

CMEARTICLE

Failure to thrive in babies and toddlers

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Mrs Thomas, a homemaker, took her only child, 18-month-old Marcy, to the family clinic for fever and running nose. You diagnosed the common flu and was about to prescribe paracetamol when Mrs Thomas mentioned her concern that Marcy was not gaining weight and looked skinny compared to other children in the neighbourhood. She asked you if there was anything seriously wrong with Marcy and requested vitamin supplements to boost her appetite.

WHAT IS FAILURE TO THRIVE?

Failure to thrive (FTT) in a child is defined as 'lack of expected normal physical growth', 'failure to gain weight' or 'lack of growth'.⁽¹⁾ There is no objective consensus on the definition of FTT, as no single measurement on its own appears adequate to identify nutritional growth delay.⁽²⁾ Weight-for-age is the simplest parameter to assess for FTT. Other parameters that may assist in FTT diagnosis include weight-for-height and height-for-age. Diagnosis often requires repeated growth measurements over a period of time, although a single measurement of growth parameters may be sufficient in some situations (Table I).

Normal growth variants in children

Not all children with low weights have FTT.⁽³⁾ Some who fail to meet normal growth parameters may demonstrate a normal growth variant, including:

- Children growing along a percentile curve, even if weight is < 2nd percentile (3rd percentile line is more common locally).
- Premature babies or babies with intrauterine growth restriction who have appropriate weight-for-height and growth velocity.
- 'Catch-down' growth (decrease of ≤ 2 major percentiles)⁽⁴⁾ – in 'catch-down' growth, the growth of normal children between six and 18 months of age decreases to lower growth percentile curves that match their genetic programming, then begins to follow new, lower percentile curves. These children should have normal developmental, behavioural and physical examinations. While they should be closely followed, no further evaluation is needed.
- Constitutional growth delay – the hallmark of this condition is delayed bone age (below chronological age). Bone age is obtained by assessing the appearance and shape of the bones on a radiograph of the left hand and wrist.

Table I. Definitions of failure to thrive.

- Weight below 2nd percentile on an appropriate growth chart, with decreased velocity of weight gain that is disproportionate to growth in height⁽⁵⁾ (in Singapore, the 3rd percentile is more commonly seen in growth charts).
- Weight decrease of two or more major percentile lines (90th, 75th, 50th, 25th, 10th and 5th).⁽³⁾
- In infants, a daily weight gain that is less than expected for their age.⁽³⁾
- A single measurement showing that weight percentile is markedly discrepant from other parameters (height or head circumference), e.g. when weight-for-height is < 10th percentile.

These children may have more severe and prolonged 'catch-down' growth; they may grow along a low growth percentile curve, with a low preadolescent growth rate and delayed pubertal development. However, 'catch-up' growth occurs when they enter puberty. Growth continues longer than that of other children and results in normal adult stature. There may be a family history of such delayed growth in the parent(s). Children with constitutional growth delay should be monitored closely and no further evaluation is needed.

- Familial short stature – these children have a projected adult height that is within their anticipated adult height, based on mid-parental height.⁽⁶⁾ Mid-parental height is calculated in the following ways: (a) for girls, subtract 13 cm from the father's height and find the average with the mother's height; (b) for boys, add 13 cm to the mother's height and find the average with the father's height; and (c) for both genders, 8.5 cm on either side of this calculated value represents the 3rd–97th percentiles for anticipated adult height. Projected adult height is obtained by extrapolating along the current height percentile curve for up to 18–20 years of age. For children with constitutional growth delay or accelerated

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growth, it is more accurate to use bone age, rather than chronological age, to determine projected height. Children with familial short stature, unlike those with constitutional growth delay, have a bone age that is consistent with their chronological age. No further evaluation is needed for these children.

HOW COMMON IS THIS IN MY PRACTICE?

In a local 2012 survey, about 50% of parents or guardians reported ‘picky eating all the time’ in their children who were aged 1–10 years.⁽⁷⁾ The prevalence of ‘feeding difficulties’ (food refusal and selective eating) was about 15%. FTT is seen in 5%–10% of children in primary care settings and in 3%–5% of children in hospital settings in the United States.^(8,9)

CAUSES, COMPLICATIONS AND RED FLAGS

After FTT is diagnosed, the patient’s history is taken, and physical examination and further evaluation are performed to determine the causes and complications (Tables II & III). Malnutrition or inadequate caloric intake is the most common cause of FTT in Singapore, first affecting the child’s weight, then height and, lastly, head circumference.⁽⁴⁾ Common reasons for malnutrition include failed breastfeeding, improper formula preparation, inappropriate diet and ‘picky eating’.⁽¹⁰⁾

