Definition

- No clear consensus
- Growth below the 3rd or 5th percentile
- Decreased growth crossing 2 major growth percentiles

Epidemiology

- Prevalence
  - Depends on population sampled
  - 5 - 10%
    - Low birth weight children
    - Children living in poverty

Epidemiology (2)

- Associated conditions
  - Family discord
  - Neonatal problems
  - Maternal depression

  - In US, inorganic >> organic

Causes

1. Failure to offer adequate calories
2. Failure of child to take adequate calories
3. Failure of child to retain sufficient calories

Causes (2)

- Inorganic
  - Neglect or stimulus deprivation
  - Poor parent-child interaction
- Organic
  - Known illness interferes with growth
- Mixed etiology possible
  - Premature infant with poor bonding
Organic Causes

- GI
  - GER
  - Celiac disease
  - Pyloric stenosis
  - Cleft lip/palate
  - Milk protein intolerance
  - malabsorption

- Renal
  - UTI
  - RTA
  - DI
  - Chronic renal insufficiency

Organic Causes (2)

- Cardiopulmonary
  - Congestive heart failure
    - Structural defects
    - Poor function
  - BPD
  - CF

- Renal
  - Hyperthyroidism
  - DM
  - Adrenal insufficiency
  - Growth hormone insufficiency

Organic Causes (3)

- Neurologic
  - Mental retardation
  - Cerebral hemorrhages
  - Degenerative disorders

- Infectious
  - Parasitic or bacterial of GI tract
  - TB
  - HIV

Organic Causes (4)

- Metabolic
  - Inborn errors

- Congenital
  - Chromosomal abnormalities
  - Congenital syndromes
  - FAS
  - Perinatal infections

Organic Causes (5)

- Miscellaneous
  - Lead poisoning
  - Collagen vascular disease

Inorganic Causes

- Failure to offer sufficient or appropriate foods
  - Lack of knowledge
  - Depression
  - Unusual dietary beliefs
  - Lack of food
**Signs and Symptoms**
- Failure to meet expected growth norms
- Alopecia
- Loss of subcutaneous fat
- Reduced muscle mass
- Dermatitis
- Recurrent infections
- Kwashiorkor
- Infants may be hypervigilant
- Poor interaction with others

**Signs and Symptoms (2)**
- Ideal body weight (IBW)
  - 50% weight based on age
- Mild FTT
  - 75-90% of IBW
- Moderate FTT
  - 60-74% of IBW
- Severe FTT
  - < 60% of IBW

**Signs and Symptoms (3)**
- 1st is decreased weight
- Decreased height
- Last is decreased head circumference
- Chronic malnutrition
  - Normal wt for ht because both are low

**Evaluation**
- Good H & P
  - Formula preparation
  - Food intake history
    - How often
    - What kinds of food
    - Where
  - Output history
    - Emesis
    - Diarrhea

**Evaluation (2)**
- Observe for poor feeding or swallowing
  - Oral motor dysfunction
  - Anatomic abnormalities
  - Cardiopulmonary dysfunction
- Evaluate family interaction

**Evaluation (3)**
- Labs
  - Often not helpful
- Initial tests
  - CBC
  - Lead level
  - Urinalysis
  - CMP
  - Transthyretin
- Other tests
  - As indicated by H&P
  - Thyroid function
  - GER
  - UGI
  - Malabsorption
    - fecal fat
    - Organic and amino acids - urine and serum
  - Sweat test
**Approach by Age**

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to 3 mo</td>
<td>Inorganic GER, Perinatal infection, Inborn errors of metabolism, CF</td>
</tr>
<tr>
<td>3 – 6 mo</td>
<td>Inorganic GER, RTA, HIV, Milk-protein intolerance, CF, Inborn errors of metabolism</td>
</tr>
<tr>
<td>&gt; 12 mo</td>
<td>Inorganic GER, Inappropriate liquids or solids, RTA, Intestinal parasites</td>
</tr>
</tbody>
</table>

**Approach By Symptoms**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spitting, emesis, food refusal</td>
<td>GER</td>
</tr>
<tr>
<td>Diarrhea, fatty stool</td>
<td>Malabsorption, Intestinal parasite, Milk-protein intolerance</td>
</tr>
<tr>
<td>Snoring, mouth-breathing</td>
<td>Adenoid hypertrophy, Sleep apnea</td>
</tr>
</tbody>
</table>

**Treatment**

- If severe (regardless of cause)
  - Hospitalization
  - Careful feeding
  - Daily BMP, Mg, Phos
    - Checks for refeeding syndrome
    - Replete as necessary
  - Search for cause

**Approach by Symptoms (2)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent wheezing, pulmonary infections</td>
<td>Asthma, CF, Congenital heart disease</td>
</tr>
<tr>
<td>Recurrent infections</td>
<td>HIV</td>
</tr>
<tr>
<td>Travel to developing countries</td>
<td>Parasitic infection, Bacterial infection</td>
</tr>
</tbody>
</table>

**Treatment (2)**

- Reasons for hospitalization
  - Severe malnutrition
  - Need for diagnostic/laboratory evaluation
  - Lack of catch-up growth
  - Evaluation of parent-child interaction
Treatment (3)

- Goals of Hospitalization
  - Sustained catch-up growth
  - Education of parents
    - Appropriate foods
    - Appropriate feeding styles
  - Comfort of parent with any special feeding needs
    - NG tube
    - Preparation of concentrated formulas

Treatment (4)

- Organic
  - Treat underlying condition
    - Tailor nutrition to underlying condition
      - Renal issues - decreased protein intake
      - Cardiac issues - decreased fluid intake

Treatment (5)

- Inorganic
  - Meal time: 20-30 minutes
    - May need to NG if can’t feed in this time
  - Solids before liquids (older children)
  - Minimize environmental distractions
  - Eat with others
  - No force feeding

Treatment (6)

- Inorganic (cont)
  - Limit low-calorie, low-nutrition foods
    - Water
    - Juice
  - Encourage high-calorie foods
    - Peanut butter
    - Whole milk and cheese
    - Formula

Treatment (7)

- Inorganic
  - Supplements if necessary
    - Carnation Instant Breakfast
    - Pediasure
    - Polycose
    - 24 or 27 cal/oz formula
  - Weight gain with adequate nutrition confirms this diagnosis

Long Term Outlook

- Problematic if occurs in 1st year of life
  - Maximal brain growth in 1st 6 mo of life
  - 1st yr brain growth is as much as rest of life
- Inorganic
  - About 1/3: cognitive and behavioral issues persist despite appropriate weight
- Organic
  - Depends on underlying cause
Long Term Outlook (2)

- Ongoing monitoring of child
  - Emotional development
  - Cognitive development
- Appropriate intervention as needed
  - Early intervention
  - CPS for social support

References


CDC for current growth charts