Evaluation and Treatment of Children with Failure-to-Thrive: An Interdisciplinary Perspective

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INTRODUCTION

Growth is an early, objective measure of a child's well-being during the first years of life [1]. Birthweight doubles in the first 5 months and triples in the first year. Similarly, birth length increases by 50% over the first year and doubles by age 4 [2]. Age- and gender-specific growth charts based on data from the National Center for Health Statistics (NCHS) are used to plot a child's weight and height [3]. Children who fail to grow according to age and gender expectations or who experience a deceleration in expected weight gain are classified as having failure-to-thrive (FTT).

The prevalence of growth deficiency has been estimated at 5% to 10% [4], but many undiagnosed children may be experiencing inadequate growth [5]. Information on the prevalence of inadequate growth among young children is available from the National Health and Nutrition Examination Surveys (NHANES I, II, and III) and the Pediatric Nutrition Surveillance System (PedNSS), conducted through the NCHS and the Centers for Disease Control and Prevention (CDC). On the NHANES, the prevalence rates of low height-for-age and low weight-for-height (below the 5th percentile based on the NCHS/CDC growth reference) among 2- to 5-year-old children were generally consistent with the expected 5%. The PedNSS examined the growth of young children in publicly funded nutrition and public health programs and found similar rates—low height-for-age at 5.8% and low weight-for-height at 2.6% [6]. Surveys of young children from low-income families have found higher rates of growth deficiency. For example, in a survey conducted in 1983 among 1429 children from low-income families in Massachusetts, 10.4% had low height-for-age (below the 5th percentile) and 8.3% were obese (above the 95th percentile weight-for-height) [7]. Although FTT is more common among infants from low-income families with limited resources, it is seen in all segments of the population [8,9].

FTT is widely recognized as a serious pediatric problem [10,11]. The long-term consequences of FTT include growth deficits, decreased immunologic resistance, diminished physical activity, depressed performance on assessments of cognitive development, and poor academic performance [10,12,13]. The relationship between nutritional status and long-term health outcomes often is mediated by family, environmental, and cultural variables [8,10,14], making the family an ideal context for preventing the negative consequences of FTT.

Although several medical conditions can undermine a child’s growth, in most cases no clear medical explanatory factors exist for FTT [9]. In contrast, psychosocial and communication problems are common among families of children with FTT. For these reasons, effective evaluation and management of FTT require clinicians from multiple disciplines to examine the medical, nutritional, and psychosocial aspects of inadequate growth. Bithoney and colleagues [15] have shown that after 6 months, children with FTT who were followed in an interdisciplinary clinic achieved better growth than children with the same level of growth deficiency who were followed in a primary care clinic. The authors attributed the improved growth to the use of age-appropriate high-calorie diets, specific interventions targeted to parent-child feeding behavior, treatment of child and maternal psychopathology, and attention to family issues (eg, housing, child abuse, neglect, and access to public assistance programs). The time and expertise required to provide these services necessitate an interdisciplinary team.

The following case study reviews the essential components of an interdisciplinary approach to the evaluation and management of children with FTT, which is modeled after the team approach used by the Growth and Nutrition Clinic at the University of Maryland Medical Center. The interdisciplinary team at our clinic includes a nurse, pediatrician, psychologist, nutritionist, and social worker. Due to the complex

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nature of FTT, each case is unique and handled differently. However, observations of feeding behavior conducted in the clinic through videotape and at home through direct observation are essential to our approach, as a child’s feeding behavior and the feeding partnership that develops between the parents and the child are central to FTT.

CASE STUDY
Initial Presentation

A 21-month-old female toddler is brought by her parents to the growth and nutrition clinic of a major university hospital for evaluation of poor weight gain, on referral by her primary pediatrician. The child was born at 29 weeks’ gestation, weighing 1070 g and measuring 38 cm in length (appropriate for gestational age). Her rate of weight gain was at the 25th percentile weight-for-height (adjusted for prematurity) until approximately 6 months of age, when her rate of weight gain began to decelerate and her adjusted weight-for-age dropped to the 5th percentile.

At the initial visit to the clinic, the child weighs 8.13 kg and is 76 cm in length; her head circumference is 44.5 cm (below the 5th percentile on all anthropometric indices). Her unadjusted weight-for-age is 70% of median, height-for-age is 90% of median, and weight-for-height is 82% of median. Thus, she is moderately underweight, mildly stunted, and mildly wasted [16,17]. The child’s primary pediatrician had suggested a feeding tube, but the parents are seeking other options.

Perinatal and Medical History

The clinic pediatrician collects the perinatal history. The child was conceived by in vitro fertilization. Her mother, pregnant for the first time at age 36, experienced an extremely difficult pregnancy resulting in gestational diabetes, pre-eclampsia, carpal tunnel syndrome, and possible kidney damage. The mother denies smoking or drinking during the pregnancy. The mother went into premature labor, and the child was born at 29 weeks’ gestation, weighing 1070 g and measuring 38 cm in length (appropriate for gestational age). Her unadjusted weight-for-age is 70% of median, height-for-age is 90% of median, and weight-for-height is 82% of median. Thus, she is moderately underweight, mildly stunted, and mildly wasted [16,17]. The child’s primary pediatrician had suggested a feeding tube, but the parents are seeking other options.

