Failure to Thrive:
The Good, the Bad and the Very Bad

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Failure to thrive- inadequate weight gain or deviation from growth standards for age and sex, based on standardized National Centers for Health Statistics (NCHS) growth charts

Generally defined as:

- Child < 2 yo who is below 5th% weight for age on more than one occasion
- Child < 2 yo who is < 80% of ideal weight
- Child < 2 yo whose weight declines across 2 major percentile lines

- Growth failure occurs in 10% of US children
  - 35% of children worldwide are nutritionally stunted (DeOris, WHO, 1997)
- FTT represents 1 - 3% of all US pediatric admissions
- It crosses all socioeconomic levels
- Most FTT is mixed in etiology
- Nonorganic etiology accounts for 70%-80% of growth failure
- 25% of children will shift downward in the first 2 years to their own curves

History of FTT

- 1915: Chapin reported 42% death rate in institutionalized children under age 2
- 1945: Spitz reported depression, malnutrition and growth failure in foundling homes
- 1957: Coleman found same syndrome in children in their own homes
- 1960s: Recognition of neglect as cause of FTT
- 1983: Kotelchuck and Newberger suggest model of "inadequate mothering" should be reassessed, propose idea of multifactorial etiology
- 1985: Altemeier reported correlation between parent's childhood and infant FTT

The child with failure to thrive:

1) has not taken,
2) has not been offered, or
3) has not retained

adequate calories for growth

Alternately put,
the child has:

- Inadequate caloric intake
- Inadequate absorption
- Increased metabolism
- Defective utilization

Selective Differential Diagnosis of Failure to Thrive

Inadequate caloric intake
Incorrect preparation of formula (too diluted, too concentrated)
Unsuitable feeding habits (food fads, excessive juice)
Behavior problems affecting eating
Poverty and food shortages
Neglect
Disturbed parent-child relationship
Mechanical feeding difficulties (oromotor dysfunction, congenital anomalies, central nervous system damage, severe reflux)

Inadequate absorption
Celiac disease
Cystic fibrosis
Cow's milk protein allergy
Vitamin or mineral deficiencies (acrodermatitis enteropathica, scurvy)
Biliary atresia or liver disease
Necrotizing enterocolitis or short-gut syndrome

Increased metabolism
Hyperthyroidism
Chronic infection (human immunodeficiency virus or other immunodeficiency, malignancy, renal disease)
Hypoxemia (congenital heart defects, chronic lung disease)

Defective utilization
Genetic abnormalities (trisomies 21, 18, and 13)
Congenital infections
Metabolic disorders (storage diseases, amino acid disorders)

Krugman S, *Am Fam Phys*, 2003

Aspects of failure to thrive

- Medical
- Nutritional
- Developmental
- Social

Developmental History

- Gestational and perinatal history
  - Age and parity of mother, pregnancy complications, substance abuse
- Developmental milestones
- Temperament of child
- Daily routine
- Child behaviors
  - Moody, demanding, rejecting, distractible
- Minor recurrent ailments
- Previous growth records- look for inflection points

Dietary History

- Over dilution of formula
- Large amounts of cereal or food in bottle
- Excessive fruit juice, soda, or water
- Inappropriate food texture
- Infrequent feeds (quiet children)
- No set feeding times
- No high chair
- Grazing
- Distractions from feeding
- Feeding struggles
- Food allergies (factitious food allergies)

Family History

- Familial illness with decelerated growth
- Severe childhood deprivation
- Developmental impairment
- Serious mental illness
- Parental eating disorder as a child
- Intergenerational substance abuse
- Consanguinity
- Height of both parents

Psychosocial History

- Family (dis)organization
- Social isolation
- Post-partum or other depression
- Substance abuse
- Violence
- Maternal childhood history of child abuse
- Parental stress
  - Job loss, death of family member
- Poor problem solving abilities
- Poverty

