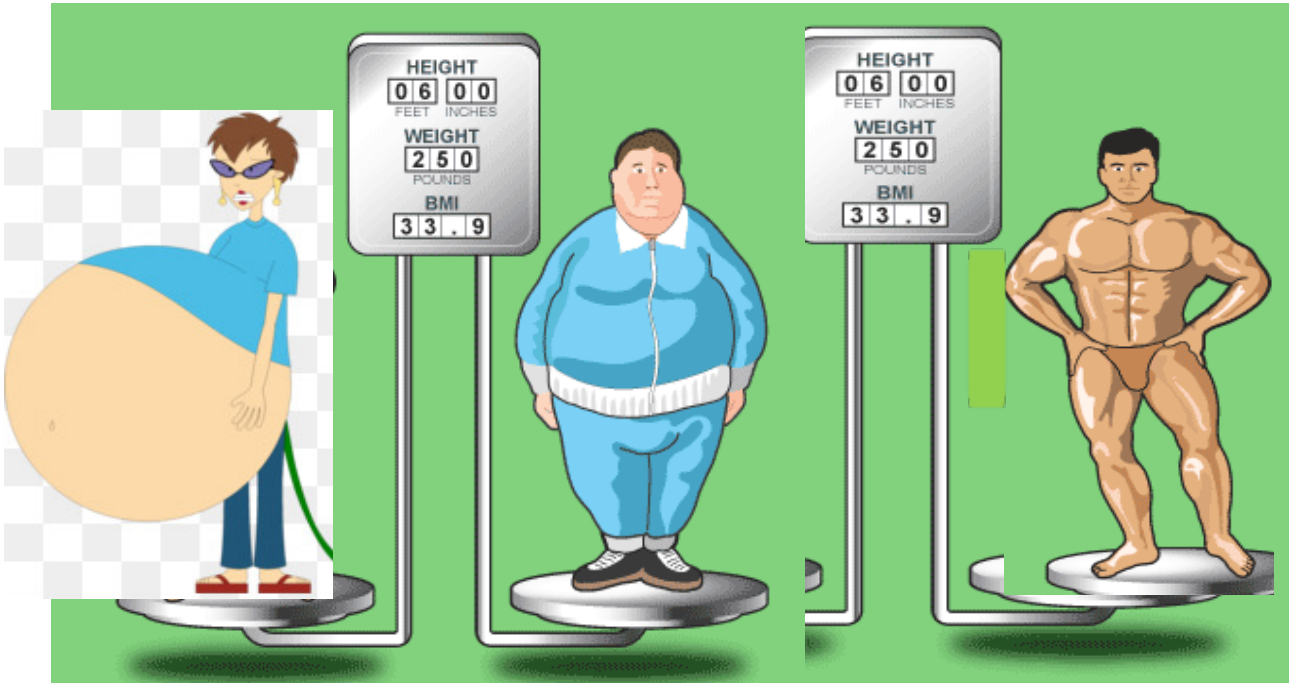
- n = 26,206 (K-7)
- Results
  - Model indicates that obesity among AI/AN students was 32.0%.
  - In the 8 districts for which there were measurements (24.1%).
- In 2011–2012, approximately 1 in 6 (17.7%) children in the US were obese

Growth Chart Interpretation

- Include the history & physical exam when interpreting growth charts

Physical Exam - Nutrition Focused



When weight and height (BMI & wt-for-lt) do not represent nutrition

Weight

- Edema
- Ascites
- Solid Organ Txp
- Amputation
- Orthopedic devices
- Tubes, lines, masks
- Items in pocket

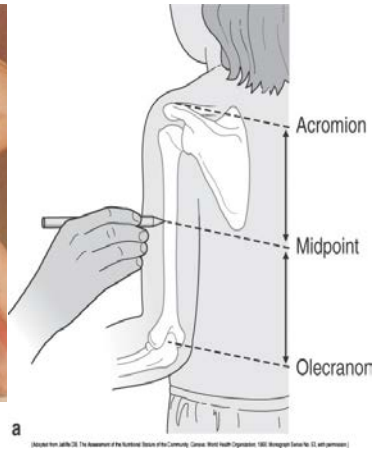
Height

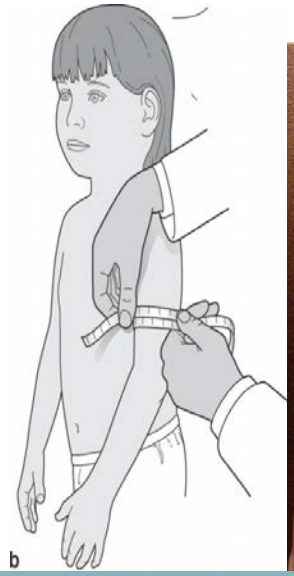
- Non-ambulatory
- Spinal curvatures
- Contractures
- Shoes or boots
- Large hair braids/ accessories

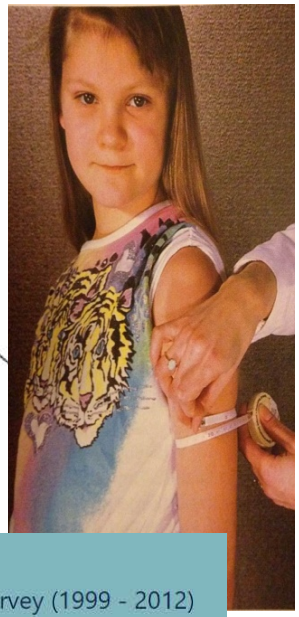
Other Anthropometrics

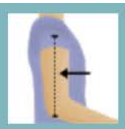
- Mean Upper Arm Circumference (MUAC)
- Triceps Skin Fold
- Scapular Skin Fold
- Height surrogates
  - Knee-Ht Caliper
  - Arm Span
  - Segmental Height

Mean Upper Arm Circumference (MUAC)





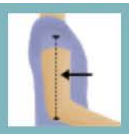




CDC mid-upper arm circumference

(2017) Uses data from the CDC National Health and Nutrition Examination Survey (1999 - 2012) for mid-upper arm circumference percentiles and Z-scores on children from 2 months to 18 years of age.

Peditools.org Wyllie R, Hyams JS, Pediatric Gastrointestinal and Liver Disease, 3rd ed



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PediTools

Clinical tools for pediatric providers

From 2 to 222 months

○Male ○Female

Age (months)