The presence of any red flags should alert the family doctor to initiate a referral to a paediatrician: (a) the child’s weight is three Z scores below the 50th percentile⁽¹¹⁾ (for a specific age, take the absolute weight difference between the 50th and 95th percentiles and divide by two to obtain the weight

Table II. Workup to decipher causes of failure to thrive (FTT) in babies and toddlers.^(12,13)

Cause of FTT	History	Physical examination	Further evaluation/management
1. Antenatal/perinatal causes Intrauterine infections Teratogenic exposures Congenital syndromes	<ul style="list-style-type: none"> • Antenatal history 	<ul style="list-style-type: none"> • Complete examination for associated features 	<ul style="list-style-type: none"> • Refer to paediatrician
2. Insufficient intake of calories/nutrients (a) <i>Suck-swallow problems</i> Swallowing incoordination Cleft lip/palate Neuromuscular disorders (b) <i>Inadequate provision of calories/nutrients</i> Inadequate breast milk production Lack of caregiver knowledge Parental inhibition of giving high-caloric foods Unlimited access to juice or snacks Inappropriate mealtime environment Financial difficulties Poor social support	<ul style="list-style-type: none"> • Duration of milk feeds/meals • Feeding difficulties (chewing or swallowing, spitting, refusal, regurgitation or vomiting) • Breastfeeding difficulties • Feeding patterns (self-feeding, mealtime routines, meals at childcare, snacks, chair/support during meals) • Parental perception (of child’s growth and feeding behaviour) • Social history (financial status, parental conflicts, parental coping and skills, possible abuse or neglect) 	<ul style="list-style-type: none"> • Excessive drooling • Cleft lip/palate • Neurological examination • Parent-child interaction 	<ul style="list-style-type: none"> • Observe a feed • Refer for early assessment • Refer to lactation consultant • 3-day food diary for caregivers to complete • Home visit • Refer to medical social support if it is due to poor social environment
3. Malabsorption Gastro-oesophageal reflux Cow’s milk protein allergy Pancreatic insufficiency Short gut syndrome Inflammatory bowel diseases	<ul style="list-style-type: none"> • Recurrent vomiting, diarrhoea • Abnormal stools • Predisposing factors • Associated symptoms 	<ul style="list-style-type: none"> • Significant diaper rash • Signs of malnutrition 	<ul style="list-style-type: none"> • Refer to paediatrician
4. Chronic medical conditions Genetic/chromosomal disorders Congenital heart diseases Chronic respiratory conditions Malignancies Endocrine causes (e.g. diabetes mellitus, hyperthyroidism, growth hormone deficiency) Renal causes (e.g. renal failure, renal tubular acidosis) Chronic infections (e.g. human immunodeficiency virus infection) Chronic anaemia	<ul style="list-style-type: none"> • Antenatal history • Family history • Review of systems • Recurrent or severe respiratory, mucocutaneous or urinary infection 	<ul style="list-style-type: none"> • Dysmorphic features • Systems examination (heart, lung, abdomen, nervous system) • Pallor • Organomegaly • Lymphadenopathy 	<ul style="list-style-type: none"> • Refer to paediatrician <p><u>Basic tests include:</u> Full blood count; serum electrolytes; renal function with bicarbonate; urine dipstick; and stool sample for ova, cysts and parasites</p>
5. Others Drugs (rare, e.g. certain antiepileptic medications) Child abuse, including psychosocial neglect (nonorganic FTT) ⁽¹⁴⁾	<ul style="list-style-type: none"> • Drug history • Psychosocial history 	<ul style="list-style-type: none"> • Parent-child interaction • Unexplained wounds suggestive of child abuse • Skin health (rashes, poor hygiene) • Oral hygiene 	<ul style="list-style-type: none"> • Refer to paediatrician or social services

Table III. Assessing for complications of failure to thrive (FTT).

