

In The Name of God

NUTRITIONAL MANAGEMENT OF FAILURE TO THRIVE

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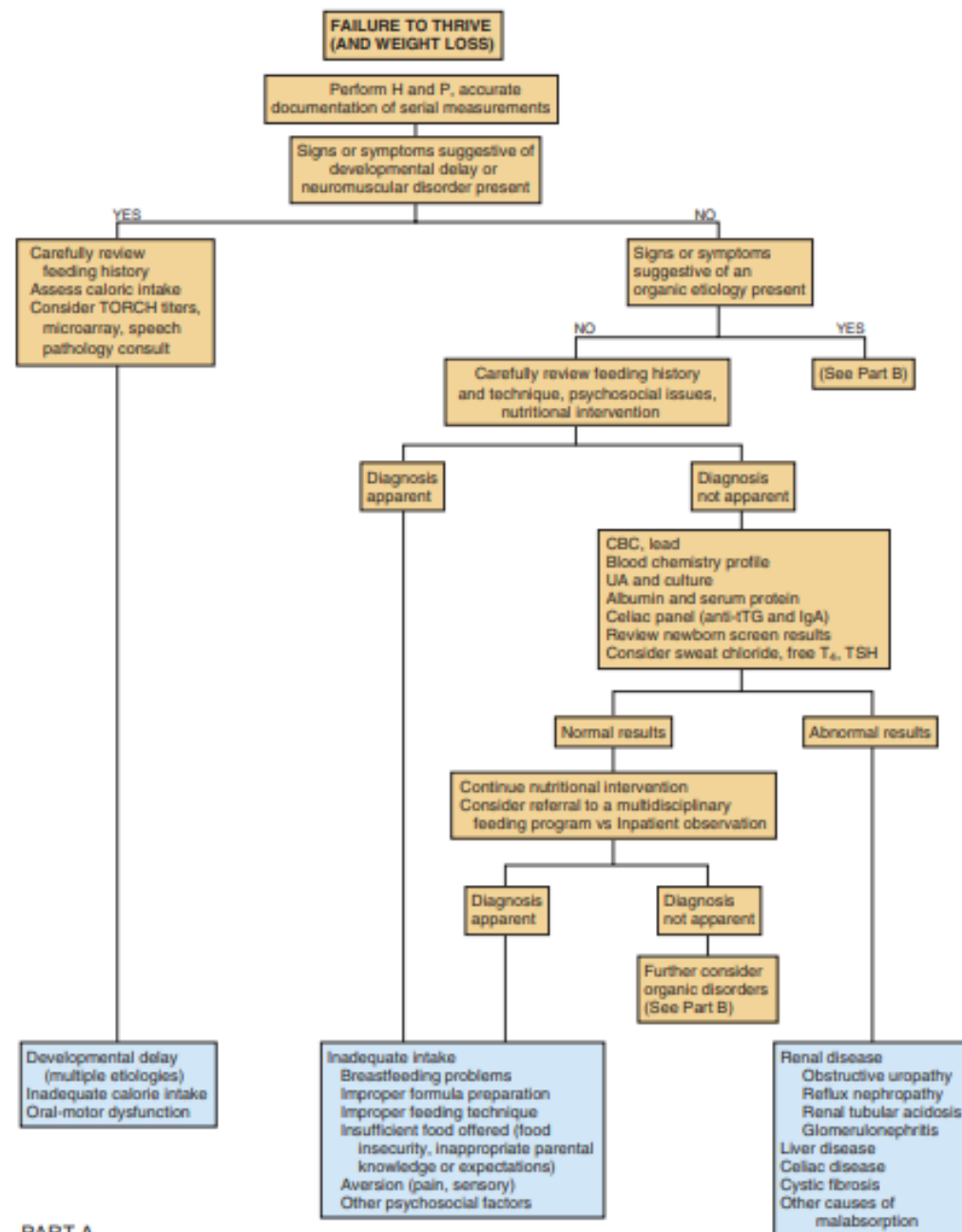
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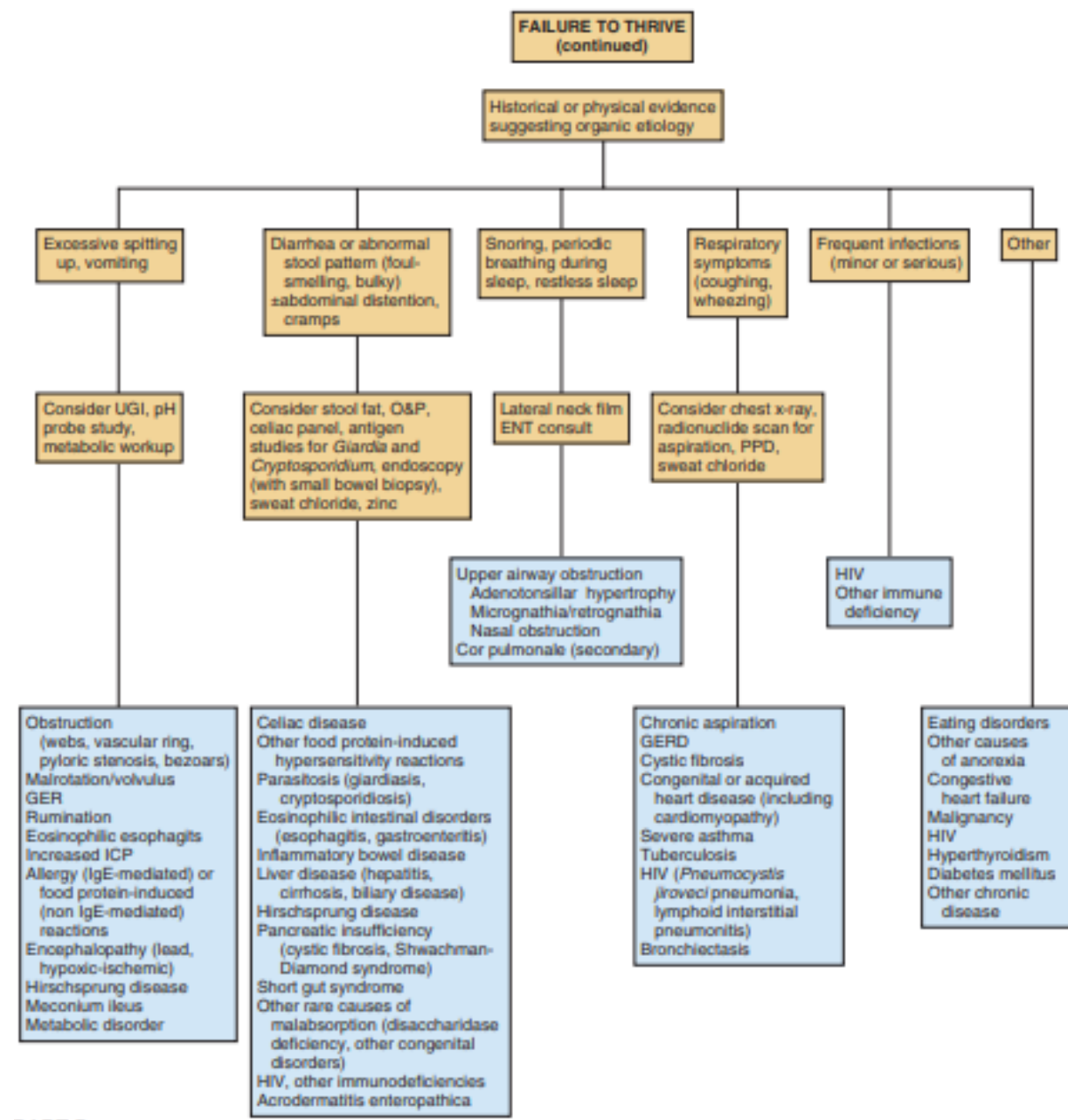
Failure to thrive

