

## FAILURE TO THRIVE

### Introduction

Failure to thrive refers to a group of symptoms rather than a diagnosis. The phrase first appeared in the 1933 *The Diseases of Infancy and Childhood, 10<sup>th</sup> ed.* In 1960, Elmer referenced “maternal deprivation syndrome” to describe the psychosocial aspects of poor weight gain. In more recent years, terms such as *undernutrition* and *inadequate growth* have been proposed as alternatives.

No matter what appellation is used, the definition, diagnosis and management of infants and children who are growing inadequately are difficult and broad areas for discussion with variable literature to guide physicians.

### Statistics and Risk Factors

- FTT accounts for 1-5% of all pediatric hospital admissions
- Most common cause is undernutrition
  - Infants have three times the energy needs of adults
- Socioeconomic risk
  - Increased incidence with urban and rural areas of poverty
  - Risk factors of poverty include: poor knowledge of infant/child nutrition, financial hardship, and social problems/stressors
  - However, FTT is present in *all* socioeconomic classes
- Maternal risk
  - Children of mothers <18yo have shown poorer growth in the 1<sup>st</sup> year of life
- Abuse and neglect risk
  - 5-10% of FTT (in UK study) were registered for abuse
  - FTT children are four times more likely to be abused than controls

### Definitions and Anthropometrics

There is vast heterogeneity of definitions/parameters for failure to thrive. Most literature accepts any of the following three parameters:

1. Weight less than the 3<sup>rd</sup> or 5<sup>th</sup> percentiles on more than one occasion
2. Weight less than 80% Ideal Body Weight for age
3. Weight that crosses two percentile lines

However, studies have shown that there is no one anthropometric measure that is ideal to predict children at risk. Some have suggested that weight for height is a better indicator of acute risk, and it also provides a screening to determine children who are small due to familial short stature.

Notes about percentiles:

- 5% of infants will shift two centiles from birth to six weeks
- 5% of children 6wks to 1year will cross two centiles
- 30% of normal children 3-18mo will shift downward on the growth curve
- 5% of children at 98<sup>th</sup> percentile will fall three centiles, whereas only 1% of children at 2<sup>nd</sup> percentile will fall two centiles
- Children achieve their stable channel of growth by an average of 13months old

### Differential Diagnosis

The traditional classification of organic and non-organic failure to thrive has become less appropriate as there is growing understanding of the complex nature of growth. The **Transactional Model** of FTT focuses on the complex interplay of organic, psychosocial, and environmental factors.

The actual etiology of FTT is better understood through a analysis of caloric use. Therefore, the three major categories of FTT are:

1. Inadequate Caloric Intake
  - a. Anatomic – cleft palate, choanal atresia, micrognathia
  - b. Feeding issues – breastfeeding problems, poor technique, improper formula preparation, poor 6-12mo transition to solids, parental restriction due to health concerns, poor knowledge of nutrition
  - c. Psychosocial – poor mother-infant bonding, child neglect/abuse, emotional deprivation, maternal mental health
  - d. Neurologic – oromotor control, hypotonia, lack of suck coordination, hydrocephalus
2. Inadequate Caloric Absorption
  - a. Emesis – GERD, GI obstruction, drugs, food insensitivity, metabolic disorders
  - b. Malabsorption – chronic diarrhea, celiac disease, giardiasis, cystic fibrosis, food insensitivity, protein-losing enteropathy, excessive juice intake
3. Excessive Caloric Expenditure
  - a. Congenital and acquired heart disease
  - b. Chronic hypoxemia or pulmonary disease
  - c. Hyperthyroidism
  - d. Metabolic disorders
  - e. Immunodeficiencies
  - f. Recurrent infection

Other underlying etiologies include increased lead levels (whose absorption is increased in the presence of low Fe and Ca levels, which are seen in undernutrition), biliary atresia, hepatitis, iron deficiency anemia and malignancy.

Also of note, parental interactions can cause FTT through opposite mechanisms: less than six months of age it is often secondary to poor attachment, but 6-12mo it is often due to overinvolved parents “force feeding” and poor intake is a response.

Varying literature describes anywhere from 18-31% of cases are due to an underlying medical condition. The most common underlying medical condition is gastrointestinal (GERD and diarrhea).

### **Diagnostic Testing**

The majority of cases can be diagnosed through history or physical. In one often referenced article, 0.8% of all tests resulted in an abnormality contributing to diagnosis in hospitalized children.

Older literature indicates that 75% of “nonorganic” FTT can be diagnoses by history alone, and 25% can be diagnosed by physical.

Laboratory tests are then used if a specific medical condition is suggested, or to determine the nutritional status of the child. For the latter, it is appropriate to obtain a CBC, UA, UCx,, electrolytes, BUN/Cr. Nephrology literature suggests that a VBG bicarbonate is more sensitive than serum chem. for RTA.

### **Interventional Approach**

All evaluations begin with a thorough history including:

- Feeding History

- Developmental History
- Psychosocial History
- Family History
- Prenatal/Birth History

A thorough physical examination should be performed focusing on:

- Neurodevelopmental level
- Neurocutaneous features
- Dysmorphic features
- PARENT-INFANT INTERACTION (feeding, playing, caregiving)

The majority of FTT infants can be cared for as outpatients. One study in the UK demonstrated no difference between home versus clinic interventions, and one randomized controlled trial showed strong benefit from a home visitor intervention. Intervention includes close follow-up, dietary interventions based on catch-up growth, behavioral and feeding modification, etc.

Hospitalization is indicated if:

- Abuse or neglect is suspected
- Caretaker is impaired
- Severe malnutrition is present
- Patient is refractory to outpatient management

Original data suggested a 10-14 day admission was necessary. However, with the involvement of a multidisciplinary team approach, average stays can be shortened to 4 days with continuing outpatient follow-up.

Goals of hospitalization should be:

- Provision of adequate calories, protein, and other nutrients
- Nutritional counseling of families
- Monitoring of growth and nutritional status
- Specific treatment of complications or deficiencies
- Long-term monitoring and follow-up
- Education of the family on social and nurturing techniques
- Supportive economic assistance

At UCCCH, this involves the consultation of Nutrition, Social Work, CPS and the extensive involvement of and documentation by Nursing.

**Daily caloric requirements for catch-up growth:  $120 \text{ kcal/kg/d} \times \text{median wt (kg)} / \text{current wt (kg)}$**

### Outcomes

A variety of studies have demonstrated an increased risk of long-term growth and developmental delays. Due to the heterogeneity of definition and presence of confounding variables in most studies, one systematic review shows that any IQ differences are of questionable significance, but that height and weight differences between study groups are significant (with non-FTT subjects taller and heavier) but all subjects were above the 3<sup>rd</sup> percentile for both. More studies need to be done to determine the true incidence of long-term developmental and growth issues.

### Child Abuse and Neglect Issues

Risk factors that suggest neglect in the setting of FTT:

- parental depression, stress, marital strife, divorce
- parental history of abuse as a child

- mental retardation and psychological abnormalities in the parent(s)
- young and single mothers without social supports
- domestic violence
- alcohol or other substance abuse
- previous child abuse in the family
- social isolation and/or poverty
- parents with inadequate adaptive and social skills
- parents who are overly focused on career and/or activities away from home
- failure to adhere to medical regimens
- lack of knowledge of normal growth and development
- infant with low birth weight or prolonged hospitalization

Additional factors that should suggest abuse or neglect:

- Intentional withholding of food from the child
- Strong beliefs in health and/or nutrition regimens that jeopardize a child's well-being
- Family that is resistant to recommended interventions despite multidisciplinary team approach

## **References**

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