Complication of FTT	History	Physical examination	Further evaluation/management
1. Specific vitamin/mineral deficiencies <ul style="list-style-type: none"> • Iron (very common) • Vitamin D (especially with inadequate milk intake) 	<ul style="list-style-type: none"> • Frequent respiratory and gastrointestinal infections 	<ul style="list-style-type: none"> • Pallor • Rickets • Stomatitis/cheilosis • Oedema • Dermatitis 	<ul style="list-style-type: none"> • Iron supplements • Ensure adequate milk intake <p><u>Basic tests include:</u> Full blood count; blood calcium levels; blood phosphate levels; blood alkaline phosphatase levels; blood parathyroid hormone levels; iron studies; and blood 25-hydroxyvitamin D levels</p>
2. Developmental delay	<ul style="list-style-type: none"> • Developmental history 	<ul style="list-style-type: none"> • Developmental assessment 	<ul style="list-style-type: none"> • Refer to paediatrician

difference for one Z score); (b) signs of child abuse, including psychological neglect;⁽¹⁴⁾ (c) clinical features of a medical cause for FTT; and (d) complications of FTT, e.g. developmental delay.

TAKING MEASUREMENTS

When taking measurements for a child with FTT, use appropriate growth charts from Singapore⁽¹⁵⁾ or the World Health Organization.⁽¹⁶⁾ Specific growth charts should be used for ex-premature infants and those with dysmorphism syndromes (i.e. Turner syndrome, Down syndrome and achondroplasia). Ensure that the equipment, such as the stadiometer, has appropriate accuracy and that measurement techniques are correct (e.g. child stands straight with back and heels against the stadiometer). Take the average of two height measurements. Neonates and young infants should be weighed while naked (without nappies and clothes) and consistently, before or after feeding.

WHY IS IT IMPORTANT TO MY PRACTICE?

The family doctor working in the community is best placed to detect FTT in children when they present for illnesses or health monitoring by enquiring further in cases where FTT is suspected. Through evaluation as well as timely management of FTT and any underlying psychosocial issues in the family, the outcomes for these children can be improved.

Management of FTT⁽¹³⁾

Medical conditions causing FTT should be treated or referred to a paediatrician for further investigations and management, while urgent psychosocial issues require counselling and referral to social services. Physicians should give age-appropriate nutritional counselling to parents or guardians, including advice on food preparation and feeding techniques.⁽¹⁰⁾ The mealtimes of children with FTT should be limited to no more than 30 minutes; authoritative feeding styles are most effective.⁽¹⁷⁾ Children should be monitored for 'catch-up' growth. If there is a limited variety of food and the child is not taking a nutritionally complete milk formula, consider checking for iron deficiency and prescribing

Mrs Thomas revealed that Marcy, a premature baby at 35 weeks, has always been small but healthy. Marcy is a fussy eater, eating only rice, chicken and spinach. Mrs Thomas and her husband are of average height with no family history of serious medical conditions and no financial difficulties. A careful examination showed Marcy to be an alert and cheerful child who looked thin but did not have ill health, neglect, developmental delay or nutritional deficiencies. Her weight is at the 10th percentile and has not crossed any growth centile. Her head circumference and height, which are at the 25th percentile, are constant. You reassured Mrs Thomas that Marcy, though thin, is healthy and developing normally. You advised her to introduce different foods slowly and discretely, then arranged for a follow-up visit in a month's time to monitor Marcy's growth.

a multivitamin supplement that contains iron. Adequate complementary foods should be introduced at the appropriate time.

TAKE HOME MESSAGES

1. Use local and age-appropriate growth centile charts to determine if the child has FTT, being aware of normal growth variants.
2. Take a careful and thorough medical, dietary and psychosocial history to determine any underlying causes for FTT and any associated complications.
3. The most common cause of FTT worldwide is malnutrition or insufficient caloric intake due to poverty or caregiver ignorance.
4. Management of a child with FTT often requires collaboration of care between the family doctor and other healthcare colleagues such as the paediatrician, dietitian and nurse counsellor.
5. Children with FTT should be treated promptly and followed up closely for catch-up growth.

ABSTRACT Failure to thrive in a child is defined as 'lack of expected normal physical growth' or 'failure to gain weight'. Diagnosis requires repeated growth measurements over time using local, age-appropriate growth centile charts. Premature babies with appropriate growth velocity and children with 'catch-down' growth, constitutional growth delay or familial short stature show normal growth variants, and usually do not require further evaluation. In Singapore, the most common cause of failure to thrive in children is malnutrition secondary to psychosocial and caregiver factors. 'Picky eating' is common in the local setting and best managed with an authoritative feeding style from caregivers. Other causes are malabsorption and existing congenital or chronic medical conditions. Child neglect or abuse should always be ruled out. Iron deficiency is the most common complication. The family doctor plays a pivotal role in early detection, timely treatment, appropriate referrals and close monitoring of 'catch-up' growth in these children.