- (FTT) accounts for 1% to 5% of tertiary hospital admissions for patients less than 1 year of age
- As many as 10% of children in primary care settings
- More than 90% of cases in most studies do not have an underlying medical cause
- Nonorganic (FTT) is reported more commonly in females than in males





PART A



PART B

Management

- Children with **mild** malnutrition can be managed by the primary care physician in **the outpatient setting** .
- Children with **moderate** malnutrition can be managed **by the multidisciplinary** team (physician, social worker, psychologist, nutritionist, nurse, child life specialist, and home visitor) **in the outpatient setting**
- Children with **severe** malnutrition **require hospitalization** for evaluation and proper treatment .

Indications for Hospitalization in Children with Failure to Thrive

- Extreme parental impairment or anxiety
- Extremely poor parent-child interaction
- Need for precise documentation of nutritional intake
- Outpatient treatment failure
- Psychosocial factors that put the child's safety at risk
- Serious underlying illness or medical problem
- Severe malnutrition or dehydration



Goals of management

- Provision of adequate calories, protein, and other nutrients
- Nutritional counseling to the family
- Monitoring of growth and nutritional status
- Specific treatment of complications or deficiencies
- Long term monitoring and follow up
- Supportive economic assistance

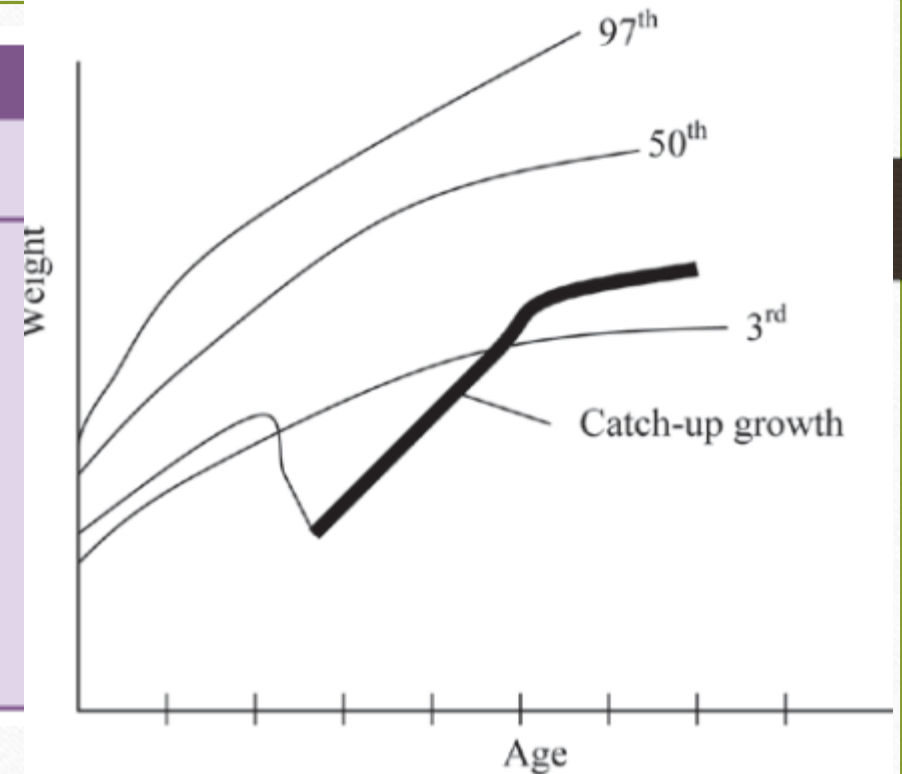
Nutritional therapy is the mainstay of management

The goal of nutritional therapy is to enable "catch-up" weight gain.

(weight gain at a rate that **is two to three times greater** than average for age or approximately **45 to 60 g/day**)

TABLE 12.4 Mean Weight Gain by Age

Age (Months)	Mean Weight Gain: Boys (g/day)	Mean Weight Gain: Girls (g/day)
0–<3	27–34	23–34
3–<6	16–19	15–18
6–<9	11–14	11–14
9–<12	9–12	9–12
12–<15	8–10	8–10
15–<18	7–9	7–9
18–<21	6–8	6–8
21–<24	6–8	6–8
24–<36	5	5



Improve Calorie Intake

- **Mealtime Behavior**
- **Beverages**
- **Food Selection**
- **Daily Routines and Snacks**



Mealtime Behavior

- A pleasant, safe setting should be created for mealtime
- Eating with all
- “Two-spoon method”
- Meal time do not exceeds more than 15 or 20 minutes



Beverages

- Exclusive breast-feeding is the preferred
- Whole milk is preferred for underweight toddlers
- Sweetened juices should be limited to 4-6 ounces per day for children aged 1-6 years and to 8-12 ounces for older children
- Formulas can be made with less water
- Polycose and vegetable oils can be added

eTable C. Formula Recipes for Increasing Calories in Infants with Failure to Thrive

Calories (kcal) per oz	Water (oz)	Scoops of formula powder	Final volume (oz)
19 (per standard product instructions)	4	2	4½
20 (per standard product instructions)	4	2	4½
22	3.5	2	4
24	5	3	5.5
26	3	2	3.5
27	7	5	8

NOTE: Standard formula generates 19 or 20 kcal per oz depending on the brand formulation; some companies produce the 19 kcal formula because it is thought to more closely resemble the calorie concentration of breast milk. The recipes in this table use standard formula and yield a higher concentration of calories by mixing relatively more powder with less water. Water should be added to the bottle first, followed by the powdered formula using an unpacked, level scoop. Only the scoop that was included with the formula should be used.

Information from University of Michigan. Formula adjustment (standard formula). <https://www.med.umich.edu/1libr/pa/FormulaAdjustmentstandard.pdf>. Accessed April 26, 2016.