OR Date of birth

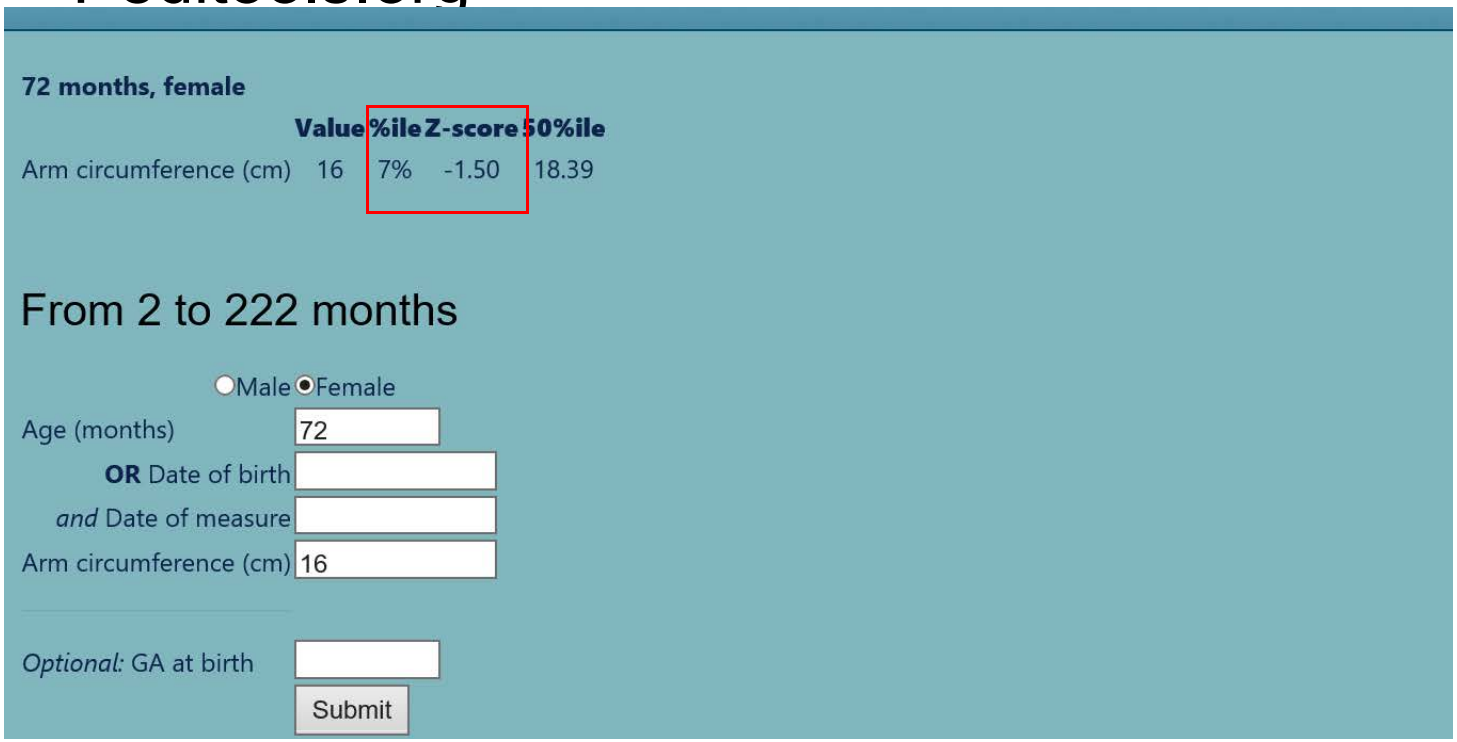
and Date of measure

Arm circumference (cm)

Optional: GA at birth

Submit

Peditools.org

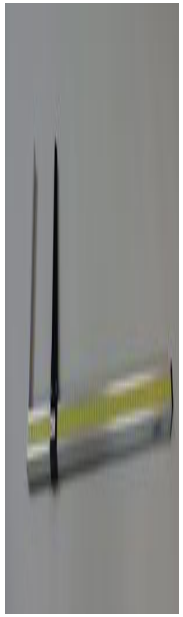


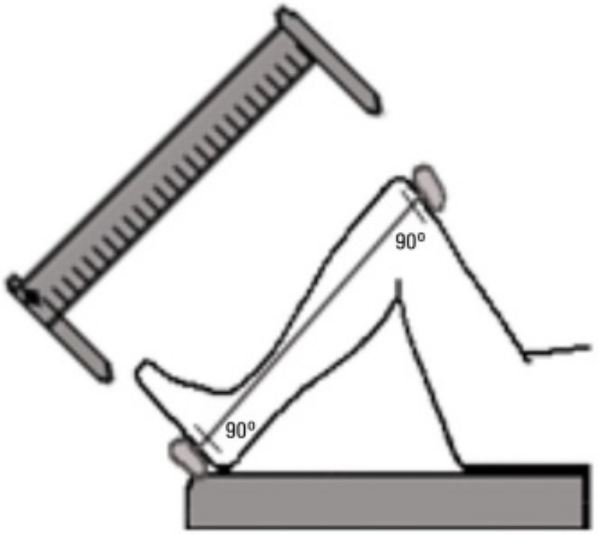
Chou JH et al., J Med Internet Res 2020;22(1):e16204

Triceps Skin Fold

WHO arm circumference and triceps / subscapular skin fold
2007 WHO child growth standard to calculate arm circumference, triceps skin fold, and subscapular skin fold percentiles and Z-scores on children from 3 to 60 months of age.

Knee-Height





Step 3 Physical Exam

- Nutrition Focused Physical Exam (NFPE)
  - Fat Loss
  - Muscle Loss
  - Fluid Status
  - Micronutrient Status

Visualization

Fat Loss

1. Periorbital region
2. Cheeks
3. Upper arm-triceps
4. Thighs

Visualization

Fat Loss

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Visualization

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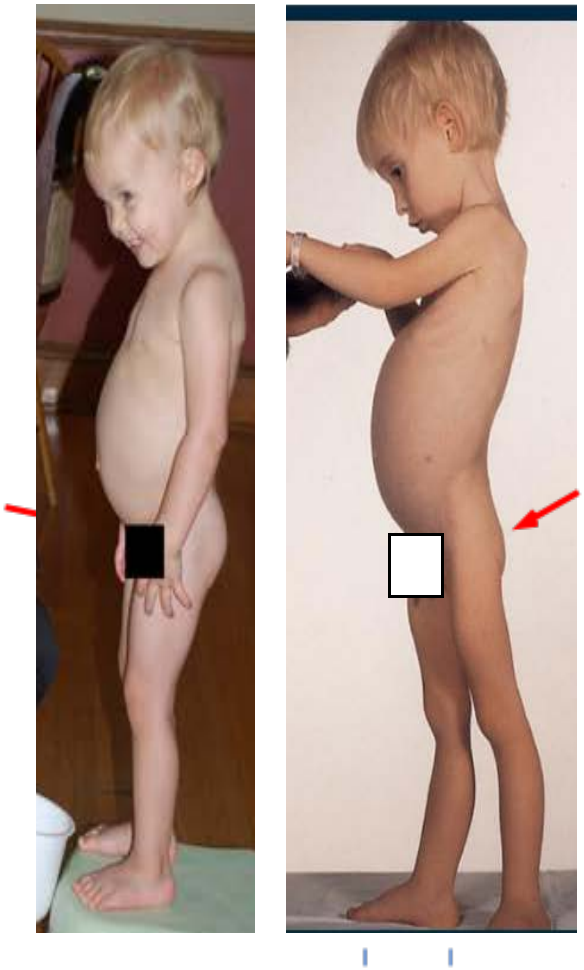
Visualization

Fat Loss

1. Periorbital region
2. Cheeks
3. Upper arm-triceps
4. Thighs
5. Buttocks



Muscle Loss

- Temple Region
- Clavicular Region
- Scapular Region
- Interosseous regions-hand
- Thenar Eminence
- Patellar Region-Quadriceps

Scenarios and Cases for Practice

1. Home call-Fluids:

- A mother calls you because her (previously healthy) toddler won't drink more than a sip and is refusing to eat. He has a low grade temp of 99.9. Energy is down but he's still playful. Urine output is normal. You tell her to try to give him 1 TBSP of fluids (Pedialyte) every 15-30 minutes, and increase the volume as he tolerates.
- She asks, how much should I try to get him to drink today? What will keep him hydrated?
- You check his chart—he weighs 16kg.
- You tell her __1300__ mL = his maintenance

2. PICU Case-Fluids

- Patient is a 6 mo baby girl, with short bowel syndrome due to mid-gut volvulus at birth, admitted for respiratory distress from RSV. She is well hydrated on her admission to the PICU. Her Creatinine is 0.25. She gets intubated in the late afternoon.
- At home she receives about 50% of her calories and fluids by parenteral nutrition (PN) and the other 50% of her calorie and fluid needs by GJ (j-port) feedings. Both run over 24 hours.
- She is tolerating her GJ(j-port) feedings just fine, has no diarrhea.