Social History

The child’s social history is gathered by the clinic social worker. The mother is 38, has a degree in nursing, and is employed full-time. The father is 47 and works full-time. Both parents report that their eating is better in day care than at home, which they attribute to the presence of other children.

Feeding Issues

The nutritionist collects information on the child’s feeding history. The mother reports that feeding problems began when the child was an infant, with frequent vomiting and refusal to take the bottle. Baby cereals were introduced at 6 months, followed by fruits and other baby foods. The parents tried several strategies: feeding the child any food she wanted when she wanted, forced feeding, and eating with her to model feeding enjoyment. The parents explain that the child does not seem to enjoy feeding or mealtimes and prefers to play. As she became older, the parents added calories by adding oil and butter to her foods and making milk shakes containing a high-calorie powdered supplement, whole milk, and ice cream, as advised by the child’s primary pediatrician.

Mealtime is very unpleasant. The parents dread meals because they feel pressure to ensure that their daughter eats something. One or both parents eat with the child, and the entire focus of a meal is dedicated to feeding her. The child is often uncooperative and at times gags or refuses to sit in the high chair.

Feeding Observation

The child is videotaped eating lunch at the clinic, and the psychologist reviews the videotape. The child is seated in a high chair with her parents on either side of her. They offer her noodles and a high-calorie shake in a sippy cup (plastic cup with lid). The child eats well, using a spoon to feed herself. Occasionally, her mother offers a spoonful, which the child accepts. At one point, the child begins to eat with her fingers and is told, “No, here’s your spoon.” Both the parents and the child are concerned with not making a mess. The child recognizes the word mess and identifies a mess as she is making it. The child is talkative and comments on the pictures of animals in the room. She seems to enjoy her food and hums to herself as the meal progresses. Her parents do not engage her except to encourage eating. Their conversation is strained and limited to the amount that she is eating. Several times they remind the child to chew because she eats her noodles quickly without much chewing. When the child is finished, she pushes the food away, attempts to get out of the chair, and the meal is ended. The family reports that the videotaped meal is atypical because the child ate so well. The

OUTCOMES AND THE PATIENT

The child is in good health. They have been married for 7 years and very much wanted to have a child. The father has a 19-year-old son from a previous marriage; the son does not live with the family. The parents share child care responsibilities and receive support from their extended family. The child attends family day care, where she eats breakfast and lunch. The parents report that her eating is better in day care than at home, which they attribute to the presence of other children.
parents express frustration that the child was so compliant and did not present the food refusal behaviors typically encountered at home.

- What is the definition of FTT?

**Defining FTT**

Multiple terms currently used to describe children with below-expected growth—pediatric undernutrition, malnutrition, poor growth, growth deficiency, growth delay, growth failure, and failure-to-thrive—all refer to children whose rate of growth has not kept pace with age and gender expectations based on national standards. However, there are no universally agreed-upon criteria to determine when FTT has occurred nor any indices that should be used to assess growth.

Until recently, FTT was categorized as organic or nonorganic based on etiologic factors. Organic FTT was identified by specific organic problems, such as gastrointestinal, endocrine, or genetic disorders. Nonorganic FTT was a diagnosis of exclusion: when no organic cause could be identified, a child’s poor growth was attributed to dysfunctional psychosocial factors within the family. However, this distinction is artificial because both groups of children may experience malnutrition and be at risk for diminished growth potential as well as immunologic and psychosocial consequences. Regardless of etiology, when a child does not eat or grow at a rate consistent with age expectations, most families are concerned and at increased risk for conflict over mealtime choices and behaviors. The dichotomy between organic and nonorganic FTT has been replaced by a broader conceptualization that incorporates medical, psychological, interpersonal, familial, ecological, and cultural factors into the evaluation of FTT and subsequent intervention strategies.

Although growth is described by multiple measures over time, many clinicians base their diagnosis of FTT on a single measure of weight-for-age or weight-for-height below the 5th or 3rd percentile. A child who is proportional (weight-for-height approximates the 50th percentile) gains weight along the 5th percentile with no health or nutritional problems, however, may be small but normal. A deceleration in the rate of growth is a better indicator of growth problems but requires multiple measures of growth over time and more sophisticated interpretation [15,18,19].

Some clinicians use growth quotient (GQ) to examine change in weight. GQ is calculated as follows:

\[
GQ = \frac{\text{observed weight gain in a given time}}{\text{expected weight gain in a given time}}
\]

Observed weight is based on changes in a child’s weight over time. Expected weight gain is based on the 5th percentile on the NCHS growth charts. A child growing at the expected rate would have a GQ of 1, a child growing faster than the expected rate would have a GQ greater than 1, and a child growing slower than the expected rate would have a GQ less than 1. Because a child’s rate of expected weight gain varies as he or she ages, it is important to compare a child’s weight gain with the expected weight gain for children of that age.

**Reviewing FTT in the Literature**

Some caution is recommended when reading the existing literature on FTT, because much of the information is derived from hospitalized children in academic referral centers. Hospitalized children may not represent the majority of current children with FTT who are treated on an outpatient basis and do not require hospitalization. In the managed care environment, children with FTT are rarely hospitalized unless they have severe, complicating problems. Hospitalized children are likely to have multiple nutritional, medical, and psychosocial complications. Investigators are now studying less biased samples of children who are more representative of community populations of children with growth problems [20,21]. Other important limitations of previous studies on FTT include small samples, a lack of appropriately matched comparison groups, nonstandardized assessments, evaluators who are aware of group assignment, inattention to differences in age or nutritional status, and cross-sectional rather than longitudinal research designs [22,23].