Poverty

- Difficulty buying sufficient food
  - food shortages at end of month
- Inadequate housing
  - lack of cooking facilities
- Crowding, leading to distractions
- Increased health problems
- Decreased access to health care
- Inferior educational opportunities

Physical Examination: Growth Assessment

- Weight, height (recumbent length < 2 yo), head circumference
- Plot measurements on proper growth curves
- Serial measurements are crucial
- Patterns of growth may suggest specific diagnoses

New Growth Charts
Updated in 2000

- Data used is different from 1977 data
  - Original charts based on white, middle class, bottle-fed infants
  - Eliminated VLBW babies from stats
- Age ranges
- Statistical smoothing
- More percentiles are available
- Lines match up with pounds and not kgs now
- Added BMI

Patterns of growth

- HC, Ht, Wt are similarly delayed in congenital and hereditary disorders
- HC normal, Wt and Ht proportionally decreased in constitutional delay and genetic dwarfism
- HC normal and Wt decreased out of proportion to Ht in malnutrition and malabsorption

Definitions

- Wasted: deficit in weight for age
  - failure to gain weight or loss of weight
  - develops rapidly and is readily reversed
- Stunted: deficit in height for age
  - chronic process, decreased skeletal growth
- Best index of acute risk is weight for height

TABLE 1. *Comparison of a normal, a wasted, and a stunted child using growth indices*

	Normal	Wasted	Stunted
Weight/age (%)	100	70	70
Weight/height (%)	100	70	100
Height/age (%)	100	100	84

Shah, *J Clin Gastro*, 2002

Percent of median weight for age as indication of severity of malnutrition
(Gomez criteria, J Trop Peds, 1956)

90-110% of median = normal

75-90% of median = mild

60-74% of median = moderate

<60% of median = severe

For instance, a 12 month old girl who weighs 7.3 kg has a median (50th%) weight of 9.7kg.
She is at 75% of her median weight, indicating mild FTT.

FTT: Levels of complexity

I. Mild-to-moderate FTT without a discernible organic disorder

Focus on age of onset, associated symptoms, possible feeding problems

Assessment and nutritional management at regular health-supervision visits

Parenting education

Referral to support services (La Leche, WIC, etc.)

Close follow-up until normal growth is established

II. Moderate-to-severe wasting and stunting, or failure of milder FTT to respond to initial trial of therapy

Intensive investigation of medical, nutritional, social factors

Identification and treatment of underlying medical illness (cystic fibrosis, tracheoesophageal fistula, etc.)

Referral for psychosocial interventions (developmental evaluation, community mental health)

III. FTT requiring hospitalization

More severe FTT; failure of milder FTT to respond to several months of therapy; abuse or neglect at home

Precise documentation of caloric intake and controlled refeeding

Treatment of malabsorption syndromes

Involvement of child protection services

IV. FTT requiring team management

Complex medical and psychosocial etiology

Collaboration among pediatrician, other medical specialists, nutritionist, social worker, mental health professional

Frank, *Cont Peds*, 1993

Physical Examination: Signs of Malnutrition

- Decreased pulse, temperature, BP
- Decreased activity, apathy, hypotonia
- Decreased adiposity
- Prominent ribs and bone structures
- "Old" skin, pallor
- Sparse fragile hair
- Heart murmur from anemia
- Protuberant abdomen, HSM

Characteristics of NOFTT Babies

- Less sociable
- Less likely to initiate interaction
- Less verbal
- Less attentive
- More irritable, fussy and demanding

Observation Points in NOFTT Families

Parents:

- physical contact, cuddling
- response to separation from child
- signs of depression, apathy
- loss of self-esteem
- lack of perception of child's needs
- observe feeding

Observation Points in NOFTT Families

Child:

- developmental level
- "radar" eyes (watchful); sad, apprehensive face
- body tone (rigid or floppy)
- oral self-stimulating behavior
- decreased stranger anxiety/ indiscriminate affection
- frog-leg, deprivation posture
- observe feeding- irritability, refusal, passivity