Potassium level on her blood gas came back at 6.5

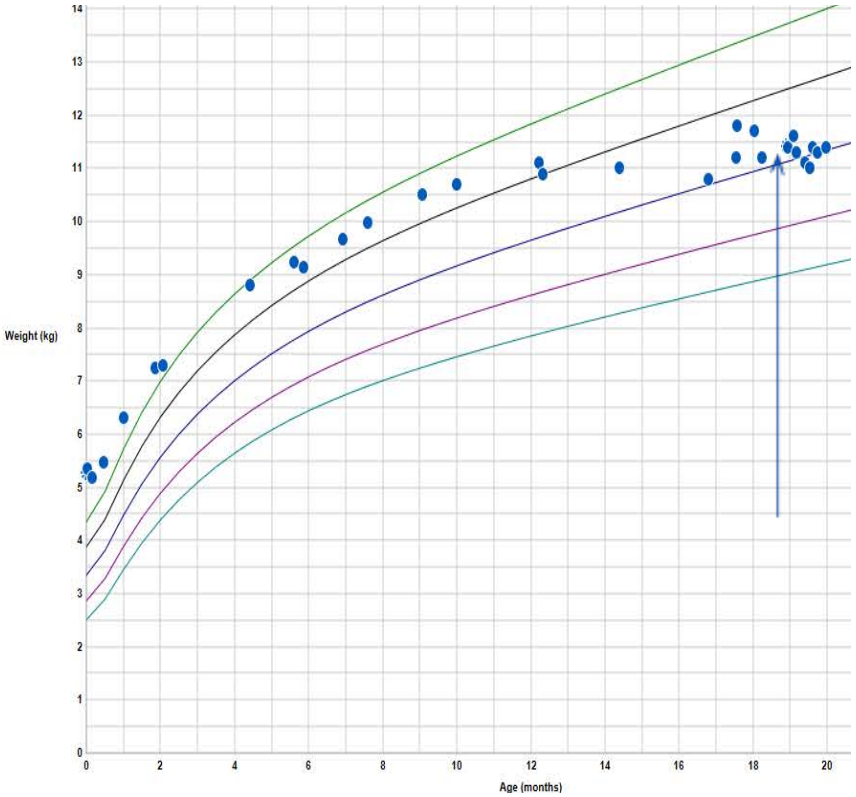
Case 3

- 21mo M, born full term
- BW, BL, BHC all > 97th%ile
- Mom and dad both ~5’8”
- Breastfed via nursing
- Food refusal

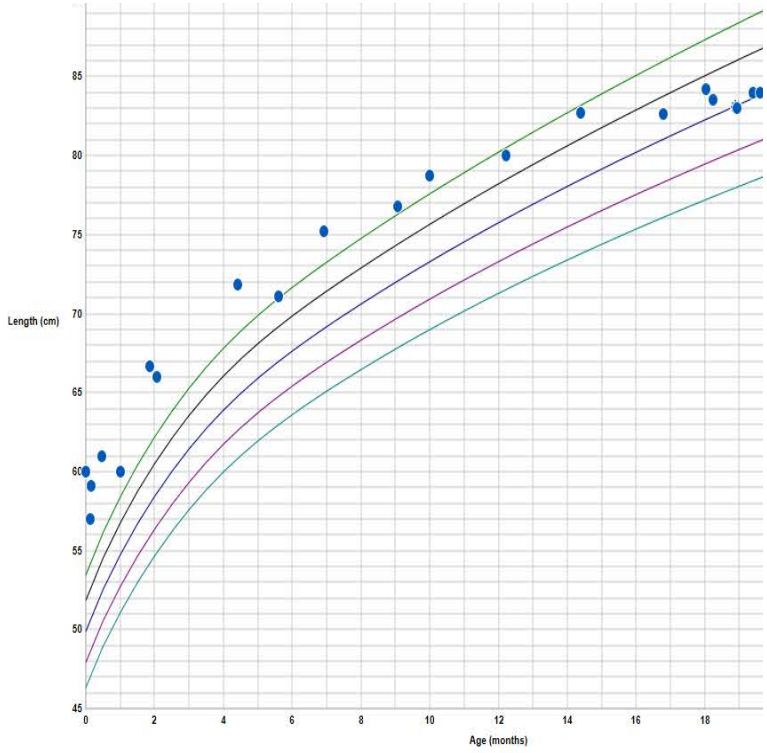
1. Growth curves
   - < 24 months: WHO growth curves
   - Wt, Length, HC, Wt-for-Length
2. grams/day of weight gain
3. Physical exam-nutrition focused
4. Other anthropometrics if needed

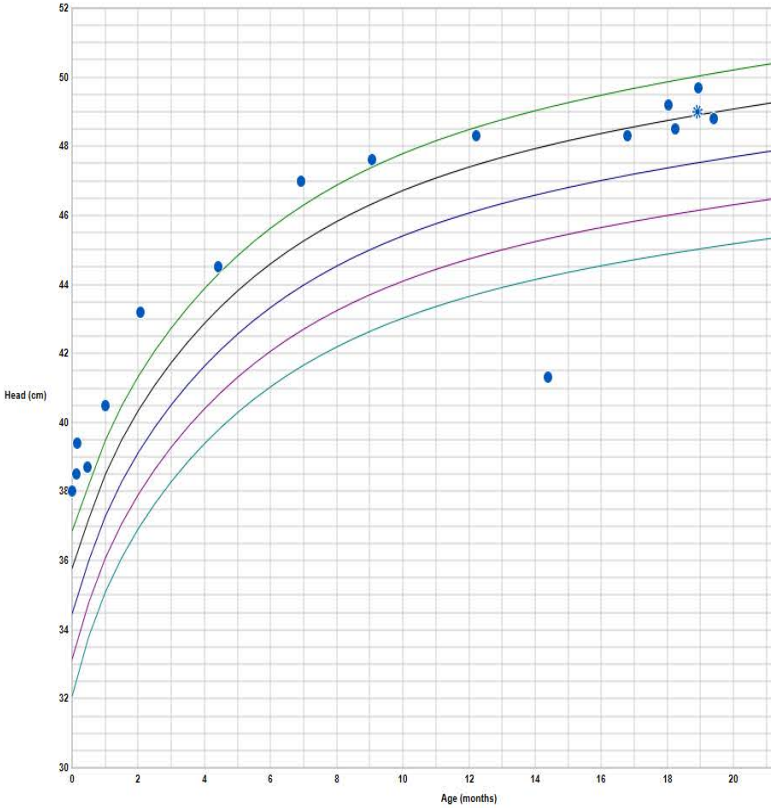
Case 3

- 19 mo M, born full term
- BW, BL, BHC all > 97th%ile
- Mom and dad both ~5’8”
- Breastfed via nursing
- Food refusal