- How should children be weighed and measured?
- How should changes in weight and length be plotted?

**Measuring and Plotting Growth**

Children should be weighed and measured using standard procedures by personnel who have been trained (eg, via a training videotape available from NHANES) to ensure reliability and validity [24,25]. Weight and height are plotted on age- and gender-specific growth charts from the NCHS [3]. Weight-for-age is commonly used in pediatric clinics to track a child’s growth and is an excellent indicator of changes in weight over time. However, weight-for-age can be difficult to interpret because it does not account for variations in height [17,26]. When a child’s weight-for-age is low, it is unclear if the primary problem is low weight, short stature, or a combination of the two. Weight-for-height (weight plotted by height, regardless of age) reflects body proportionality. Low weight-for-height is often an early sign of malnutrition and
**Anthropometric Indices**

Anthropometric indices are expressed in multiple ways and may be confusing. Weight-for-age, weight-for-height, and height-for-age are expressed as percentile scores, standard deviation scores, or percent of median scores. Percentile scores are commonly used clinically because they are relatively easy to interpret. Standard deviation scores (Z-scores) are commonly used for analyses because they characterize extremes and facilitate comparison across ages [17]. They are, however, more difficult to use and interpret in clinical settings. Percent of median scores are often used to evaluate the degree of malnutrition. Percent of weight-for-age is calculated by dividing the child’s weight by the median expected weight (ie, the 50th percentile) based on the child’s chronological age. However, the median and distribution of the reference population vary by age and gender, so the clinical significance of percent of median scores differs depending on the anthropometric index. For example, mild wasting is defined as weight-for-height between 81% and 90% of median, and mild stunting is defined as height-for-age between 90% and 95% of median [15,16]. Percent of median scores can also be used to characterize change. For example, 2 months after referral to our clinic, the weight-for-age of the child in this case study had advanced from 70% to 74% of median, demonstrating catch-up growth. Because both scores are below the 5th percentile, percent of median provides a clearer description of the improved growth.

**Expected Growth Patterns**

During the first 2 years of life, children’s positions on both weight and height scales vary as they move closer to the median (ie, regression toward the mean) [25]. Beyond 2 years of age, there are fewer shifts and children tend to follow their genetically determined growth curve. Therefore, examining rate of change should always account for a child’s position on the growth distribution. A child who drops 15 points from the 75th to the 60th percentile may be regressing toward the mean, whereas the case study patient who drops 15 points from the 20th to the 5th percentile is experiencing growth failure, or FTT.

**Evaluating Growth in Premature Infants**

Growth charts are available from Ross Products (Abbott Laboratories, Inc., Columbus, OH) for premature infants with birthweights below 1500 g [28] and infants with birthweights between 1500 and 2500 g [29]. These growth charts are based on premature infants from various ethnic groups enrolled in the Infant Health and Development Program (IHDP), a national cohort of approximately 1000 premature infants collected in the 1980s. These charts reflect modern neonatal care and should replace the Lubchenco charts, which were collected from 5000 white infants born in Denver in the 1950s [25]. Another option is to use standard growth charts and to correct for prematurity, with recommended adjustments for gestational age up to 24 months on weight, 40 months on height, and 36 months on head circumference [30]. There is debate regarding the long-term growth potential of children born with low birthweight (< 2500 g) [25]. Previously, researchers believed that body proportionality (symmetry versus asymmetry) was an indicator of specific causal mechanisms. However, recent studies from large cohorts of children illustrate that children with low birthweight have a reduced growth potential regardless of their proportionality [25].

**Interdisciplinary Approach to Evaluation of FTT**

FTT presents multiple challenges to community physicians because it includes physical, psychological, and social issues. Although children with FTT are at risk for a range of long-term growth and health problems, most children do not have medical problems, and diagnostic laboratory tests are of limited value [9]. In addition, children with FTT are typically managed as outpatients.

Because FTT is a complex, multifaceted problem with medical, nutritional, and psychosocial issues, an interdisciplinary approach is optimal to ensure that the child receives a comprehensive evaluation across multiple domains and an integrated set of recommendations [5,15]. In an interdisciplinary team, clinicians from multiple disciplines conduct independent evaluations but coordinate their evaluations to reduce redundancy and ensure comprehensiveness. Clinicians communicate frequently, so that recommendations and reports are integrated across disciplines. Children with FTT who receive care in interdisciplinary growth and nutrition clinics achieve better growth than children served through primary care clinics [15]. Working with an interdisciplinary team to address the nutritional, feeding, parent-child communication, and social problems commonly found in families of children with FTT is a cost-effective strategy that leads...
to improvements in growth [15]. With this approach, children are more likely to receive the integrated services they need and to avoid expensive medical tests and extended visits.

