


Failure to Thrive

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Failure to thrive is a condition commonly seen by primary care physicians. Prompt diagnosis and intervention are important for preventing malnutrition and developmental sequelae. Medical and social factors often contribute to failure to thrive. Either extreme of parental attention (neglect or hypervigilance) can lead to failure to thrive. About 25 percent of normal infants will shift to a lower growth percentile in the first two years of life and then follow that percentile; this should not be diagnosed as failure to thrive. Infants with Down syndrome, intrauterine growth retardation, or premature birth follow different growth patterns than normal infants. Many infants with failure to thrive are not identified unless careful attention is paid to plotting growth parameters at routine check-ups. A thorough history is the best guide to establishing the etiology of the failure to thrive and directing further evaluation and management. All children with failure to thrive need additional calories for catch-up growth (typically 150 percent of the caloric requirement for their expected, not actual, weight). Few need laboratory evaluation. Hospitalization is rarely required and is indicated only for severe failure to thrive and for those whose safety is a concern. A multidisciplinary approach is recommended when failure to thrive persists despite intervention or when it is severe. (Am Fam Physician 2003; 68:879-84,886. Copyright© 2003 American Academy of Family Physicians.)

 A patient information handout about failure to thrive, written by the authors of this article, is provided on page 886.

See page 785 for definitions of strength-of-evidence levels.

The recognition of growth and developmental problems in infants and children is one of the major challenges facing primary care physicians. Failure to thrive (FTT) is a common condition of varying etiologies that has been associated with adverse effects on later growth and cognitive development.^{1,2} Primary care physicians need to be able to diagnose and manage FTT promptly to reduce the risk of long-term sequelae.

Definition

FTT is best defined as inadequate physical growth diagnosed by observation of growth over time using a standard growth chart. The National Center for Health Statistics (NCHS) recently released improved growth charts that can be found at www.cdc.gov. While definitions of FTT have varied, most practitioners diagnose FTT when a child's weight for age falls below the fifth percentile of the standard

NCHS growth chart or if it crosses two major percentile lines.³ Recent research has validated that the weight-for-age approach is the simplest and most reasonable marker for FTT.⁴ Other growth parameters that can assist in making the diagnosis of FTT are weight for height and height for age. FTT is diagnosed if a child falls below the 10th percentile for either of these measurements.

Etiology and Differential Diagnosis

Historically, FTT has been classified as organic or nonorganic. Usually, this distinction is not useful because most children have mixed etiologies.⁵ For example, a child may have a medical disorder that causes feeding problems and family stress. The stress can compound the feeding problem and aggravate FTT. A more useful classification system is based on pathophysiology—inadequate caloric intake, inadequate absorption, excess metabolic demand, or defective utilization. This classification leads to a logical organization of the many conditions that cause or contribute to FTT (*Table 1*).

Stress and other psychosocial factors frequently contribute to FTT. For example, a depressed mother may not feed her infant adequately. The infant may become with-

Failure to thrive is diagnosed when a child's weight for age is below the fifth percentile or crosses two major percentile lines.

TABLE 1

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)

drawn, responding to the mother's depression, and feed less well. Another example is when parents are overly anxious about a child's feeding. Coercive practices can lead to feeding behavior problems and FTT.

Growth variation in normal infants can confound the diagnosis of FTT. Approximately 25 percent of children will shift down their weight or height by more than 25 percentile points in the first two years of life.⁶ These children are falling to their genetic potential or demonstrating constitutional growth delay (slow growth with a bone age less than chronologic age). After shifting down, these infants grow at a normal rate along their new percentile and do not have FTT.

Specific infant populations with growth variations also need to be considered when making the diagnosis of FTT. Infants who have had intrauterine growth retardation or premature infants may appear to have FTT when they grow at less than the fifth percentile. As long as the child is growing along a curve with a normal interval growth rate, FTT should not be diagnosed.⁷ In addition, using

modified growth charts for specific populations, such as premature infants,⁸ exclusively breastfed infants, specific ethnicities (e.g., Asian), and infants with genetic syndromes (e.g., Down syndrome),⁹ can help reassure the physician that these children are growing appropriately.

Evaluation**RECOGNIZING FTT**

The key to diagnosing FTT is finding the time in busy clinical practice to accurately measure and plot a child's weight, height, and head circumference, and then assess the trend. One study¹⁰ from England demonstrated that 54 percent of general practitioners had not diagnosed FTT although a child's weight for age fell below two major percentile lines. In addition, a pilot study¹¹ performed at a family practice residency clinic found that of 29 children diagnosed with FTT, 100 percent of the charts contained measurements that were incorrectly plotted. The diagnosis was delayed in 41 percent of the patients.

HISTORY

After determining that FTT is a concern, the evaluation should focus on a careful history, including an assessment of diet and feeding or eating behaviors, and past and current medical, social, and family history. *Table 2* details items that should be covered in each category.

