



Failure to Thrive
WI CAN Educational Series
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**Hillary W. Petska, MD
has documented that
she has no relevant
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Key Points

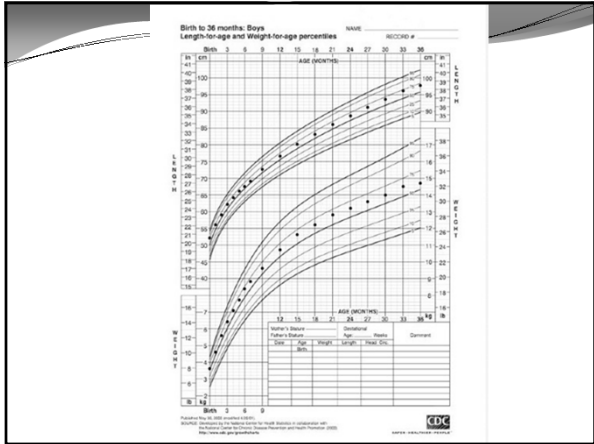
- Failure to thrive is a common problem in infancy and childhood.
- Failure to thrive is due to inadequate nutrition, although the underlying cause is typically multifactorial.
- Failure to thrive has significant short- and long-term health consequences for children.
- Failure to thrive may be a sign of child neglect.

What is normal?

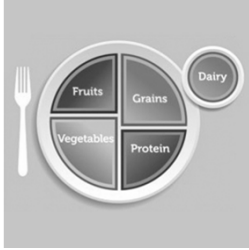
- Infants typically lose 5-10% of birth weight, but regain by 10-14 days
- Double birth weight by 4-5 months
- Triple birth weight by 1 year

Expected Daily Weight Gain for Age

Age (months)	Weight Gain (oz/day)
0 - 3	1 (26 - 31 g)
3 - 6	0.6 (17 - 18 g)
6 - 9	0.4 (12 - 13 g)
9 - 12	0.3 (9 - 13 g)
12 - 36	0.25 (7 - 9 g)



Nutrition 101



- Infants should be breast or formula fed until 1 yo
- Breastfed babies should be given Vit D
- Solids can be started around 6 mos
- At 1 yo, transition to whole cow's milk (max: 24 ounces), low fat milk at 2 yo
- For kids > 1 yo, limit juice to 4-6 oz/d

Optimal Nutrition

- Not all diets are created equal.
 - Low iron formula - iron deficiency
 - Cow milk - iron deficiency
 - Goat milk - folate deficiency
 - Raw milk - infection risk
 - Almond milk - multiple deficiencies
 - Fruit juice - kwashiorkor
- Caloric needs vary by age
 - Infants: 100-120 kcal/kg/d
 - Toddlers: 90-100 kcal/kg/d
 - School Age: 60-90 kcal/kg/d
 - Adolescents: 45-60 kcal/kg/d

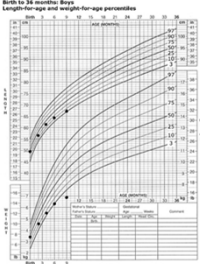
Epidemiology of FTT

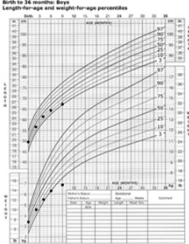


- Mostly diagnosed in children < 2 yo
- Seen in 5-10% of children in primary care settings
- Accounts for 1-5% of all referrals to children's hospitals

Definition

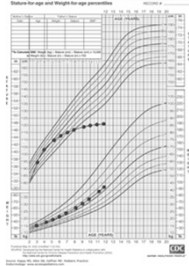
- Prolonged cessation of appropriate weight gain compared to age/gender norms
- Weight < 3rd percentile
- Decline of weight across 2 major percentiles in 6 months