**Growth and Nutrition Clinic at the University of Maryland**

The clinic at the University of Maryland is similar in structure to many growth and nutrition clinics across the country. Children are referred for evaluation and treatment related to concerns about growth or feeding problems. Each child is weighed and measured by a nurse and evaluated by a pediatrician, psychologist, nutritionist, and social worker. The pediatrician reviews the child’s neonatal and medical history and conducts a physical examination. The nutritionist reviews the child’s dietary history and current nutritional intake and the household feeding practices. The psychologist conducts a developmental evaluation of the child and observes the family interacting during a videotaped observation of a meal. The social worker interviews the family regarding resources and access to services and conducts a home visit to observe mealtime interactions in the home.

At our clinic, the initial evaluation typically requires 2 clinic visits and 1 home visit. The first clinic visit involves a videotaped feeding observation, the order of the other evaluations varies. We schedule the nutrition evaluation on the first visit, so we can correct nutritional misconceptions and initiate nutritional counseling as soon as possible. We also schedule the pediatric evaluation on the first visit to obtain additional medical information if necessary. The social work evaluation may be conducted during either clinic visit or the home visit. The second clinic visit typically includes the developmental assessment, a review of the videotaped feeding observation, and feedback from the previous evaluations. The clinic has a baby-sitter to care for the child while the parents or caregivers are participating in the evaluations and intervention.

- **What are the medical considerations in the evaluation of FTT?**

**Medical Evaluation**

For children with FTT, the importance of a careful medical history cannot be overstated. The history should begin with information about the pregnancy, including the mother’s obstetric history, number of pregnancies, exposure to toxic substances (legal and illicit), infections, weight gain, stress, and emotional support.

The perinatal history provides information about the infant’s intrauterine environment. Information should be gathered on gestational age, birthweight, length, head circumference, infections, Apgar scores, congenital anomalies, medical complications, and length of hospital stay. Newborn growth parameters should be plotted on a newborn growth chart to determine whether the infant was small, average, or large for gestational age. Low birthweight, particularly small for gestational age, is probably the most common cause for growth delay during infancy and early childhood. Children with low birthweight remain behind their peers until approximately 5 years of age [31].

The medical evaluation is important because children with FTT are more likely to have experienced recurring illnesses, particularly respiratory conditions, otitis media, and gastrointestinal problems [32]. Although severe medical conditions such as cystic fibrosis or HIV infection can undermine growth, most cases of FTT have no clear medical explanatory factors, making extensive laboratory tests unwarranted. In a classic study of children hospitalized for FTT, only 1% of the laboratory tests provided useful information and only 0.4% of tests established the diagnosis [9].

Rider and Bithoney [32] recommend that the minimal laboratory evaluation include hemoglobin or hematocrit, urinalysis (specific gravity and pH), and urine culture. A urinalysis and culture can reveal asymptomatic bacteria (occult infection), and a normal pH and specific gravity reassure that kidney function is normal. If the complete blood count (CBC) with differential and red blood cell indices are normal, malabsorption, chronic infection, iron deficieny, or severe lead poisoning are less likely diagnoses. When indicated by history or physical or environmental factors, purified protein derivative (PPD), HIV, and lead level tests may be performed. Additional laboratory tests should be performed if information from the interview with the family or abnormal physical findings raise suspicion. For example, a greater deceleration in weight than in height may indicate endocrine problems and warrant an assessment of bone age. Diarrhea may warrant stool analysis (pH, reducing substances, occult blood, methylene blue stain, ova and parasites) and sweat chloride testing. Recurrent emesis or discomfort may suggest reflux esophagitis or gastritis, and radiologic studies, endoscopy, or pH probes may be diagnostic. There are detailed references that may be useful when further medical testing is warranted [32].

- **What are the nutritional considerations in the evaluation of FTT?**

**Nutritional Evaluation**

The National Academy of Sciences has published recommended dietary allowances (RDAs) of nutrients by age [33] (Table 1). Because FTT usually is associated with inadequate nutritional intake, evaluation requires careful attention to current and past nutritional history. A feeding interview, or
diet history, is often used to evaluate a child’s nutritional intake and to identify family mealtime patterns. The most common strategy is a 24-hour recall, in which the parent or guardian is asked to review the food offered and eaten during the previous 24 hours. Although this strategy is subject to respondent bias and relies on the parent’s memory, a skilled clinician can administer a 24-hour recall by asking open-ended questions to review the structure of the child’s day. Clinicians may also ask parents to provide a 3-day food record. Parents will provide more accurate responses if the clinician provides clear instructions, emphasizes the importance of determining the child’s eating habits, and does not chastise the parents for food choices. Parents may resort to desperate strategies to encourage their children to eat.

The nutritional evaluation should also include the child’s feeding history. The clinician should ask about the method of early feeding (breast or bottle), any decisions to change formula, introduction of solid food, weaning, the child’s acceptance of new foods, and the child’s method of expressing pleasure or displeasure with food. The clinician should also ask parents about their beliefs regarding children’s nutritional needs, access to food, and family mealtime patterns, because children who are permitted to graze (ie, to drink or eat throughout the day) may not be hungry at mealtime. Similarly, family members who are on diets may be restricting their caloric intake and inadvertently modeling dieting behavior for their child.

A child’s mealtime behavior should also be assessed, including questions about where the meal takes place, availability of child-size equipment (eg, high chair), involvement of other family members, and competing activities (eg, television). Finally, parents should be asked about feeding behavior problems, including refusal, negativism, appetite, and pica.