Keywords: constitutional growth delay, familial short stature, fussy eater, malnutrition

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SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME

(Code SMJ 201606A)

	True	False
1. Failure to thrive (FTT) in a child is defined as 'lack of expected normal physical growth', 'failure to gain weight' or 'lack of growth'.	<input type="checkbox"/>	<input type="checkbox"/>
2. The internationally accepted objective consensus definition for FTT is based on two measurements, taken at least two weeks apart, to confirm nutritional growth delay.	<input type="checkbox"/>	<input type="checkbox"/>
3. Weight-for-age, weight-for-height and height-for-age, used in our growth charts and health booklets, are the acceptable parameters to assess for FTT.	<input type="checkbox"/>	<input type="checkbox"/>
4. In infants, a daily weight gain that is less than expected for their age may already be suggestive of FTT.	<input type="checkbox"/>	<input type="checkbox"/>
5. FTT is suspected when a single measurement showing weight percentile is markedly discrepant from the other parameters (height or head circumference); for example, when weight-for-height is < 10th percentile.	<input type="checkbox"/>	<input type="checkbox"/>
6. Children who are the shortest in their kindergarten classes for two consecutive years should always be investigated for FTT.	<input type="checkbox"/>	<input type="checkbox"/>
7. Some normal children may experience 'catch-down' growth, where growth decreases by ≤ 2 major percentiles between six and 18 months of age to match their genetic programming and then begins to follow new, lower percentile curves.	<input type="checkbox"/>	<input type="checkbox"/>
8. Children may have more severe and prolonged 'catch-down' growth, growing along a low growth percentile curve and having a low preadolescent growth rate and delayed pubertal development.	<input type="checkbox"/>	<input type="checkbox"/>
9. Children who experience 'catch-down' growth typically will not experience 'catch-up' growth when they go through puberty, resulting in shorter adult stature.	<input type="checkbox"/>	<input type="checkbox"/>
10. Children with constitutional growth delay should be thoroughly evaluated with further scans and hormonal blood tests at regular intervals.	<input type="checkbox"/>	<input type="checkbox"/>
11. The projected adult height of children is independent of their parental heights, and is only influenced by nutritional and environmental factors in their childhood.	<input type="checkbox"/>	<input type="checkbox"/>
12. For children with constitutional growth delay, it is more accurate to use bone age, rather than chronological age, to determine their projected height.	<input type="checkbox"/>	<input type="checkbox"/>
13. Children with familial short stature have bone age consistent with their chronological age and require no further evaluation.	<input type="checkbox"/>	<input type="checkbox"/>
14. Malnutrition or inadequate caloric intake is not among the top three common causes of FTT in Singapore over the last decade.	<input type="checkbox"/>	<input type="checkbox"/>
15. Malnutrition or inadequate caloric intake firstly affects the child's weight, then head circumference and, lastly, height.	<input type="checkbox"/>	<input type="checkbox"/>
16. The family doctor working in the community is best placed to detect FTT in children when they present for illnesses or health monitoring.	<input type="checkbox"/>	<input type="checkbox"/>
17. The family doctor may need to refer the child or family to a paediatrician, a dietitian or social services, as appropriate, to deliver holistic care.	<input type="checkbox"/>	<input type="checkbox"/>
18. Age-appropriate, nutritional counselling for parents or carers, including advice on food preparation, might be required for management of FTT.	<input type="checkbox"/>	<input type="checkbox"/>
19. Evidence supports the use of authoritative feeding styles for fussy eaters.	<input type="checkbox"/>	<input type="checkbox"/>
20. If a child is not taking or unable to take a nutritionally complete milk formula, physicians should consider checking for iron deficiency.	<input type="checkbox"/>	<input type="checkbox"/>

Doctor's particulars:

Name in full : _____
 MCR number : _____ Specialty: _____
 Email address : _____

SUBMISSION INSTRUCTIONS:

(1) Log on at the SMJ website: <http://www.sma.org.sg/publications/smjcurrentissue.aspx> and select the appropriate set of questions. (2) Provide your name, email address and MCR number. (3) Select your answers and click "Submit".

RESULTS:

(1) Answers will be published online in the SMJ August 2016 issue. (2) The MCR numbers of successful candidates will be posted online at the SMJ website by 10 August 2016. (3) Passing mark is 60%. No mark will be deducted for incorrect answers. (4) The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council. (5) One CME point is awarded for successful candidates.

Deadline for submission: (June 2016 SMJ 3B CME programme): 12 noon, 3 August 2016.