

# Understanding Pediatric Growth Failure (Failure to Thrive)

REVIEWED AND COMMENTED ON BY

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## THE OBJECTIVES OF THIS ARTICLE ARE TO:

- Consider the evolving meaning of the term “Failure to Thrive” (FTT)
- Present an approach to the diagnosis of FTT
- Evaluate the tests needed to establish the cause of the growth failure
- Summarize the management of FTT with an emphasis on nutritional intervention

## The Meaning of Failure to Thrive

A great many of the world's children are underweight (23% under age 5 according to the UNICEF report in 2006)<sup>1</sup> and a large number of parents, concerned that faltering growth will limit their children's physical and cognitive abilities, appeal for help. Health professionals should only apply the term “failing to thrive” to these children after careful consideration, as the label is viewed as an accusation. It is emotionally laden — possibly because it was first applied to institutionalized infants who lacked vitality and in whom “parental deprivation” rather than “inadequate nutrition” was considered the motivating cause of this syndrome. We now appreciate that these children actually were nutritionally deprived and therefore, failing to thrive is no longer considered a syndrome; rather, it is a sign of growth failure that almost invariably requires nutritional intervention. This definition brings into perspective the fundamental need for nutritional repletion but there are exceptions, such as children with hormonal deficiencies who are not short of nutrients. Markowitz emphasized that FTT is “failure to reach one's growth potential.” This allows that small for gestational age (SGA) infants, very small premature babies, children of short parents or very thin parents, as well as those with congenital syndromes characterized by short stature are not necessarily failing to thrive. These children may appear to have growth failure based on anthropometric screening measurements (eg, growing below the third percentile), but as Markowitz notes, one should not confuse “screens for FTT” with failing growth potential.<sup>2</sup>

## The Diagnosis of Failure to Thrive

Key to an assessment for FTT is the accurate measurement of anthropometrics, particularly weight and height. A stadiometer is ideal for height. For the reclining baby, 2 people are needed: one to steady the head and the other to extend the legs. These measurements are compared to accepted reference norms. The American Academy of Pediatrics recommends using World Health Organization growth charts for children 0 to 2 years of age, and Centers for Disease Control growth charts for children greater than 2 years of age.<sup>3</sup>

### Screens Used to Detect Possible FTT<sup>2</sup>

- Weight for age below the third percentile
- Height for age below the third percentile
- Weight <80% of ideal weight for height (BMI after 3 years of age)
- Thrive Index — present weight or height related to measurements at 4 to 8 months of age
- Weight below the fifth percentile more than once
- Weight crosses down 2 percentiles
- Failing to gain grams per day at expected rate

The above list shows a variety of screens that have been used to assess for FTT. Most commonly used is growth occurring below the 3rd percentile, or height/weight falling through 2 percentile lines. None of the screens are perfect. By definition, 3% of the population grows below the 3rd percentile, and by 2 years of life, a surprising number of normally growing babies will descend through 2 growth lines. If one only has a single set of measurements to go by, then a strong predictor of those at risk is finding that the child is less than 80% of ideal weight for height. Simple practical methods taking growth velocity into account include using tables to determine if the “Thrive Index” or if the rate of weight gain in grams per day are normal. As a rough guide, note that at

1 month, the baby is gaining approximately 30 grams a day; by 6 months, 15 grams a day; by the end of the year, 10 grams a day; and a year later, 5 grams a day, where it tends to stay for approximately 5 years.<sup>4</sup>

An approach to establishing the diagnosis of FTT starts with a consideration of the 3 possible growth patterns: When weight, length, and head circumference are equally affected, congenital abnormalities (dysmorphic children), SGA infants, very small, premature infants, as well as those with central nervous system pathology are likely; if head circumference is unaffected and the rate of weight gain exceeds linear growth, then endocrinopathies and constitutional growth failure should be considered; if decelerating weight is followed by height and ultimately head circumference, then malnutrition is likely, and this is the pattern for most children who are failing to thrive. For this category, a diagnosis can be reached by “following” the path taken by food in producing growth. Is there enough in the environment? Is it being effectively fed to the child? And if so, is it transported through the intestine, digested, absorbed, and ultimately deposited in tissue?

A breakdown in the feeding transaction between mother and child is a common cause of FTT.<sup>5</sup> An approach to the diagnosis and treatment of these children is suggested in the algorithm developed by Kerzner. He notes that every mother who complains that her child is not eating well should be taken seriously, even if the child looks healthy. The clinician then looks for worrying features — the so-called “red flags.” Those suggesting that organic disease might be involved need to be addressed promptly. They include dysphagia, aspiration, apparent pain with feeding, vomiting, diarrhea, developmental delay, and chronic cardiorespiratory symptoms.<sup>6</sup>

After solving the organic issue, a high percentage of children will still have feeding problems, and in many more, there is no organic issue. This large group is broken down into 1 of 4 categories:

- 1 children with poor appetite, including the **vigorous child**, the **apathetic child**, and the child with an **undetermined underlying organic disease**
- 2 the **highly selective child**, the so-called picky eater, who actually rarely fails to thrive
- 3 infants with **colic** whose crying interferes with feeding, another group that rarely fails to thrive
- 4 children who develop a **fear of feeding**, and who are among the most difficult to help overcome the feeding problem<sup>5,6</sup>

The child with a **poor appetite who is fundamentally vigorous** is interested in everything except feeding. These children are easily distracted by playing and talking. In these children, if weight gain slows, they are defined as having “infantile anorexia,” which has nothing to do with anorexia nervosa. Treatment involves the promotion of appetite. The child should be given nothing but water between meals. The conflict between mother and child must be resolved, mainly through reassurance. Faltering growth must be addressed by complementing the feeding and providing additional calories.<sup>5,6</sup>



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The **apathetic or withdrawn child** is very different. These children are malnourished and there is a breakdown in communication between caregiver and child, with limited verbal and nonverbal communication (smiling, babbling, and eye contact). These children appear depressed. At times there is evidence of neglect by the parent; more often they are the victims of circumstances. Reversing this problem may include replacing the caregiver with a more effective and empathetic feeder, moving the child into a hospital environment where nutrient intake can be enhanced, and addressing causal factors for neglect.<sup>5,6</sup>

Where there is **fear of feeding**, these children cry or pull back at the very sight of the food, bottle, or high chair. They have come to anticipate that feeding will be miserable. They resist feeding by crying, arching, or refusing to open their mouths. In older children this often occurs after a choking episode or force feeding. In order to overcome this, coercive noxious feeding practices must be avoided. Solutions to this include taking advantage of the fact that the child may readily feed in the sleep state. A schedule can be set up where the food is ingested during sleeping cycles. This allows the child to gradually become desensitized. In addition, it is helpful to replace the bottle with a cup or a spoon. In extreme cases a multidisciplinary feeding team including oral motor specialists and or behavioral therapists may be necessary.<sup>6</sup>

Children with poor appetite due to organic disease have food refusal due to an underlying abnormality. Red flags help to identify them but for many a high index of suspicion is necessary. A systematic approach considers mechanical, digestive, and absorptive impediments in the intestine as well as defects in the organ systems that control the deposition and metabolism of nutrients: the brain, endocrine, renal, and hepatic functions. The problem may be one of excessive requirements, as in cardiorespiratory failure, or it may be subtle, as in the case of celiac disease.<sup>6</sup>

## What Investigations Are Needed?

Poor nutrition and psychosocial factors are the most frequent causes of growth failure; therefore, laboratory testing has a very low yield of positive tests. In principle, laboratory tests are only warranted if the history and a physical finding indicate a need. “Baseline” studies help to screen for underlying pathology and are often necessary to help form an alliance with the family and assure them that subtle organic causes like celiac disease are not being neglected.

### Investigations to Consider in a Child With FTT

#### First line

- CBC ferritin
- ESR, CRP
- Urine analysis
- Complex metabolic panel to include glucose, creatinine, serum calcium, and liver function tests
- Lead level
- Anti-endomysial antibodies
- Thyroid function

#### Second line

- Urine microscopy and culture
- Allergy testing
- Serum amino acids
- Urine amino acids and organic acids
- Stool microscopy and culture
- Stool fat and elastase
- Sweat test
- PPD and HIV screen
- MRI
- Endoscopy with mucosal biopsies
- Impedance/pH probe
- Bone age
- Skeletal survey
- ECG echocardiogram

## Assessment of Dietary Intake and Nutrient Needs

In order to tailor intervention to meet the needs of the child, it is necessary to assess feeding issues and determine nutrient requirements. A thorough feeding history including details of volume, frequency, the foods preferred, their preparation and availability, as well as the response to transition from breast milk to formula and from liquids to solid textures is obtained.<sup>7</sup> Observing the behavior and interaction between the parent and child during a meal or feeding is extremely helpful to determine if there is a delay in acquiring developmental feeding milestones, rejection of specific textures and consistencies, or dysfunctional and disruptive feeding interactions, such as gagging in response to forced feeding. Competent swallowing without an aspiration risk must be ensured very early in the intervention.

Children who fail to thrive almost invariably need to increase their calorie and nutrient intake, and determining goals for them helps in developing appropriate interventions. The standard recommendation for calorie requirements for those failing to thrive is 120–200 kcal/kg/d (DRI for Age x Ideal Weight ÷ Actual Weight).<sup>2,8</sup> However, this method often over-estimates their energy needs. A more practical approach is to aim for the child’s DRI for calories for age and then add 10% to 20% of additional calories until the child is gaining at the normal growth rate for age. Incremental increases in caloric intake are better tolerated in children with FTT. Protein needs for children with FTT are similar to protein requirements for healthy children<sup>9</sup> but the consumption of some of the micronutrients, such as iron, zinc, and vitamin D, may be suboptimal.<sup>8</sup> Therefore, children with FTT should be evaluated for these nutrient deficiencies and supplemented as necessary. In most cases a multivitamin or 12 oz of a 30-calorie-per-oz formula will be sufficient to ensure adequate micronutrient intake.