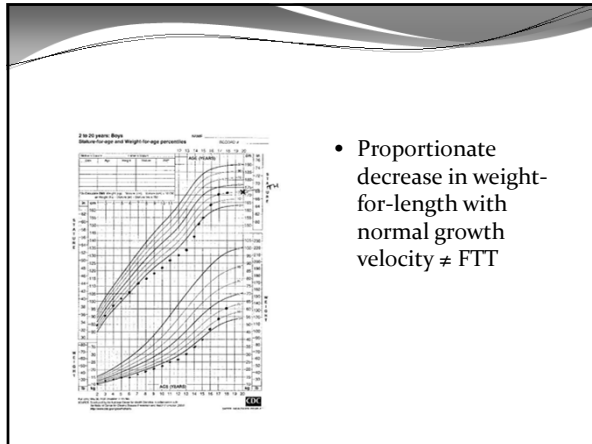




- Decreased weight in proportion to length = FTT
- Inadequate nutrition: weight, then height, then head circumference affected
- Isolated cessation of head circumference growth may indicate a neurologic disorder.

- Decreased length in proportion to weight = endocrine abnormality





- Proportionate decrease in weight-for-length with normal growth velocity \neq FTT

“Mimics”

- Intrauterine growth restriction, prematurity, genetic short stature, constitutional growth delay
- Conditional growth charts for children with altered growth patterns:
 - Trisomy 21 (Down syndrome)
 - Prader-Willi syndrome
 - Williams syndrome
 - Cornelia deLange syndrome
 - Turner syndrome
 - Rubinstein-Taybi syndrome
 - Marfan syndrome
 - Achondroplasia

Causes

FTT is a sign, not a diagnosis

- Inadequate energy intake
- Inadequate nutrient absorption
- Increased energy requirements

May be due to a medical condition, psychosocial reasons, or both

Table. Diagnostic Classification of Causes and Selected Examples of Failure to Thrive	
Inadequate Nutritional Intake	
• Not enough food offered	
–Food insecurity	
–Poor knowledge of child’s needs	
–Poor transition to table food	
–Avoidance of high-calorie foods	
–Formula dilution	
–Excessive juice	
–Feeding difficulties	
–Neglect	
• Child not taking enough food	
–Oromotor dysfunction	
–Developmental delay	
–Behavioral feeding problem	
–Altered oromotor sensitivity	
–Pain and conditioned aversion	
• Emesis	
–Gastroesophageal reflux	
–Malrotation with intermittent volvulus	
–Increased intracranial pressure	
Malabsorption	
• Celiac disease	
• Crohn disease	
• Food protein sensitivity or intolerance	
Increased Metabolic Demand	
• Insulin resistance (eg, intrauterine growth restriction)	
• Congenital infections (eg, human immunodeficiency virus, TORCH)	
• Syndromes (eg, Russell-Silver, Turner, Down)	
• Chronic disease (eg, cardiac, renal, endocrine)	

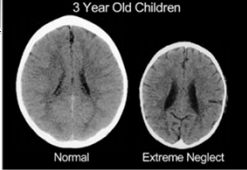
Medical Risk Factors

- Prematurity
- Developmental delay
- Congenital anomalies
- Intrauterine exposures
- Lead poisoning
- Anemia
- Dietary beliefs/practices
- Any condition that results in inadequate intake, malabsorption, or increased metabolic rate


Psychosocial Risk Factors

- Poverty
- Social isolation
- Family violence
- Substance abuse
- Mental health
- Cognitive limitations
- Stress

Effects of FTT



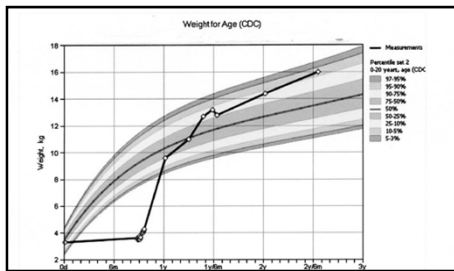
3 Year Old Children



- Poor linear growth
- Decreased brain growth
- Lower IQ
- Developmental delay
- Behavioral problems
- Increased risk of infection
- Poor wound healing
- Anemia
- Weak bones
- Death