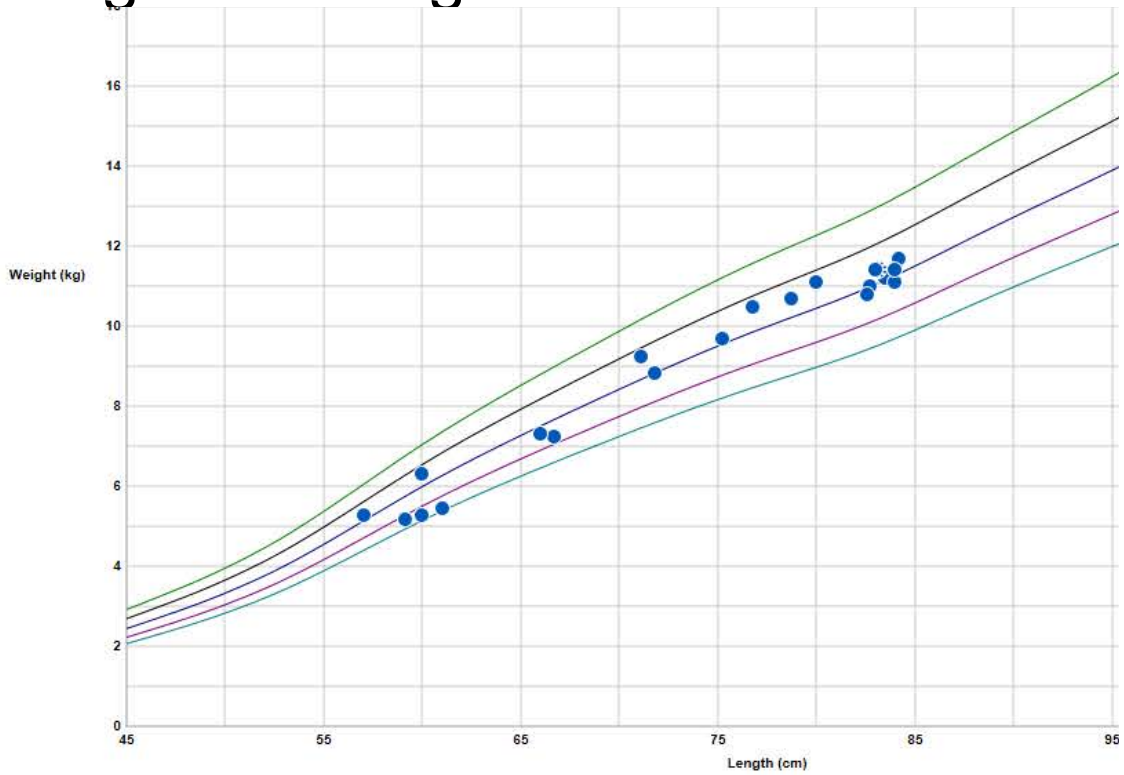


Length and HC





Weight for Length



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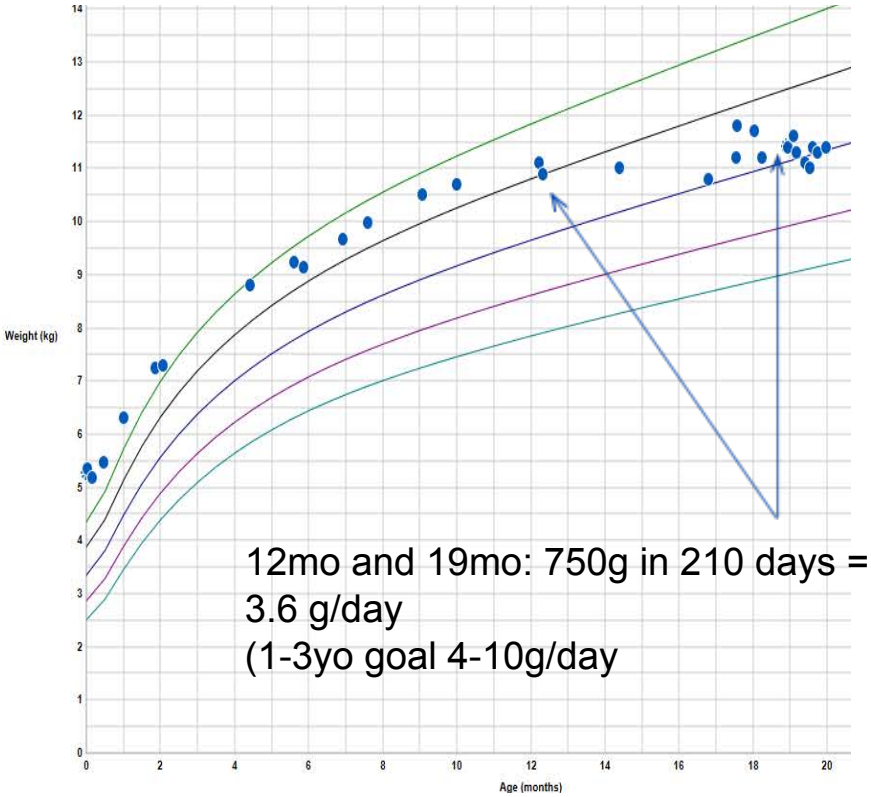
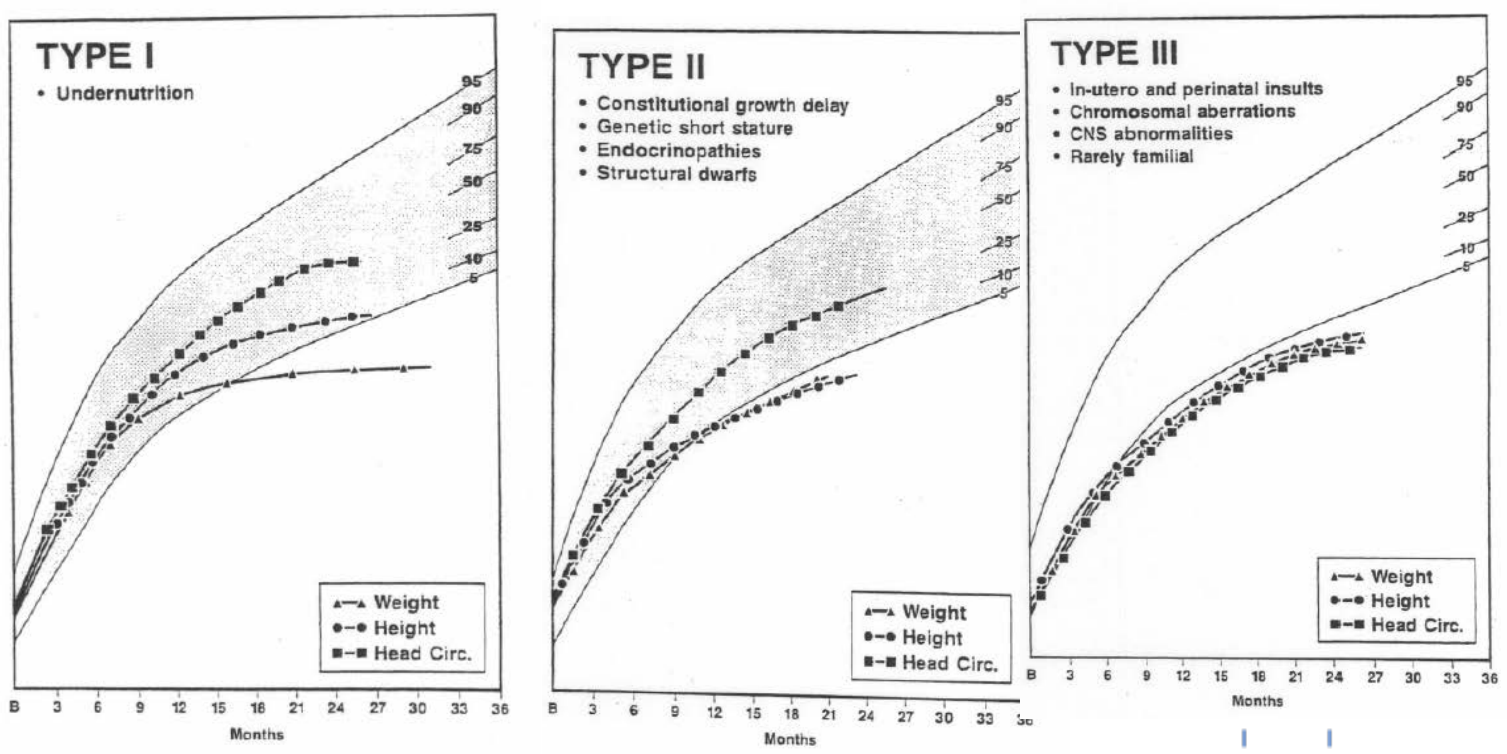


