Growth Faltering & Failure to Thrive: Who’s Failing & Who’s Thriving?

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Objectives

- Diagnostic criteria for growth faltering, including WHO Growth Standards
- (Causes of growth failure – risk by age)
- Parenting styles & feeding behaviors
- (Most common nutritional deficiencies)
- (Therapeutic approach & defining success)

Terminology

“Failure to Thrive”
Growth Failure
Growth Faltering
Undernutrition

Definitions & Considerations

- “Growth faltering”
  - Linear growth (length for age)
  - Ponderal (weight-for-age & weight/length)
- Size vs growth: cross-sectional vs longitudinal
- Nutritional vs non-nutritional primary etiology
  - How hard to look
- Too short? Too skinny? or both?

Definitions: “Wasting”

- Weight curve has crossed > 2 percentile channels on NCHS growth charts, after having achieved a previously stable pattern
  or
- Weight/age (or weight-for-length) < 2 standard deviations below median for age & sex (≈ 3rd percentile)
Wasting (skinny!)
- Crossing > 2 major %ile channels (wt-for-age)
  - Rate of wt gain < normal for age
  - Weight/length < 5th %ile
- Implies ~ acute undernutrition, esp. inadequate energy intake
  (may be “organic” cause)

Definitions: Stunting / Short “Stature”
- Linear growth faltering:
  - Mild: 90-95% of median (50th %ile)
  - Moderate: 85-89% of median
  - Severe: < 85%
- If nutritional, implies chronic undernutrition, but...
  - DDx: endocrinopathy, IUGR, GI, renal, genetic, constitutional, chronic illness/inflammation, etc

Short Stature/Stunting
- Length-for-Age (% of Median)
  - Normal: 95 - 105%
  - Mild: 90 - 94%
  - Moderate: 85 - 89%
  (Severe: < 85%)
  - Stunting: - 2 Z < median

“Ideal Body Weight”
- 50th %ile (median) weight-for-length
  - Age independent
  - Degree of wasting
  - Weight deficit
  - Influenced by body composition (small head, low muscle mass)

“Ideal Body Weight”

Interpretation of % “Ideal Body Weight”

Waterlow JC. BMJ 1972
Why Characterize Extent of Wasting?
- Determine severity & clue to etiology of problem
- Gauge type & urgency of intervention
- Set goals for intervention & catch-up
- Provide perspective to parents

Degrees of Wasting
- 60% IBW (67% IBW)
- 83% IBW

12 mo old, ex-34 wk, 4 kg (= 60% IBW);
GT feeds = 100 kcal/kg (60 kcal/kg IBW)
100 kcal/kg IBW: 600 kcal (= 150 kcal/kg actual wt)

Current Growth Curves: Now a Choice
- 2000: CDC/NCHS released revised U.S. growth reference, 0-3 yr + 2-20 yr
- 2006: WHO released new growth standard for infants & young children 0-4.9 yr (“WHO Multicentre Growth References”)

Growth Charts
Looking for Goldilocks

Definitions
- Standard: growth chart describing how children should grow (prescriptive)
- Reference: growth chart describing how children do grow (descriptive), e.g. in the U.S.
WHO Standards: Background

- Differences in growth among breastfed and formula fed infants:
  - Growth not independent of feeding choice
  - “What was optimal?”

- Breastfed infants should be the ideal standard, yet no available charts represented breastfed infants
  - Use of inappropriate reference → inappropriate interpretation of growth & feeding recommendations

WHO Growth Study

- Population:
  - Breastfed infants 0 - ≥ 12 mo
  - Complementary feeding initiated after 4 mo

- Settings: 6 countries
  - Norway, U.S., Brazil, India, Oman, Ghana

- Environment:
  - No smoking, no chronic illness, low risk microbial contamination

- Pediatric care: Immunizations, routine practices

- Complementary foods – according to recommended practices by country

[Acta Paediatrica, April ’06]

WHO Standards vs CDC Reference (0-2 yr)