Mother-Infant Observation

- Haynes compared 51 mother-infant pairs with deprivational malnutrition to 25 normal pairs
- Mothers of malnourished babies either had no childhood memories or described unhappy, deprived childhood with frequent abuse
  - Real difficulty recognizing babies' needs
- Some healthy mothers also described trauma but had found support to help them

Haynes, *CAN*, 1983

Mother-Infant Observation

Conflict between needs of mother and needs of child

- Group 1: overwhelmed by stress or depression
  - When made aware could not figure out how to respond to child or correct problem
- Group 2: ambivalent- wt gain is baby's problem
  - Responded appropriately when her need and baby's need coincided, but not otherwise
- Group 3 hostile: babies are "demanding" or "bad"
  - Denied needing help
  - Often progress to aggression and abuse

Failure to Thrive Imitators

- Familial short stature
- Constitutional growth delay (shifting linear growth)
- Breastfeeding
- Intrauterine growth retardation
- Exposure to prenatal toxins
- Prematurity
  - correct head circumference until 18 months
  - weight until 24 months
  - height until 40 months

Diagnostic Considerations in Growth Failure Before Birth

- Symmetric IUGR
- Prenatal infections
- Congenital syndromes
- Teratogenic exposures

Diagnostic Considerations in Growth Failure in Neonates

- Incorrect formula preparation
- Failed breastfeeding
- Neglect
- Poor feeding interactions
- Less commonly, metabolic, chromosomal, or anatomic abnormalities

Diagnostic Considerations in Growth Failure at 3-6 Months

- Underfeeding
- Improper formula preparation
- Milk protein intolerance
- Oral-motor dysfunction
- GE reflux
- Celiac disease, HIV, cystic fibrosis, congenital heart disease

Diagnostic Considerations in Growth Failure at 7-12 Months

- Autonomy struggles
- Overly fastidious parent
- Oral-motor dysfunction
- Delayed introduction of solids
- Intolerance of new foods

Diagnostic Considerations in Growth Failure After 12 Months

- Coercive feeding
- Highly distractible child
- Distracting environment
- Acquired illness
- New psychosocial stressor

Limited Lab Assessment in FTT

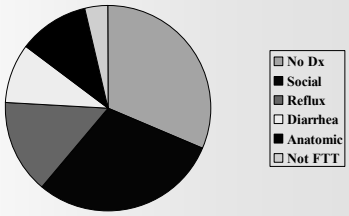
- Lab assessment rarely useful
  - Sills (*Am J Dis Child* 1978) found 0.4% diagnostic and another 1% "helpful"
- In specific cases:
  - screen for lead toxicity and iron deficiency
  - CBC
  - Urinalysis
  - PPD, HIV
  - electrolytes with BUN, creatinine
  - serum protein and albumin
  - alkaline phosphatase
  - Low serum bicarb should not be confused with RTA in FTT kids

Indications for Hospitalization

- Severe FTT (<60% ideal body weight)
  - Signs of severe malnutrition on exam
- Below birth weight at 6 weeks
- No weight gain in 2 weeks or not enough gain in 4 weeks
- Head circumference falling off curve at < 6 months
- Signs of abuse/ gross physical neglect
- Home unsafe/ caretaker inadequate
- Failure of outpatient therapy
- Pursuit of organic diagnosis

Medical Diagnoses

- N= 122 inpatient
  - av. age 25 months
- Yield of tests:
  - 0.8%
- Anatomic = 12
  - 2 Pyloric stenosis
  - 3 UTI
  - TB, Malrotation, Celiac Sprue
  - Hypercalcemia



Berwick, *Peds Rev*, 1980

When should FTT be reported to CPS/Police?