Infant Growth Curve Patterns



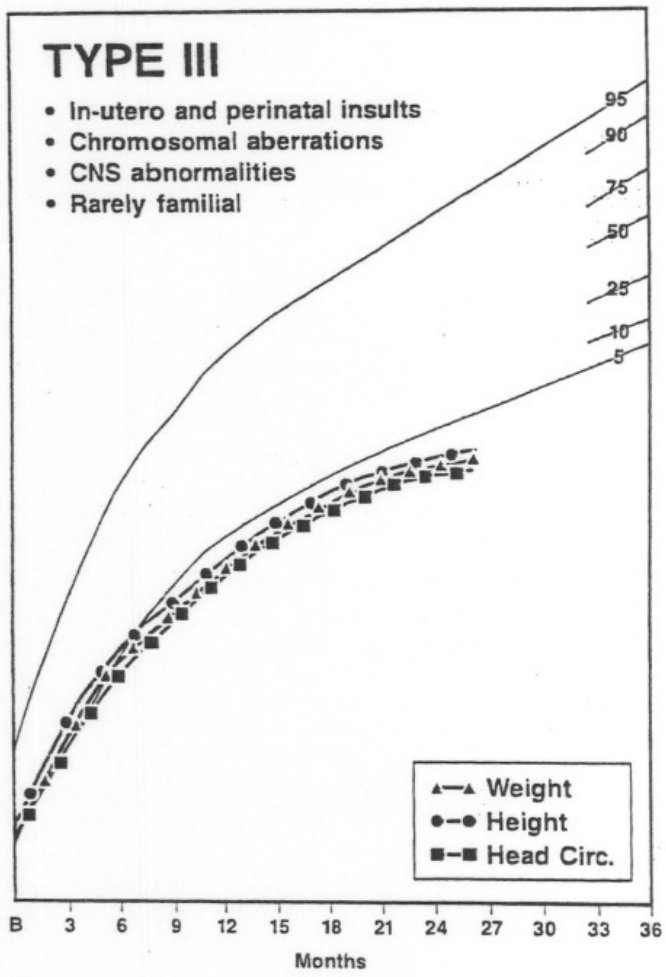
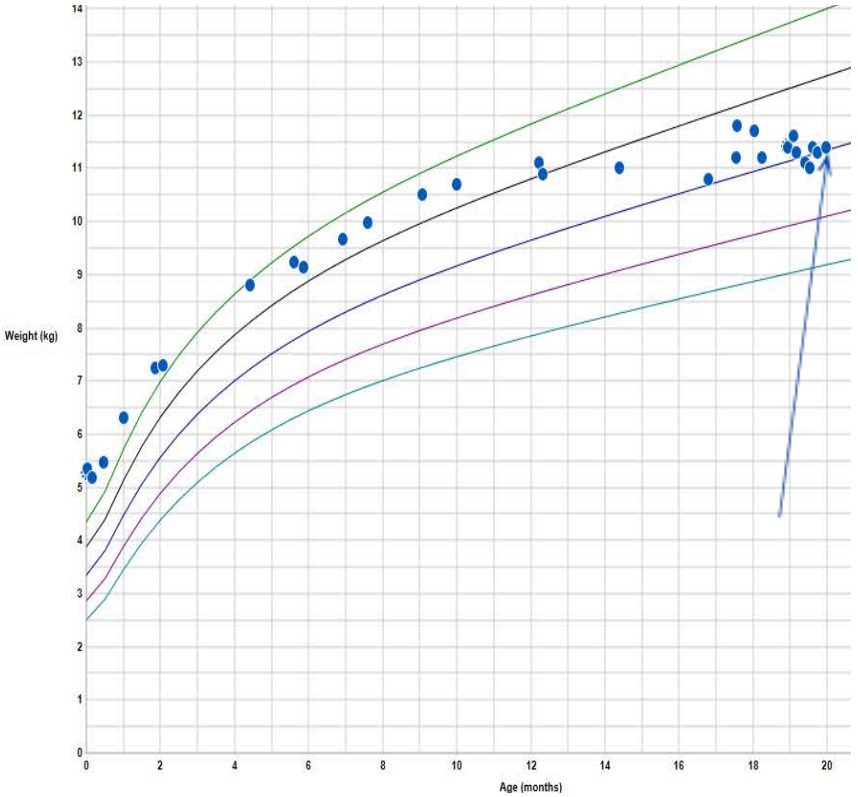
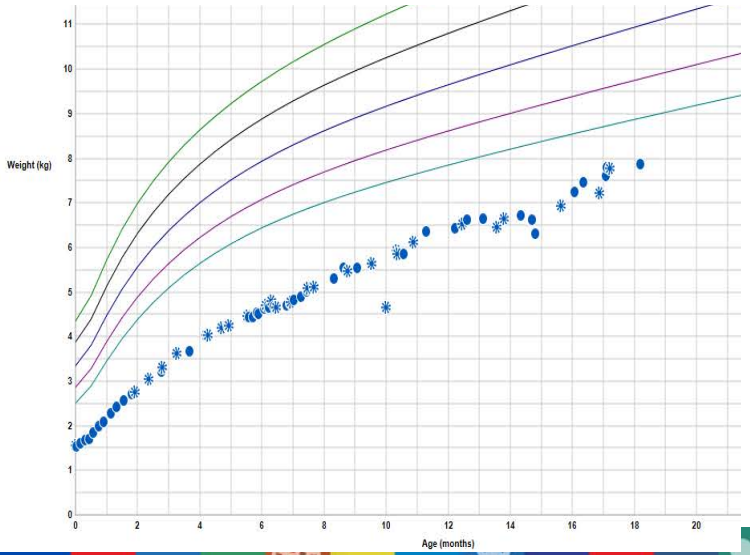