**Psychological and Developmental Considerations**

Evaluations for children should include their growth and feeding history; temperament, cognitive, motor, language, and socioemotional development; and parent-child interaction [34]. Standardized, norm-referenced assessments, such as the Bayley Scales of Infant Development II (BSID II) [35] and the Receptive Expressive Emergent Language Scale [36], are often used to determine children’s cognitive, motor, language, and socioemotional development because children with FTT often have delays in other areas and may be eligible for early intervention services. Scores on norm-referenced assessments can also be used to track children’s developmental progress through the intervention process. The Behavior Rating Scale on the BSID II is particularly useful, because it provides norm-referenced data on children’s behavior in a structured setting.

- **What is the normal progression of feeding skills?**

- **How are feeding skills related to parent-child interaction, developmental skills, and behavior problems?**

### Normal Progression of Feeding Skills

Feeding progresses through increasingly complex stages as children acquire the skills to move food from the front of their mouth to the pharynx in preparation for swallowing [37,38]. In the initial stage, liquid is drawn into the mouth by sucking and moved to the back of the mouth by the elevation and retraction of the tongue.

Weaning occurs when children switch from a diet that is primarily breast milk or formula to solid food [39]. As children’s neurologic skills mature, their feeding skills become more sophisticated, and they are able to handle a wider variety of textures and flavors [40]. For example, children are unable to handle solids before they have achieved the oral-motor control necessary to move food to the back of their mouth in preparation for swallowing. On the other hand, an oral-motor problem may exist in children with physical conditions such as cerebral palsy. If the parent provides a history that includes choking or difficulty with foods of varying texture, the child’s oral-motor development should be examined by an occupational therapist or another professional with training in feeding disorders [41].

Once children learn to sit, they are more comfortable eating in a seated position than in a reclining position. In addition to ensuring that children remain seated during a meal, high chairs and booster seats provide support and promote body position and hand-to-mouth control that facilitate feeding [42]. High chairs also restrain children and ensure that they remain seated throughout the meal.

### Table 1. Recommended Dietary Allowances for Energy and Protein

<table>
<thead>
<tr>
<th>Age</th>
<th>Energy (kcal/kg)</th>
<th>Protein (g/kg)</th>
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</thead>
<tbody>
<tr>
<td>0–6 months</td>
<td>108</td>
<td>13</td>
</tr>
<tr>
<td>6–12 months</td>
<td>98</td>
<td>14</td>
</tr>
<tr>
<td>1–3 years</td>
<td>102</td>
<td>16</td>
</tr>
<tr>
<td>4–6 years</td>
<td>90</td>
<td>24</td>
</tr>
</tbody>
</table>

As children develop more sophisticated hand control, they assume more responsibility for feeding themselves. Although early self-feeding often results in messes with limited amounts of food consumed, it enables children to build mastery around feeding and involves them in the meal. The early phase of self-feeding is often a “2-spoon” period, as both child and parent hold spoons and share feeding.

Table 2 outlines problems that can develop during each of these stages of feeding progression, as well as preventive measures.

### Parent-Child Interaction and Feeding Skills
Caregivers help their children build expectations around food and mealtimes. Children, in turn, learn to interpret and satisfy feelings of hunger and satiety through feeding. A “feeding partnership” develops whereby children and caregivers communicate with one another. This partnership forms a basis for the emotional attachment essential to healthy social functioning and for the division of responsibility that guides healthy feeding behavior. Parents are responsible for feeding their children healthy food on a predictable schedule in a nurturing, developmentally appropriate setting, and children become responsible for determining how much they will eat [45–47].

Disruptions in parent-child communication may result in counterproductive battles over food. Although it may appear paradoxical, children who refuse to eat often gain power and control over their parents. Thus, when mealtimes become stressful or confrontational, children may be denied both the nutrients they require and healthy, responsive interactions with parents.

Interactional or communication problems (ie, mutual lack of clarity and insensitivity to cues) have been observed between children with FTT and their mothers during mealtime and playtime [48–51]. Under optimal circumstances, the communication between parents and children is clear because each adapts to the signals of the other and to the demands of the situation. Parent-child interaction breaks down if communication is distorted and marked by signals lacking in clarity, misperceptions of signals, inconsistent

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**Table 2. Feeding Problems and Recommendations for Prevention**