Medical Evaluation

- Comprehensive history and physical exam can typically rule out medical causes
- Hospitalization may be required:
 - Diagnostic work-up
 - Severe malnutrition or dehydration
 - Protection



Medical Management

- Multidisciplinary team
- Nutrition education
- Feeding recommendations
- Referral for resources
- Developmental screening

Identification

Thinning of the hair, head appears large compared to neck, eyes or cheeks appear sunken due to decreased subcutaneous fat

Atrophy or wasting of buttocks, "extra" skin, emaciated limbs, "large" joints or scrotum, prominent ribs, spine, shoulder blades, flat abdomen

Information Gathering

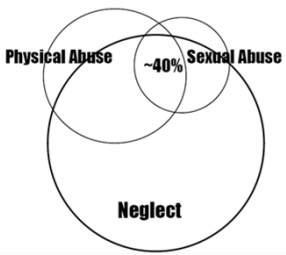
- Medical records request
- WIC records
- Interview of child and/or siblings at a Child Advocacy Center
- Collaboration with other investigators

Home Visit

- Observe a feeding:
 - Preparation of formula
 - Oral-motor dysfunction
 - Feeding environment
 - Parent-child interaction
- Home environment

Other Types of Maltreatment

- Neglect
 - Physical
 - Medical
 - Emotional
 - Educational
- Abuse
 - Physical
 - Sexual



The diagram consists of three overlapping circles. The top-left circle is labeled 'Physical Abuse', the top-right circle is labeled 'Sexual Abuse', and the bottom circle is labeled 'Neglect'. The intersection of the 'Physical Abuse' and 'Sexual Abuse' circles is labeled '~40%'.

Environmental Neglect

- Inadequate formula/food
- No clean dishes
- No electricity
- No running water
- Safety hazards

Physical Neglect

- General appearance
 - Dirty clothes/body
 - Matted hair
 - Inappropriately dressed
- Odor
- Behavior
 - Stealing, hoarding food
- Disclosures
 - Reports missing meals

Case

- Almost 3 yo female adopted from Guatemala at 1 yo
- Followed by GI for FTT
- No weight gain x 1 year

- Eventually evaluated for physical abuse after an anonymous report to CPS
- 9 fractures (jaw, skull, arms, leg)
- Multiple cutaneous injuries

FTT can also be seen in older children

Case

- 17 yo male admitted for fever, vomiting, poor feeding, trouble breathing x 4 days
- PMH: born at 28 weeks, cerebral palsy, seizure disorder, chronic lung disease
- Social history: placed with grandparents at 8 mos due to physical abuse by father

Neglect?

- Medical records - no growth x 10 years
- Nutrition - primarily baby food
- No services in the home for patient

References

- Block RW, NF Krebs, Failure to Thrive as a Manifestation of Child Neglect. *Pediatrics* 116(5):1234-1237; 2005.
- Gahagan S, Failure to Thrive: A Consequence of Undernutrition. *Pediatrics in Review* 27(1):11-11; 2006.
- Jaffe AC, Failure to Thrive: Current Clinical Concepts. *Pediatrics in Review* 32(3):100-107; 2011.
- Jenny C, Child Abuse and Neglect: Diagnosis, Treatment, and Evidence. Saunders: St. Louis; 2011.
- Kirkland RT, KJ Motil, Etiology and evaluation of failure to thrive (undernutrition) in children younger than 2 years. UpToDate, 2013.
- Kirkland RT, KJ Motil, Management of failure to thrive (undernutrition) in children younger than 2 years. UpToDate, 2013.
- Schwartz ID, Failure to Thrive: An Old Nemesis in the New Millennium. *Pediatrics in Review* 21(8):257-264; 2000.
- Tranchida, Vincent. The Pathology of Fatal Child Neglect. University of Wisconsin School of Medicine and Public Health. Monona Terrace Community and Convention Center, Madison, WI. 15 February 2013. Conference Presentation.
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