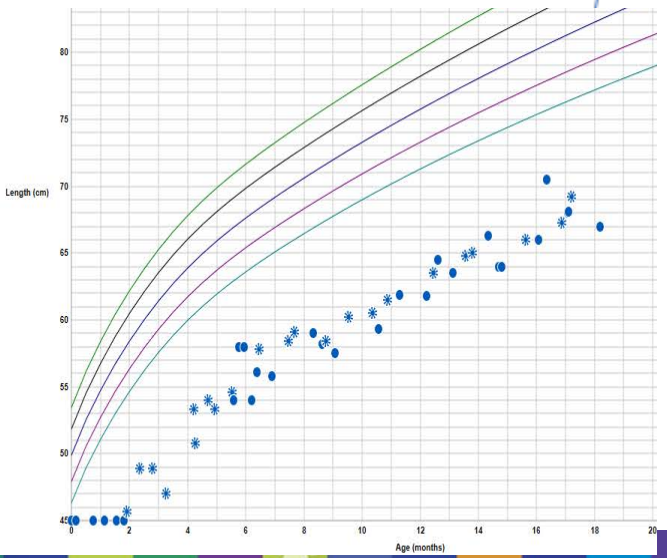
Fig. 1-4. Concomitant retardation of weight, height, and head growth.



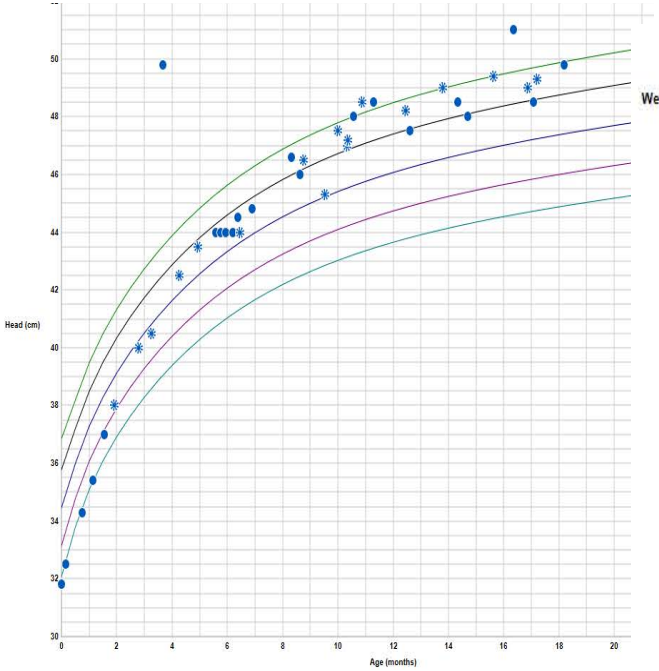
Case 4

- 19mo, ex-34 week preemie M
- Spitting up and constipation

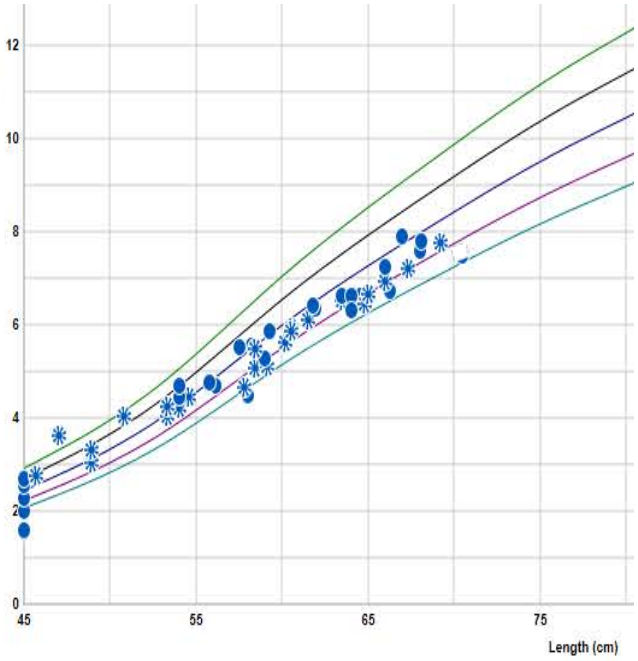




HC



Wt-for-Length



a. What type of growth curve does this child have?

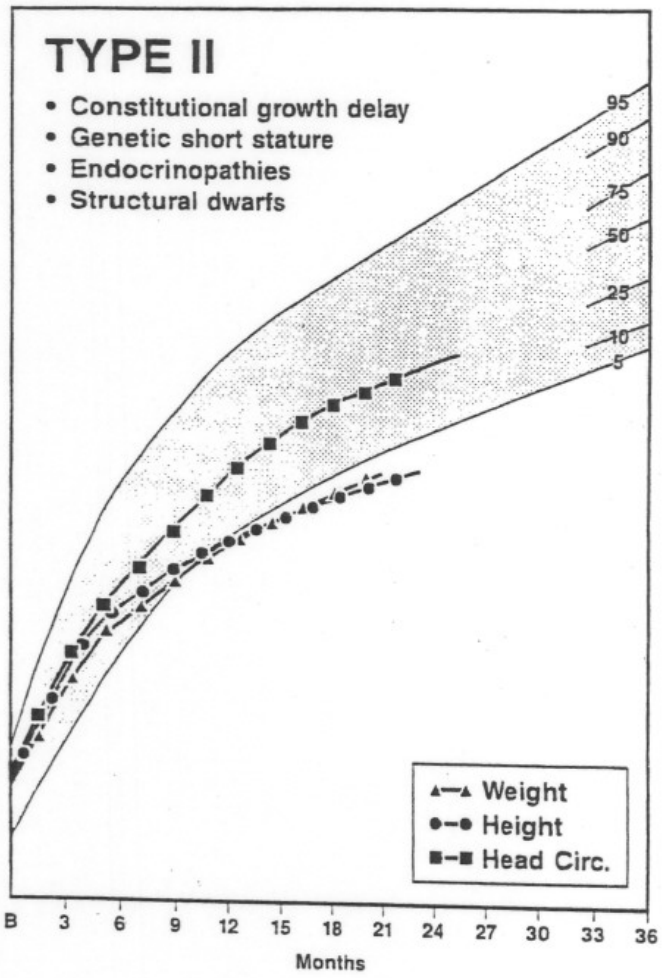


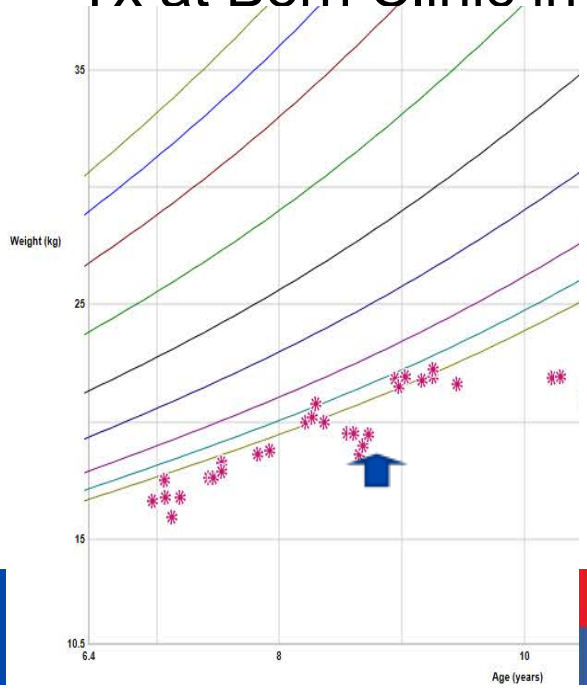
Fig. 1-3. Near proportional retardation of height and weight and normal head growth.