<table>
<thead>
<tr>
<th>Feeding Stage</th>
<th>Problem</th>
<th>Prevention (Parent and/or Clinician Action Required)</th>
</tr>
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<tbody>
<tr>
<td>Liquid</td>
<td>Neurologic or anatomic deficits</td>
<td>Offer breast milk or formula frequently, at predictable intervals, and when the child exhibits signs of hunger</td>
</tr>
<tr>
<td></td>
<td>Parents insensitive to child’s needs</td>
<td>Hold child during feeding in a comfortable, cradled position with head and trunk well supported</td>
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<tr>
<td></td>
<td></td>
<td>Respond to child’s signals that indicate satiety, distress, or hunger [42]</td>
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<tr>
<td></td>
<td></td>
<td>For bottle-fed babies: ensure nipple type and hole provide an adequate supply of liquid; ensure child develops an appropriate rhythmic pattern of feeding</td>
</tr>
<tr>
<td>Solid food</td>
<td>Solid food introduced too early*</td>
<td>Educate parents that this sign indicates the child is not ready for solid foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Help parents avoid misinterpretations that could worsen mealtime stress by asking about the feeding partnership, with careful attention to the developmental challenges that the parent may be presenting to the child</td>
</tr>
<tr>
<td></td>
<td>Delayed weaning/refusal of solid foods†</td>
<td>At 6 or 7 months of age, begin to offer solid foods so child can learn to chew [43]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Offer security of an alternative transitional object (eg, blanket or stuffed animal) during weaning process</td>
</tr>
<tr>
<td>Sitting in high chair</td>
<td>Child averse to being in chair</td>
<td>Avoid sudden introduction to high chairs</td>
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<tr>
<td></td>
<td></td>
<td>Avoid confining child to high chair unattended or for long periods of time</td>
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<tr>
<td></td>
<td></td>
<td>Ensure that child is seated comfortably with support</td>
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<td></td>
<td></td>
<td>Encourage child to associate sitting in high chair with pleasant aspects of mealtime</td>
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*Exclusive breast or bottle feeding that persists into the second year of life without adequate complementary feeding may not provide children with the variety of nutrients they require for healthy growth [44]. In addition, delayed introduction of solids may interrupt the development of age-appropriate feeding skills by continuing an infantile behavior.
responses, or responses not in keeping with the signal. Children vary in their capacity to communicate with their parents, and children who are ill, premature, or temperamentally challenging may be less able to initiate or sustain clear communication [52]. Parents also vary in their ability to interpret and respond to their children's signals. For example, during the second 6 months of life, children become more aware of their surroundings and may pause during feeding to look at something in their environment. A parent who interprets the pause as meaning that the child is no longer hungry may terminate the meal prematurely, leaving both parent and child frustrated. Distorted parent-child communication can contribute to the higher rates of insecure attachment found among children with FTT [53–55].

Behavior Problems

Children with feeding problems often display difficult behavior in other settings, as measured through both observation and maternal report [56]. Among some children, the behavior problems associated with feeding are part of their overall temperament (ie, responses to their physical and social environment), including irritability, apathy, and generalized inactivity or overactivity [57–60]. The relationship between feeding and temperament can only be understood by examining family dynamics and the parent-child relationship. Temperament can be assessed directly by observing the child during feeding and indirectly by questioning the parent regarding the child's adjustment to daily routines, such as feeding, bedtime, bathing, dressing, and social interactions. Children who are temperamentally difficult are often resistant to changes such as new foods.

An optimal way to evaluate children's feeding skills and temperament is to videotape parents and children having lunch. Before the initial visit to our clinic, the parents are told that a videotape will be made of them with their child during lunch, and the visit is scheduled for a time when the parents think the child will be hungry. Parents may either bring food or eat the food available in the clinic (baby food, microwavable meals, applesauce, pudding, crackers, milk, and juice). Feeding occurs in a room equipped with a high chair, child's table and chair, and adult chairs. Families are instructed to sit wherever they prefer, to feed their children as they do at home, and to take as long as necessary. The video camera is visible in the room, but an operator does not need to be present. The family remains in the room alone until they signal that they have finished.

- What are the family considerations in the evaluation of FTT?
about food, feeding behavior, and growth. If the parents’ beliefs are incorrect, clinicians should help parents modify their beliefs. For example, showing parents how to plot their child’s growth on a growth chart can help them understand their child’s relative position in comparison with other children of the same age and the changes expected in weight and height.

**Food Acquisition, Storage, and Preparation**

Clinicians should inquire about the family’s access to food and to facilities for storage and preparation. A family’s ability to purchase healthy food may be hampered by the lack of supermarkets in low-income neighborhoods, by transportation, or by economic limitations [75]. Some families must rely on nearby convenience stores, which stock expensive, prepared food. For families with limited financial resources, the clinician should ask about access to public assistance programs, such as food stamps, WIC (Special Supplemental Nutrition Program for Women, Infants, and Children), and TANF (Temporary Assistance to Needy Families).

**Home Visits**

Home visits provide an ideal opportunity to assess family interactions and mealtime behavior. Observing the child and family in their natural environment enables clinicians to consider the contextual variables that may influence feeding, including the physical environment and the presence of other family members. Observations should be directed toward both parents and children, rather than focusing exclusively on parental behaviors. For example, recommending that the family eat together, seat the child at eye level with the family, place plastic or newspaper on the floor under the child’s seat, and remove the television from view can facilitate communication and modeling during mealtime.

**Home Visit**

The home visit is conducted by a social worker the week following the initial clinic visit. The family lives in a middle-class community in a single-family home that is neat and well maintained. They have a high chair in the kitchen, where the child eats. Apart from mealtime, interactions between the child and the mother are pleasant. The mother uses appropriate redirection of the child’s behavior when needed, and the child responds to the mother’s instructions. The child plays independently as well as with her mother. She is verbal, enthusiastic, and appears to be happy.