It is important to ascertain the child's developmental status at the time of diagnosis because children with FTT have a higher incidence of developmental delays than the general population.¹² Physicians should still be concerned about a child without developmental delays who is failing to thrive. FTT is primarily a growth disorder, not a developmental problem.

PHYSICAL EXAMINATION

A complete physical examination is essential, with four main goals: (1) identification of dysmorphic features suggestive of a genetic disorder impeding growth; (2) detection of underlying disease that may impair growth;

TABLE 2

Evaluation of Failure to Thrive: History

<i>History</i>	<i>Implication</i>
Dietary history	
Important to be as specific as possible (one-day log of all foods given and eaten)	Quantify total caloric intake.
Amount of food and/or formula	
Attempt to quantify total caloric intake (for infants)	
Is the formula prepared correctly?	Too diluted = too few calories; too concentrated = unpalatable, infant may refuse to drink
Types of food	
Beverage consumption—specifically milk, juice, sodas, and water	Excess fruit juice as cause for FTT
Feeding history	
When does the child eat? Where? With whom?	Distracted infants, inappropriate supervision
How is the child fed—self, spoon, other? Positioning?	Inappropriate feeding techniques for developmental stage
Feeding battles	Food refusal
Snack intake—what, how often is the child grazing?	Poor mealtime eating caused by snacking and early satiety
Past and current medical history	
Birth history—complications, small for gestational age, prematurity	Differentiate FTT from small for gestational age.
Recent acute illnesses—otitis media, gastroenteritis, recurrent viral infections	Growth may improve shortly on own, but needs close follow-up.
Chronic medical conditions—anemia, asthma, congenital heart disease	Organic causes of FTT
Past hospitalizations, injuries, accidents	Evaluate for neglect or child abuse.
Stool pattern—frequency, consistency, blood, mucus	Rule out malabsorption (cystic fibrosis, celiac disease), infection, and allergy.
Vomiting, reflux, or other gastrointestinal symptoms	Evaluate for milk protein allergy, gastroesophageal reflux, and infection.
Social history	
Who lives in the home?	Identify those caring for the child.
Who are the caregivers?	
Who helps support the family?	Assess adequate quantity of food.
What is the child's temperament?	High-strung, colicky children may have feeding difficulty.
Any important stressors—economic, intrafamilial, major life events?	May lead to inadequate food supply, depressed parents, neglect
Does anyone at home have a problem with alcohol or drugs?	Neglect
Other children with neglect, FTT, Children's Protective Service reports?	History of neglect
Family history	
Medical conditions or FTT in siblings	Predisposition to organic or genetic causes of FTT
Family members with short stature	Check midparental height formula.*
Differentiate between falling to expected height and true FTT.	
Mental illness	Caretakers with mental illness who may be unable to care for child

FTT = failure to thrive.

*— $[(\text{dad's height in cm} + \text{mom's height in cm}) \pm 13 \text{ cm}] \div 2$.

NOTE: Add 13 cm for boys, subtract 13 cm for girls. For example, if a girl has a mother who is 5 ft, 5 in (165 cm) tall and a father who is 5 ft, 10 in (178 cm) tall, her expected adult height is $[(178 + 165) - 13] \div 2$, or 165 cm. This height falls between the 50th and 75th percentiles for an 18-year-old girl, and this curve is followed to the actual age to predict the expected height.

(3) assessment for signs of possible child abuse; and (4) assessment of the severity and possible effects of malnutrition.^{12,13} The severity of a child's undernutrition can be determined most easily by using the Gomez criteria. By comparing the child's current weight for

age with the expected weight (50th percentile) at that age, the degree of malnutrition can be assessed. If the weight is less than 60 percent of expected, the FTT is considered severe, 61 to 75 percent denotes moderate FTT, and 76 to 90 percent is mild.¹⁴

No routine laboratory tests are ordered in the initial work-up of failure to thrive unless suggested by the history or physical examination.

PARENT-CHILD INTERACTION

FTT often involves psychosocial problems compromising the relationship or fit between parent and child. Observing the interaction between a parent and child, especially during a feeding session in the office, may provide valuable information about the etiology of FTT.^{3,12} Parents can be asked to feed an infant or bring in a snack for a toddler. The assessment should be done at a time when the child is hungry. It is important to pay attention to a caregiver's ability to recognize the child's cues, the child's responsiveness, and the parental warmth and appropriate behavior toward the child.¹² It is similarly important to observe the nature of the child's cues (clear or not), the child's temperament, and responses toward the parent. Developing a portrait of the relationship is key to guiding intervention.

LABORATORY EVALUATION

Laboratory evaluation should be guided by history and physical examination findings only. There are no routine laboratory tests that should be performed on every child, because

the majority of children with FTT have no laboratory abnormalities. In a classic study of hospitalized children with FTT, only 1.4 percent (36 of 2,607 tests) were of diagnostic assistance.¹⁵ [Evidence level B, historical, uncontrolled study] A practical approach to laboratory studies is to not order any at the time of diagnosis, unless suggested by the history or physical examination. For example, a history of steatorrhea (greasy, malodorous stools) should prompt the physician to send a stool sample for fecal fat and perhaps order a sweat test if there is suspicion of cystic fibrosis. If the child's growth has not improved, screening tests to consider at the next visit include a complete blood count and a urinalysis. If FTT persists despite an adequate diet, malabsorption can be further investigated by obtaining stool for fat and reducing substances, and possibly obtaining a celiac antibody profile.