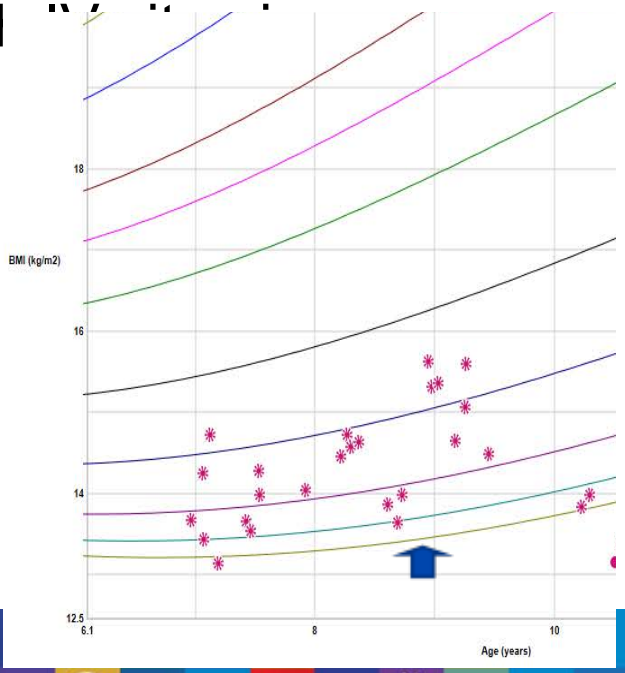
Normal Variants with Type II growth

- **Genetic short stature**
  - Short parents
  - Low percentiles, but usually do not cross percentiles
- **Midparental height**
  - Average of parent's heights
    - + Add 2.5" if male
    - - Subtract 2.5" if female
  - This is the MEDIAN height expected for that child
  - Add and Subtract 8.5 cm (**3.3"**) on either side of median to give 2 standard deviations from

Case 5

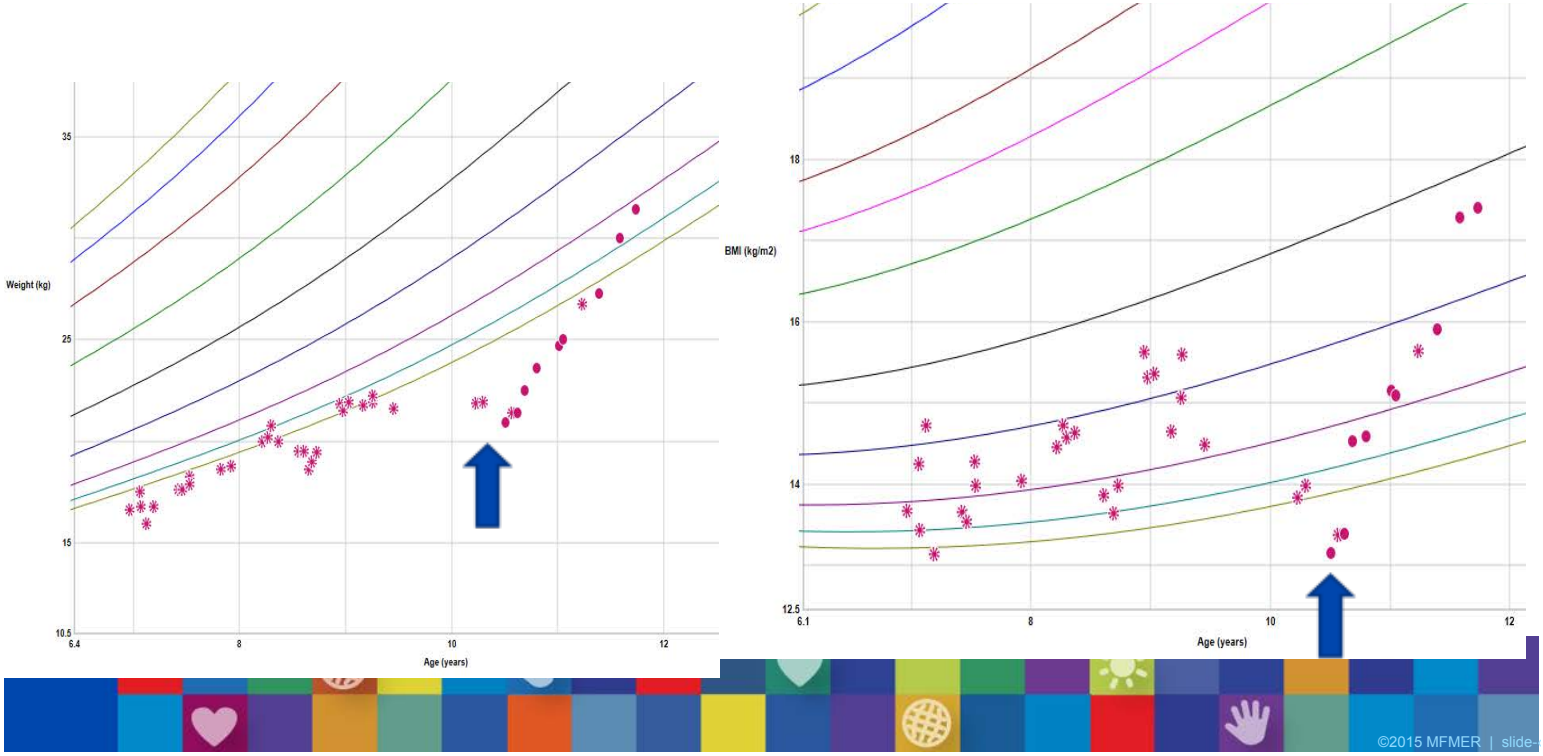
- 10yo F with no sx. Hx of hematochezia, treated with steroids x 2 mo
- Tx at Born Clinic in GR witl