- Frank neglect or physical abuse
- Severe malnutrition
- Highly dysfunctional families
- Families resistant to recommendations
- Persistent failure of management attempts

May consider daycare services vs. foster care

Reunification

Parent should:

- demonstrate understanding of how the FTT occurred
- demonstrate understanding of child's needs (physical/emotional)
- be willing to receive in-home visits
- cooperate with the medical plan
  - Including weekly follow-up for as long as 6-8 weeks
- be willing to make lifestyle changes

Failure to comply may result in TPR

Types of Nonorganic Failure to Thrive

- Neglectful
  - Parent child problems
  - Passive child
  - Parental stress
- Accidental
  - Poverty-related
  - IQ related; literacy
  - Lack of parental sensitivity to child
- Deliberate starvation/Deprivational Abuse

Schmitt and Mauro, *CAN* , 1989

Deprivational Dwarfism

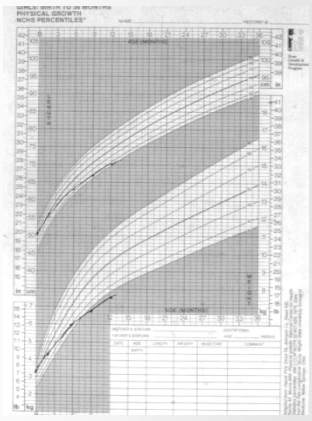
- 2-16 year old
- Steals food
- Gorges on food
- Eats unusual food, such as condiments
- Eats garbage
- Associated with depression and social withdrawal
- Requires separation from parents to treat

Fatal Starvation

- Meade, *J For Sci*, 1985
- Kloiber, *J For Sci*, 2004

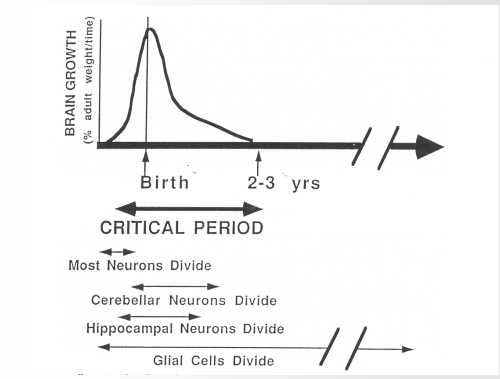
- Calculated daily caloric requirements necessary to prevent death
- Approximated number of days that food was withheld

Case Examples



Outcomes

- Growth
- Emotional Development
- Intellectual Development



Frank, *Ped Clinics of North Am*, 1988

Growth

- Treated adequately most children catch up to some degree
- On follow-up most children are smaller than peers
  - 25-30% have wts and hts below the 3rd percentile
  - Some children reach near normal after intensive years-long therapy
- Severe growth failure leads to decreased brain growth and smaller HC

Emotional Development

- High incidence of emotional disorders
- Significantly lower social maturity
- Significantly more behavior problems
- Increase in psychiatric services

Intellectual Development

- Borderline or retarded intelligence
- Significant school difficulties
- Delayed speech
- Delayed conceptual thinking
- Decreased language and reading skills
- Decreased math skills
- Repeated grades
- Poor impulse control
- Poor attention span
- Poor memory

Other Outcomes

- Impaired immunocompetency
- Combination of neglect and FTT causes worse cognitive outcome than nutritional deprivation itself (Mackner CAN 1997)
- Early postnatal FTT is a risk factor for future serious parenting deficiencies (Skuse J Med Screen, 1995)

Berwick, *Ped Rev*, 1980; Drotar, *J Dev Behav Peds* 1992; Oates, *Peds* 1985; Corbett, *J Psychol and Psychiat*, 2004; Alaimo 2001 Peds

Intervention

For any given problem, there is a solution that is simple, direct, and wrong.