Management Tools

The first rule for treating FTT is to identify the underlying cause and correct it. This requires a stepwise approach that is guided by history and response to therapy. Most cases can be managed by nutrition intervention or feeding behavior modification. Children who do not respond may require further evaluation. Two principles that hold true irrespective of the etiology are that all children with FTT need a high-calorie diet for catch-up growth, and all children with FTT need close follow-up. Usually, children should be followed at least monthly until catch-up growth is demonstrated and the positive trend is maintained.

THREE-DAY FOOD DIARY

It may seem surprising that undernutrition is a common factor in FTT, but with an energy need that is almost triple that of adults (in calories per kg) it becomes easier to understand how quickly infants can fall behind on growth.¹⁶ Having parents write down the types of food and amounts a child eats over a three-day period is one way of quantifying caloric intake. In some instances, it can make

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TABLE 3
Recommendations for Energy Intake

Age	Energy (kcal per kg per day) guidelines for average replacement
10 days to one month	120
One to two months	115
Two to three months	105
Three to six months	95
Six months to five years	90

Adapted with permission from Hay WW. Current pediatric diagnosis and treatment. 15th ed. Norwalk, Conn.: Appleton & Lange, 2001:250.

parents aware of how much the child is or is not eating.

Limit fruit juice to 8 to 16 oz per day. Fruit juice is an important contributor to poor growth by providing relatively empty carbohydrate calories and diminishing a child's appetite for nutritious meals, leading to decreased caloric intake.¹⁷

HIGH-CALORIE DIET

Children with FTT will need 150 percent of their recommended daily caloric intake, based on their expected, not actual, weight (Table 3¹⁸).^{6,7} In infants, this increased caloric intake may be accomplished by concentrating formula or adding rice cereal to pureed foods. Toddlers can receive more calories by adding taste-pleasing fats such as cheese, sour cream, butter, and peanut butter to common toddler foods. The government's supplemental food program for women, infants, and children (WIC) also provides high-calorie milk drinks (e.g., PediaSure). One or two cans per day can be used instead of milk, providing 30 calories per oz instead of the 19 calories per oz in whole milk. Adding a multivitamin helps ensure that a child receives the minimum recommended vitamins and minerals. Some practitioners add zinc to reduce the energy cost of weight gain during catch-up growth, though the data about its benefit are mixed.^{19,20}

FEEDING OR EATING BEHAVIORS

Parental anxiety about a child's FTT can be helped by reassurance. Parents should encourage, but not force, their child to eat. Meals should be pleasant, regularly scheduled, and

Children diagnosed with failure to thrive need to receive 150 percent of the recommended daily caloric intake for their expected, not actual, weight for age.

not rushed. It often helps if the parents eat with the child. The child should be positioned so that the head is up and the child is comfortable (e.g., in high chair). Starting with small amounts of food and offering more is preferable to beginning with large quantities. Parents should consider foods that the child likes (e.g., it is not important for children to eat four different green vegetables, but it is important to encourage some variety and to cover the basic food groups). Snacks need to be timed in between meals so that the child's appetite will not be spoiled.

HOSPITALIZATION

Hospitalization is rarely required, and most children with FTT are managed as outpatients. The lack of benefit to hospitalization in most cases has been apparent for decades.²¹ Hospitalization may be necessary when the safety of the child is a concern, outpatient management has failed, or the FTT is severe.

REFERRAL

For children who do not respond to initial management, it may be necessary to seek assistance from a subspecialist. Traditionally, a multidisciplinary approach to FTT—using physicians, nurses, dietitians, social workers, and psychologists—has produced better outcomes.⁷ This approach may not be practical in all cases, but for children who are not improving because of an undiagnosed medical condition or a particularly challenging social situation, a multidisciplinary approach may be the best answer.

Outcomes

Children with FTT are at risk for adverse outcomes such as short stature, behavior problems, and developmental delay.^{1,2,5,22-24} FTT is more

likely a contributing or associated factor to these adverse outcomes, rather than the exclusive cause. There are a limited number of outcome studies on children with FTT, each with different definitions and designs, so it is difficult to comment with certainty on the long-term results of FTT.²⁵ In addition, it is often difficult to disentangle the effects of FTT from those of the high-risk environments in which FTT often occurs (e.g., poverty, high family stress, and poor parental coping skills).^{5,26}

To decrease the risk of adverse effects, it is important to recognize and treat FTT promptly. Early childhood is a critical period for growth and development, and early intervention for any child with FTT will maximize the potential for better outcomes.²² Given the evidence of long-term problems, all children who have been diagnosed with FTT need to be followed carefully for possible later sequelae.

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