7 cup in 5 oz(150 cc)
4 cup in 3 oz(90 cc)

TABLE 21-3 Infant Formula Preparation*

Amount of Powder/Liquid	Amount of Water (oz)	Final Concentration
1 cup powdered formula	29	20 kcal/oz
4 scoops powdered formula	8	20 kcal/oz
13 oz liquid concentrate	13	20 kcal/oz
1 cup powdered formula	24	24 kcal/oz
5 scoops powdered formula	8	24 kcal/oz
13 oz liquid concentrate	9	24 kcal/oz
1 cup powdered formula	21	27 kcal/oz
5.5 scoops powdered formula	8	27 kcal/oz
13 oz liquid concentrate	6	27 kcal/oz

*Final concentrations are reached by adding formula to water. One scoop of powdered formula = one measuring tablespoon. For healthy infants, formulas are prepared to provide 20 kcal/oz.

From Jew R, editor: Department of Pharmacy Services Pharmacy Handbook and Formulary, 2000-2001. Hudson, Ohio, 2000, Department of Pharmacy Services, p 422.

Improve Calorie Intake

- **Initiated** with expressed breast milk or with a standard formula
- Some require increased **caloric density** on account of **intolerance** of increased feeding volumes.
- **Nutrient-dense formula** are preferred than “**energy-supplemented**” formula (powdered infant formula mixed to high concentration or with added fats or carbohydrates)
- **Diarrhea and abdominal distention** can result from a rapid transition to formulas of higher caloric density.
- Caloric density should **not exceed 26 kcal/oz for infants and 45 kcal/oz** for toddlers

The recommendation to offer supplemental formula to a breast-fed infant should be made with care and sensitivity

Nutritinal Supplementation for the Older Infant and Child

- Complete liquid formulations
- Packaged instant-breakfast drinks
- Powdered milk, margarine, cheese, wheat germ, peanut butter
- Increase the amount of food eaten
- Maximizing protein intake needed for growth
- Multivitamins with minerals
- Iron and zinc and other trace minerals

Examples of High-Calorie Fortifiers



Product	Calories	Source
Medium-chain triglyceride (MCT) oil	7.7 kcal/mL	Fractionated coconut oil
Microlipid	4.5 kcal/mL	Safflower oil
Corn oil	8.4 kcal/mL	Corn
ProMod (protein powder)	28 kcal/scoop (4.2 kcal/g) 5 g/scoop	Whey protein with lecithin
Polycose (powder or liquid)	Powder - 23 kcal/tbsp Liquid - 30 kcal/tbsp	Powder - Hydrolyzed cornstarch Liquid - Glucose polymers derived from hydrolyzed cornstarch
Rice cereal (powder)	15 kcal/tbsp	Rice flour
Nonfat dry milk powder	15 kcal/T (1.5 g protein)	Cow's milk
Powder infant formula	40 kcal/tbsp	Cow's milk
Liquid concentrated infant formula	40 kcal/oz	Cow's milk

Examples of High-Calorie Nutritional Products

Product, 30 kcal/oz	CHO, g/100 mL	Protein, g/100 mL	Fat, g/100 mL	Osmolality	Nutrient Sources						
Nutren Junior (Clintec)	12.8	3	4.2	350	CHO - Maltodextrin, sucrose Protein - Casein, whey Fat - Soy, MCT, and canola oils (Vanilla, also available with fiber)	Kindercal (Mead Johnson)	13.5	3.4	4.4	310	CHO - Maltodextrin, sucrose Protein - Caseinates, milk protein concentrate Fat - Canola, MCT, and high-oleic sunflower oils Contains soy fiber 6.3 g/L (Vanilla)

Examples of High-Calorie Nutritional Products

PediaSure (Ross)	11	3	5	310	CHO - Corn syrup solids, sucrose Protein - Caseinate, whey protein concentrate Fat - High- oleic safflower, soy, and MCT oils (Vanilla, also available with fiber)	Boost (Mead Johnson)	17.4	4.3	1.7	590-620	CHO - Sucrose, corn syrup solids Protein - Milk protein concentrate Fat - Canola, sunflower, corn oils (Chocolate, chocolate mocha, strawberry, vanilla)
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Food Selection

- Including older children in food shopping and preparation
- Two or three choices
- May have preferences for certain food textures, temperatures, and presentations
- Avoid “picky” eaters
- No “Force feeding”