## What Therapeutic Intervention Is Necessary?

Interventions for FTT should match the diagnosis.<sup>6</sup> If growth failure is due primarily to environmental causes, the emphasis of intervention should be on social services and education to improve parenting skills. When growth failure is due to

poor feeding interactions, then therapy revolves around behavioral guidelines and parental feeding practices, while providing adequate calories and nutrients for growth. If assimilation of nutrients is the primary problem, the child may need to avoid particular foods and receive modular formulas or replacement enzymes, in addition to increased calories and nutrients for both growth and replacement of losses. Finally, if growth failure is due to problems with deposition, then the child might need food adjusted to meet specific metabolic and organ function limitations while again receiving sufficient calories and nutrients to meet the child’s growth potential and specific needs.

### Anchor Foods

- Dairy or soy products
- Fortified cereals
- Meat or legumes
- Brightly colored fruits and vegetables

Intervention also involves strategies to increase oral intake. Helping parents develop a feeding schedule to encourage hunger is fundamentally important; meals and snacks should be offered at 3- to 4-hour intervals with nothing but water given in between.<sup>10</sup> It is also useful to encourage parents to identify nutrient-rich “anchor foods” and build meals around them so that an appropriate nutrient balance is ensured when calorie goals are met.

A 30-calorie-per-ounce balanced formula is helpful in providing appropriate nutrients, fats, and other calorie-dense foods to the diet, but as the calorie density of formula or food is increased, the volume of food consumed frequently diminishes.<sup>11</sup> Therefore, the relationship between caloric density and food volume must be balanced to encourage normal hunger and satiety responses, as well as to maintain hydration. Formula should be offered at the end of the day or as a snack, rather than between or with meals, because it may displace foods eaten.

### Feeding Principles

- Avoid distractions
- Feed to encourage appetite
- Limit duration of meals
- Offer age- and texture-appropriate foods
- Tolerate age-appropriate mess
- Encourage self-feeding
- Maintain a neutral attitude during meals
- Systematically offer new foods

*continued on back*



Ellen Satter has promulgated a very useful feeding strategy that partitions the responsibility of the parent and the child in the feeding relationship. **The parent decides when, where, and what the child is fed and the child decides how much.**<sup>12</sup> These feeding principles<sup>6</sup> will help parents meet their responsibilities in the feeding interaction. They help avoid forceful feeding and empower both the parent and the child.



Some children can't achieve normal growth with oral intake alone and must be tube fed. Indications for enteral tube feeding include children who are less than 80% of ideal weight for height; those who experience significant weight loss (>5%–10% of body weight); those at risk for poor hydration; and those who have poor oral motor function, especially if they are prone to aspiration.<sup>4</sup> Obviously children with growth failure should be evaluated carefully before being committed to tube feeding. Children with growth failure related to poor appetite, who are vigorous and active, are less likely to need tube feeding and may develop more aberrant feeding behavior as a result of this type of intervention.<sup>5</sup>

Eventually most children will return to oral feedings. They can do so once they are well nourished and can afford to lose a little weight. They must demonstrate competent oral feeding skills to avoid aspiration, and they should be on a tube-feeding regimen designed to encourage hunger and have parents who are willing to challenge them. There are several ways proposed to wean a child from the feeding tube but virtually all incorporate hunger as a powerful incentive to encourage the transition.<sup>10,14</sup> A sensible approach is to start by cutting calories by 10% to 20% every 2 to 4 weeks while increasing the intervals between tube feedings and offering high-calorie foods and beverages orally. Initial weight loss or slowed growth is expected and acceptable. If growth does not improve, however, the child should return to the calorie level where growth occurred.

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It is important to recognize that children with growth failure may have both physical and emotional difficulties with eating. Parents also influence the success of the intervention with their choice of feeding practices and their own eating behavior and experiences.<sup>15</sup> When developing treatment goals, it is important to achieve a balance between aggressive feeding and potential behavioral feeding problems. Short-term goals for treatment should be limited to achieving a normal growth rate for age and providing adequate micro and macro nutrients. Long-term goals, which include reaching a child's cognitive and growth potential and the development of healthy eating habits, take longer to accomplish. A stepwise approach will decrease the chance of inappropriate feeding practices without jeopardizing the child's nutritional status.

## CONCLUSIONS

Failure to thrive is a common condition that carries a lot of emotional weight and must be handled delicately. Screening for FTT demands accurate measurements to prevent misdiagnosis, and an algorithm needs to be followed to learn the mechanisms involved, whether they are physiologic or psychosocial. Once determined, there are appropriate and effective steps available to get the boy or girl who is failing to thrive back on track to a healthy childhood. ■

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