The home visit includes an observation of breakfast. The mother appears anxious as she prepares the food (scrambled egg and a high-calorie milk shake), and she talks to the child about eating (“I sure hope you eat more this morning than you did last night’’). As the mother lifts the child into the high chair, the child insists on climbing in by herself and immediately begins to fuss and cry. She shows no interest in eating and tries to throw the bowl and sippy cup onto the floor. The mother tries to secure the bowl onto the tray and coax the child into eating. The child eats two small morsels of egg that fell onto the tray and takes one small sip of milk shake. Then she pushes the food away, attempts to stand up, announces that she is finished, and the meal is terminated. The meal is brief, unpleasant, and appears to be frustrating for both mother and child. The mother mentions that the child did not eat dinner the previous evening.

Following breakfast, the child walks around carrying her sippy cup and a bowl of Cheerios. Later she eats a few pieces of egg, while her mother is distracted. The mother talks about the frustration that she and her husband are experiencing regarding their child’s refusal to eat or to try new foods. She reports that they are frequently discouraged before mealtime and spend a great deal of time talking about how to encourage their child to eat.

**Developmental Assessment**

On the second clinic visit, the child participates in a standardized developmental assessment conducted by a psychologist who is part of the interdisciplinary team. The child is compliant and cooperative and demonstrates an age-appropriate attention span. Her cognitive, motor, and language development are within normal limits whether adjusted for prematurity or not. She presents as a socially interactive child who is aware of her surroundings.

The parents are questioned as part of the developmental assessment. They report that the child has adjusted well to household routines (eg, bedtime) and responds well to limits. The child attends day care while the parents work. The parents are very nurturing toward their daughter and report that her poor appetite and refusal to eat are their only major concerns.

- On the basis of the information gathered thus far, what recommendations can be made to this child’s parents for managing her FTT?

**General Considerations in Management of Children with FTT**

In this case study, the child’s parents are clearly knowledgeable about the nutritional requirements for a toddler and able to provide regularly scheduled nutritious meals. Traditional methods of evaluation and intervention, including laboratory tests and a recommendation to increase the child’s caloric intake, were tried but did not result in weight gain. Both the primary pediatrician and the parents were
frustrated by the child’s lack of weight gain and ready to consider an expensive and intrusive intervention—the insertion of a feeding tube.

In the past, FTT and feeding problems were often conceptualized as child issues, with little attention directed to the role of the family or to the social environment. However, with the recognition that feeding occurs within a social context, effective interventions frequently involve the family and broader culture. Despite encouraging findings from clinical and observational studies, there have been few randomized controlled trials of intervention into feeding problems or FTT that incorporate family-focused intervention strategies [76] (see Wright et al [21] for an exception).

The interventions recommended here focus on increasing a child’s nutrient intake and promoting healthy feeding patterns within families. Specific medical and developmental interventions (eg, treatment of gastroesophageal reflux, oral-motor stimulation) are guided by the evaluation and are not reviewed here.

• What are the nutritional considerations (eg, achieving catch-up growth, improving feeding habits) in the management of children with FTT?

Nutritional Considerations

The Food Guide Pyramid developed by the U.S. Department of Agriculture is useful for ensuring that children receive an adequate variety of foods. Nutritional recommendations should be consistent with the family’s cultural preferences, financial limitations, and access to food stores. The child’s developmental feeding skills and food preferences should also be considered. Solid foods should be offered before liquids. New foods should be introduced slowly and repeatedly, because children are often resistant to new foods until they become familiar. Studies with preschool children show that when they observe others eating and enjoying novel food, they shift their preferences and eat novel food that they previously rejected [77]. Therefore, children benefit from eating with others.

Calculating Caloric Requirements for Catch-up Growth

Children require extra calories to achieve “catch-up growth” or to improve their relative position on the growth charts. Caloric requirements for catch-up growth are determined by calculating the child’s ideal weight (ie, weight-for-height or weight-for-age if it were at the 50th percentile). Minimal requirements for catch-up growth are based on ideal weight-for-height, and maximal requirements are based on ideal weight-for-age (Table 3, Figure). For example, when the child in the case study presented at 21 months, she was the average weight of a 7½-month-old child. Children aged 7½ months require 98 kcal/kg/day. The child’s ideal weight-for-age was 11.4 kg (ie, the 50th percentile weight-for-age for 21-month-old girls), and her ideal weight-for-height was 9.8 kg (ie, the 50th percentile weight-for-height for girls of 76 cm).

Children’s nutritional requirements differ from those of adults. Children often require foods with increased caloric density to achieve catch-up growth [30]. Often an initial recommendation is to concentrate the caloric content of formula from 20 to 24 kcal/oz. For example, a 13-oz can of regular concentrate can be used to prepare a 22-oz formula by adding 8 to 9 oz of water instead of 13 oz. Alternatively, 1 cup plus 3 Tbl (19 Tbl) of powder can be combined with water to equal 1 qt of formula. Another suggestion is to increase the fat content of foods by adding margarine, oil, cheese, or peanut butter. Once children are no longer receiving formula, they should receive whole milk that may be fortified with dried milk or a packaged supplement to add calories. Children should receive 16 to 24 oz of milk daily. Intake of juice and other sweetened drinks should be limited, because children will experience a sense of satiety and not eat at mealtimes [78]. Children need to eat more often than adults (3 meals and 2 to 3 snacks daily). Snacks should be minimal meals rather than opportunities to eat low-nutrient dense foods.