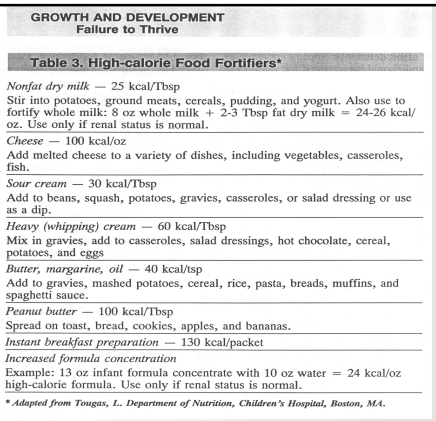
- H.L. Mencken

Multidisciplinary Team

- Pediatrician
- Nutritionist
- Social worker
- OT/PT/Speech
- Psychologist
- Developmental specialist

Goals

- Provide adequate calories
- Nutritional counseling
- Monitor growth
- Treat complications
- Long term follow-up
- Evaluation of family-social and nurturing
- Financial support



GROWTH AND DEVELOPMENT
Failure to Thrive

Table 3. High-calorie Food Fortifiers*

Nonfat dry milk — 25 kcal/Tbsp Stir into potatoes, ground meats, cereals, pudding, and yogurt. Also use to fortify whole milk: 8 oz whole milk + 2-3 Tbsp fat dry milk = 24-26 kcal/oz. Use only if renal status is normal.
Cheese — 100 kcal/oz Add melted cheese to a variety of dishes, including vegetables, casseroles, fish.
Sour cream — 30 kcal/Tbsp Add to beans, squash, potatoes, gravies, casseroles, or salad dressing or use as a dip.
Heavy (whipping) cream — 60 kcal/Tbsp Mix in gravies, add to casseroles, salad dressings, hot chocolate, cereal, potatoes, and eggs
Butter, margarine, oil — 40 kcal/tsp Add to gravies, mashed potatoes, cereal, rice, pasta, breads, muffins, and spaghetti sauce.
Peanut butter — 100 kcal/Tbsp Spread on toast, bread, cookies, apples, and bananas.
Instant breakfast preparation — 130 kcal/packet
Increased formula concentration Example: 13 oz infant formula concentrate with 10 oz water = 24 kcal/oz high-calorie formula. Use only if renal status is normal.

** Adapted from Tougas, L. Department of Nutrition, Children's Hospital, Boston, MA.*

Bithoney, *Peds in Review*, 1992

Behavioral Interactions

- Relax and make meals pleasant/Avoid battles
- Parent decides the food to offer, kid decides how much to eat
- Positive reinforcement
- Do not withhold food for punishment
- Eat as a family with no distractions
- Accept child's wish to feed himself (accept mess)
- Allow 1 hour before meal with no food to stimulate appetite; feed solids first
- Have a meal routine
- Recognize hunger and satiety clues

Bithoney, Peds in Review, 1992

Intervention for Nutritional Neglect

- Focus on ways to support the parents' capabilities
  - Short term crisis
  - Long-term difficulties
  - Malignant neglect
  - Financial issues
  - Mental handicap/psychiatric issues
- Alternative care

Intervention for Nutritional Neglect

- Interdisciplinary approach
  - social work, medical, teachers, mental health
- Interventions should be based on existing knowledge and theory
  - include parenting skills, stress reduction, impulse control, money management, job-finding services, weight reduction, smoking cessation, marital counseling, transportation

Intervention for Nutritional Neglect

- Encourage use of family's natural and informal supports
  - fathers, childcare, peer groups, church
- Least intrusive approach first
- Consider needs of child, parents, and family
  - parents may need insight into themselves before they can help others, children may need individual help
- Involvement of Child Protective Services

Intervention for Nutritional Neglect

- Structured intervention
  - development of proximal, intermediate and long-term goals
  - reasonable goals, in writing
- Home visitors
- Long-term interventions
  - problems are deep-rooted, multiple and chronic
  - most families need 12-18 months, and some need years

Intervention for Nutritional Neglect

- Prevention
  - close support and monitoring
  - counseling and anticipatory guidance
  - referral for services
- Advocacy
  - developing programs in communities
  - improving social policies

Summary

- FTT is multifactorial in origin
- History is paramount to diagnosis
- Laboratory evaluation is rarely necessary
- Hospitalize only selected cases
- Outcomes are uniformly poor without intensive treatment
- Early intervention carries the best prognosis