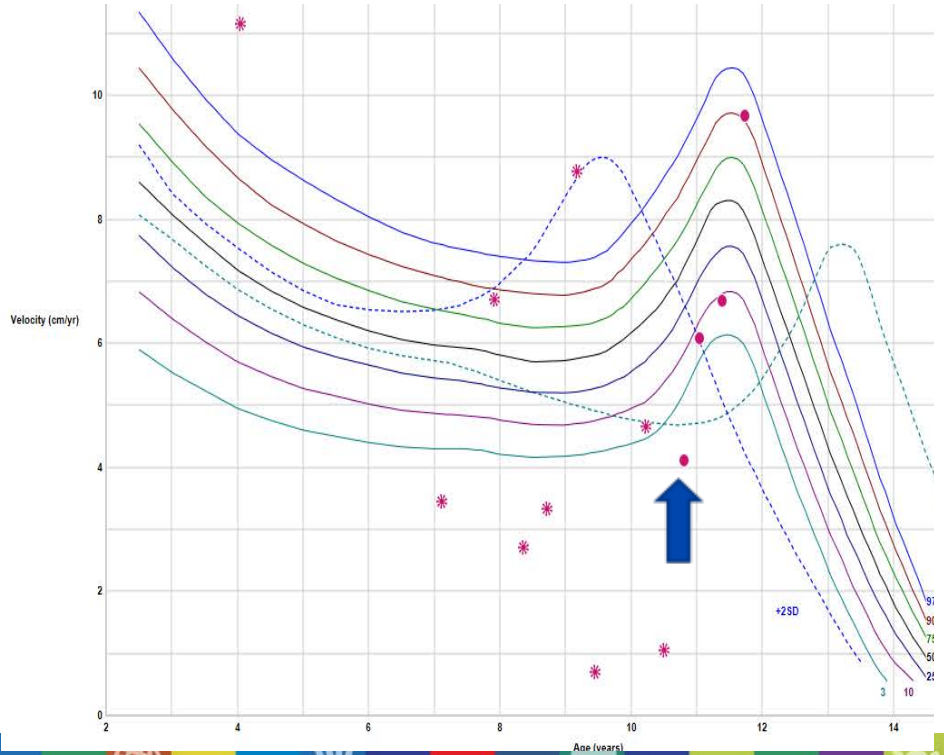


- DX 2 years ago
  - Hashimotos thyroiditis –treated
  - Continued to have poor growth
  - Karyotype-normal
  - Bone age ~ 10 yo chronological age = 10yo
- Work-up
  - Labs: CRP 1.2 (0.6), ESR 13 (10), rest of labs=normal
  - Endoscopy: grossly normal. Histology=UC
  - Pentasa started

Wt and BMI



Height velocity



Question:

- I have a question about what might be done regarding recurrent bouts of spitting up in an older infant say a happy 9mth old who might be receiving adequate amounts of food (formula and solids) but is having difficulty maintaining adequate weight.
- Post prandial positioning and frequent burping all being done per parents. How might we approach repetitive regurgitation other than with a PPI? Thanks much

Questions & Discussion

“At Risk” or Normal

<10 Years old

- Height
  - <10th percentile
- Weight
  - <10th percentile
- Wt-for-Ht (2<yo)
  - <10th percentile
- BMI (>2 yo)
  - <10th percentile
- History of weight loss

>10 Years old

- Weight
  - <10th percentile
- BMI
  - <10th percentile
- History of weight loss
- Weight
  - > 90th percentile
- BMI
  - > 85th percentile

“Failure to Thrive”

Percentile of Median

1. Weight < 75% of median weight for chronologic age (Gomez criterion)
2. Weight < 80% of median weight for length (Waterlow criterion)

Percentiles

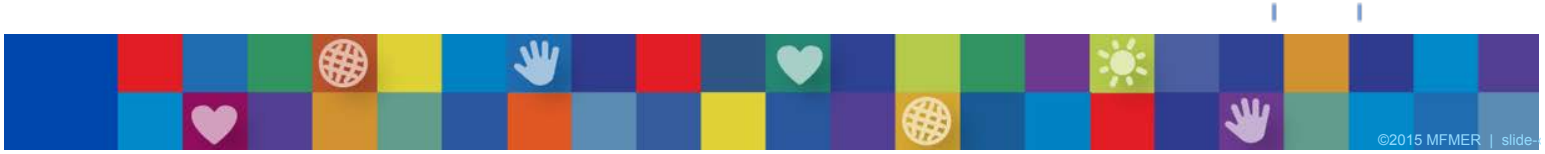
3. Body mass index (if > 2yo) for chronological age <5th%ile
4. Wt-for-Length (if <2yo) for chronological age < 3rd or 5th %ile
5. Weight for chronological age < 5th%ile
6. Length for chronological age < 5th%ile

Weight deceleration

7. Crossing more than 2 major centile lines from birth until weight

Standard deviation or Z-scores

8. Z-score ≤ -2: wt-for-age, ht-for-age, or wt-for-ht



Malnutrition

Coding and Screening for Pediatric Malnutrition (undernutrition)

- In children ages 1 month to 18 years
- Use clinical judgment and history when applying these as diagnostic criteria
- When a child meets more than one malnutrition acuity level, the provider should document the severity of the malnutrition at the highest acuity level to ensure that an appropriate treatment plan and intervention, monitoring and evaluation are provided.
- For undernourished former preemies—use a corrected age until 36 months chronological age

		Mild Malnutrition	**Moderate** Malnutrition	**Severe** Malnutrition
		E44.1	E44.0	E43.0
Single data point available	BMI for age Wt-for-Length	-1 to -1.99 Z score Requires supporting documentation, eg: • Weight loss • Lower than expected wt-gain velocity • Declining Z score • Inadequate energy/protein intake	-2 to 2.9 Z score	≥ -3 Z score
	MUAC (Mid Upper Arm Circumference) < 5 years old	-1 to -1.99 Z score	-2 to 2.9 Z score	≥ -3 Z score
	Length, Height for age	No data	No data	≥ -3 Z score
Trending 2 or more data points	Weight gain velocity < 2 years old	< 75% of norm[N] for expected weight gain	< 50% of norm[N] for expected weight gain	< 25% of norm[N] for expected weight gain
	Weight Loss * 2-20 years old	5% of usual body weight	7.5% of usual body weight	10% of usual body weight
	Deceleration in BMI or weight-for-length *	Decline of 1 Z score	Decline of 2 Z scores	Decline of 3 Z scores
	Inadequate nutrient intake *	51-75% of estimated energy/protein need	26-50% of estimated energy/protein need	≤ 25% estimated energy/protein need

* no time frame specified

[N] weight gain increments at the median of the WHO growth velocity standards for the time span between the 2 data points

Gray: Needs additional positive diagnostic criteria to make malnutrition diagnosis

Considerations during diagnosis:

- Acute typically < 3 months
- Chronic typically > 3 months

FTT: History

- Pregnancy and labor
- Birth weight (and percentile)
  - Length and Head Circumference (and percentiles)
  - * Peditools
- Early neonatal history
  - NICU? Complications?
- Development—does the pediatrician have any concerns?
- Medical or surgical illnesses
  - Medications?

FTT: Calorie History -- Baby

- Feeding behaviors and environment
- Quantitative assessment of intake…
- …..When in doubt, ask about last 24 hours.
  - Who mixes the formula?
    - Is it mixed before each feeding?
    - OR is it mixed in bulk for the day?
  - Who feeds the child?
    - *When, what time?
    - How much is offered each feeding?
    - How much does baby take?
    - How much is typically left? How often is

FTT: Calorie History -- Baby

- What time is baby fed?
  - When is the first feeding of the day?
    - When is the next feeding? And the next? And the next? And the next?...
  - How many bottles has baby had today?
  - How many hours does baby typically sleep overnight?

FTT: Calorie History – Toddler, Child, Adolescent

- Obtain typical meal-time schedule and intake in last 24 hr.
- Differentiate offered vs intake
  - B- slkdjfs (breakfast)
  - L- lskdjfr (lunch)
  - D- lskjdf (dinner)
  - S- lskdjf (snack)
  - F- llskjdf (fluids) how much volume? Water, Milk, Juice, Pop, Other drinks?
- Volumes: Spoonful, cup, plate

FTT: Social History

- Life stressors
- Social supports
- Economic supports
- Perception of growth failure as a problem ?

- Empathy