WHO 2006

- Longitudinal data
- Exclusive BF x 4-6 mo
- BF ≥ 12 mo
- Length (no stature)
- BMI for age

CDC 2000

- Cross-sectional
- Mixture of feeding (FF > BF)
- Differing data sources by age
  - NHANES I (12+ mo)
  - NHANES II (6+ mo)
  - NHANES III (2+ mo)
  - Birth weight (2 states)
  - PedsNSS
- No BMI-for-age

Mean length (cm) vs age: birth-2 yr for each of 6 sites

Conclusion: No need for different growth charts for different racial/ethnic groups
Implications of New Standards

- Early months, for same weight…
  - Infant looks “worse” on the WHO
    (higher expectations for early weight gain)
- After 6 mo, for same weight…
  - At lower range, infant looks much “better” on WHO
    (less perceived faltering for BFI)
  - At upper range, infant will look “heavy” sooner
    (earlier recognition overweight?)

Case #1

- 16 mo F: referred to Nutrition clinic
- Healthy, nl develop.
- Nursing on demand throughout day & night
- Very limited intake of other foods
- 76% of IBW

On WHO charts, 16 mo BFI “still” appears to have inadequate weight gain, though less dramatic appearance at 9-12 mo

Causes of Undernutrition & Growth Failure
Etiology of Growth Faltering

- Nutrition
  - Inadequate energy intake/utilization → wasting
  - Micronutrient deficiency ± protein
- Genetic abnormality
- Endocrinopathy (esp short stature)
- Underlying diseases (x infinity!)
  - ↓ intake, ↑ expenditure, ↑ losses

Evaluation

History, history, history...

- Nutrition hx
  - Early feeding experience (BF/formula)
  - Introduction of solids (when, what)
  - Intake – Variety, preferences (> "pureed foods")
  - Routines – “food hygiene”
    - Grazing - Duration of meals
    - Juice - “Entertainment”/distractions
    - Bottle/sippy cup - “Short order cook”
    - Drive by eating
  - (Parenting – permissive, authoritarian vs authoritative)

History, history, history...

- Past Medical Hx:
  - PG/birth, BW, health, development, habits, meds/supplements, allergies, Fam Hx, Soc Hx
- Review of Systems
  (stooling, vomiting, GERD Sx, diaphoresis, dysphagia, resp, rash, bruising, etc)
  [DDx for “non-organic” vs “organic”]

Physical Exam:

- Signs of Nutritional Deficit
  - Wasting of fat (vs muscle?)
  - Signs of nutritional deficiencies
    - Pallor - anemia
    - Rash /skin or oral lesions – micronutrient deficiency
    - Edema - hypoalbuminemia
    - Ø DTR’s
      - Vit E / f.s. vitamin defic (& hypothyroidism)

Physical Exam

- Dysmorphic features
- Eczema
- Breathing – stridor, ↑WOB, rales/wheeze
- Murmur, pulses
- Hepatomegaly
- Developmental level/neurologic deficits
Laboratory Screening

- 1st line screen:
  - CBC
  - Electrolytes & Bicarbonate, BUN, Creatinine
  - Urinalysis (+ Cx)

- 2nd line:
  - Iron panel, liver fxn, (thyroid fxn), metabolic, chromosomes,
    other (e.g. UGI, swallow study, celiac Ab)
  - Stool exam (fat, blood; Giardia, celiac, milk protein
    intolerance)

Assessment: Putting in All Together

- Growth – character (short/skinny/both), severity
- Diet/Nutrition: calories, nutrients; habits/behaviors
- Medical/developmental
- Social/environment
- Exam & labs
- Rx: tailored to findings!

If initial history, exam, labs have revealed no medical
abnormalities…get more history!

FAILING & THRIVING:

- Patients fail if functional
  consequences 2° to undernutrition
- Parents fail if unable to provide
  structure, balanced w/ child
  autonomy (Who’s in charge?!)
- Doctors fail if evaluation not
  matched to severity
- All thrive when nutritional needs
  met, feeding behaviors appropriate,
  development normal

Thanks!