Improving Feeding Habits

Feeding habits are an important component of the intervention. Children need to develop expectations regarding when mealtimes will occur, with approximately 2 hours between meals and snacks. They need to eat frequently but should not graze. When children refuse to eat, parents should terminate the meal, rather than engaging in conflict, bribery, or forced feeding. Children may also benefit from a daily vitamin that ensures that they are receiving 100% of the RDA of vitamins and minerals (including zinc and iron) for their age.

• How is the videotape used as an intervention tool?

Parent-Child Interaction

In our clinic, the videotape made during the evaluation phase is reviewed by the staff and then shown to the family. The staff views the videotape, looking for positive examples of parent-child communication in which cues are clear and partners are responsive to one another. For example, a responsive parent may give the child a bite and wait while the child chews and opens his or her mouth again, rather than attempting to present a subsequent bite before the child is ready. Showing families positive examples enables them to be their own models. By watching themselves with their
FAILURE-TO-THRIVE

Table 3. Calculating Caloric Requirements for Catch-up Growth

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Plot the child’s height and weight on NCHS growth charts</td>
</tr>
<tr>
<td>2.</td>
<td>Determine at what age the present weight would be at the 50th percentile (weight age)</td>
</tr>
<tr>
<td>3.</td>
<td>Determine recommended calories for weight age (see Table 1)</td>
</tr>
<tr>
<td>4.</td>
<td>Determine the ideal weight (50th percentile) for the child’s present age (or present height)</td>
</tr>
<tr>
<td>5.</td>
<td>Multiple the value obtained in (3) by the value obtained in (4)</td>
</tr>
<tr>
<td>6.</td>
<td>Divide the value obtained in (5) by actual weight</td>
</tr>
</tbody>
</table>

NCHS = National Center for Health Statistics.

such as the child looking to the parent for guidance, cues, or reactions. This strategy emphasizes the parent’s importance in the partnership and helps the parent develop a sense of efficacy in improving the relationship.

Parents often need help in separating their own emotional needs from those of their child. Children of parents who are depressed, hostile, or anxious are less likely to benefit from home intervention than are children of parents without these symptoms [50]. In some cases, parents may benefit from a therapeutic intervention that addresses their own mental health needs.

Child’s Behavior

Viewing interaction on videotape helps parents see the relationship from the child’s perspective. As a participant in the interaction, parents are often dominated by their own feelings and reactions, and cannot consider either the child’s perspective or the overall partnership. By watching the videotape, parents learn to view the interaction from the child’s point of view. They see how the child reacts to a smile or a criticism. Recognizing the child’s perspective is a critical step in intervention because it helps parents understand that children are influenced not only by internal regulatory processes but also by the behavior of others. Parents who understand that children are influenced by parental behavior are more receptive to behavioral interventions.

Partnership

Videotaped interactions can help parents recognize the communicative value of children’s feeding problems by watching their own reactions. Some children signal satiety by throwing food or turning the bowl upside down. Parents who anticipate their child’s actions can prevent the disruptive behavior and help the child use more socially appropriate methods to signal his or her desire to terminate the meal. In many cases parents are passive and silent, and their interactions may be limited to directives to the child to eat. Thus, the child who does not eat is more successful in engaging the parent, albeit
in negative interactions, than the child who eats the entire meal. This concept is often difficult for parents to understand until they observe the interaction on videotape and see for themselves how their child tries to engage them and finally uses behavior problems to attract their attention.

When parents watch themselves interacting with their child, they learn to differentiate successful from unsuccessful strategies. Parents become empowered by identifying strategies that work for them and their child. By practicing newly acquired skills through repeated videotaped observations, parents learn to analyze interaction patterns and identify aspects of their own behavior that contribute to feeding problems or success in their children.

**Treatment Plan and Outcome**

Upon completion of the child’s FTT evaluation, the nutritionist, pediatrician, psychologist, and social worker meet with the parents to discuss the results of the evaluation and to develop a treatment plan. The clinic team found no medical explanations for the child’s poor growth on history and physical examination. The team observed that the parents are aware of the type of food that the child needs, but that mealtimes are stressful and the child’s intake is very limited.

It is recommended that the parents provide high-calorie foods that the child can eat by herself, with a spoon or her fingers, with the parents gently interjecting bites from another spoon. In addition, the parents are advised to supplement whole milk with a powdered supplement and to reduce the amount of juice they offer. The parents watch the videotape with the psychologist and identify ways they can work to reduce the tension in their mealtimes. They agree to eat with the child and to provide her some control over choice of bib and cup. They also agree not to discuss the amount of food that the child is or is not eating during mealtime.

The parents learn to recognize the child’s signals that she is bored or full. They avoid conflict by terminating the meal when the child is not resistant, and the parents are more relaxed.

The child and her parents are seen 3 times at the clinic after the treatment plan is initiated. Repeated videotapes show marked improvement in their mealtime behavior. The child is not-resistant, and the parents are more relaxed. Although she continues to be a determined child who likes to be in control, food and mealtimes are no longer a source of conflict. In the 1-year period following initiation of treatment, the child has no health problems. She gains 2.5 kg and 11.2 cm. Although she is still small, she has experienced catch-up growth, and her weight-for-height has increased to above the 5th percentile to 88.5% of median.

**References**