Daily Routines and Snacks

- Avoid “grazing”
- Three meals and two or three snacks per day
- Planned snacks



Calculating Caloric Need

$$\frac{(\text{kcal/kg for weight age}) \times (\text{ideal weight for height in kilograms})}{\text{actual weight in kilograms}}$$

- ✓ Most infants will achieve catch-up growth on 160-180 kcal/kg/day.
- ✓ Some infants may need up to 1.5-2 times the daily requirements for catch-up.
- ✓ Caloric intake can be estimated from the diet history

TABLE 9.9 Normal Calorie Requirements and Weight Gain by Age

	Calorie Requirement (kcal/kg/day)	Weight Gain* (g/day)
Premature	150	20-40
Full-term to 3 months	100-120	25-39
3-6 months		14-20
6- 9 months	90-100	9-13
9-12 months		7-10
Toddler	75-85	6-9

*Based on WHO growth charts (5% and 95%).

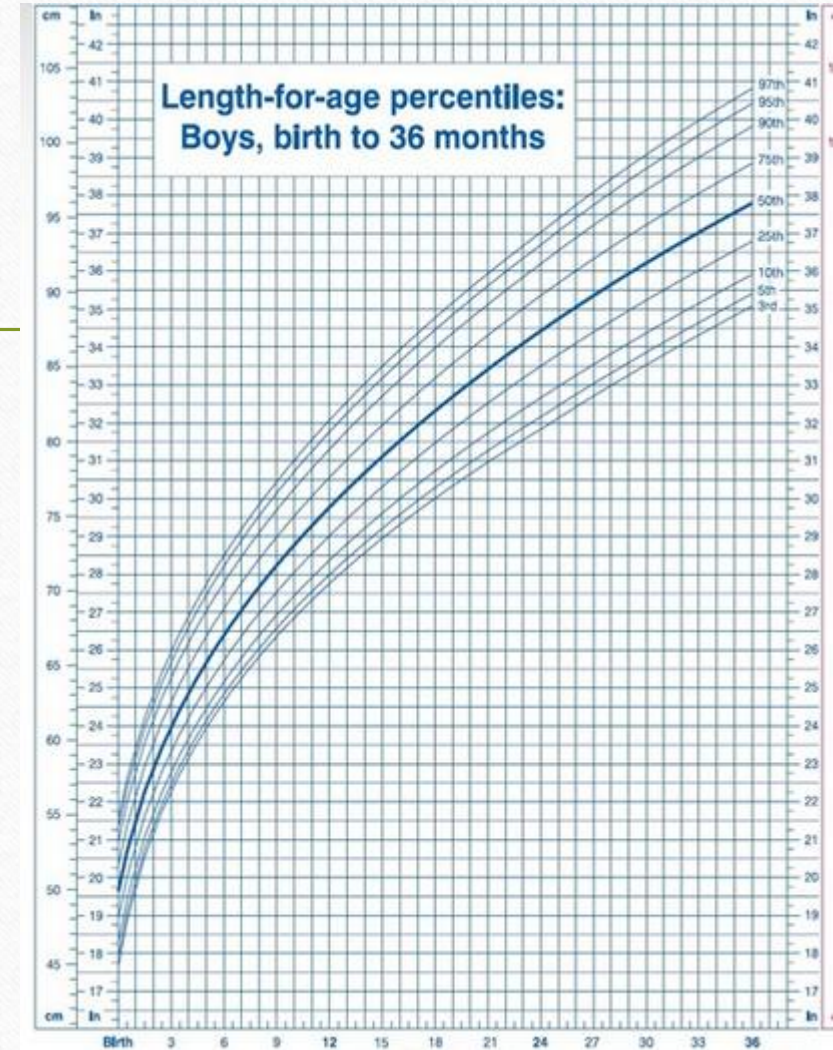
eTable B. Dietary Reference Intake for Young Children

Age	Kcal per kg per day
0 to 6 months	108
6 to 12 months	98
1 to 3 years	102

- A 10-month-old boy with failure to thrive has a **weight of 7 kg** and **height of 72 cm**. Looking at a growth chart for boys 0 to 24 months of age, *a height of 72 cm corresponds to the 50th percentile for height for a 9-month-old boy*. Using this result of 9 months, the target ideal weight can be determined by finding the **corresponding weight for a 9-month-old boy** at the 50th percentile, which is about **8.8 kg**.
- Catch-up caloric requirements = target ideal weight × DRI for age

In this case: 8.8 kg × 98 kcal per kg per day = 862 kcal per day

DRI = dietary reference intake; RDA = recommended dietary allowance



Pharmacotherapy

Specific populations with significant underlying diseases (e.g., cystic fibrosis, chronic renal disease) or in patients undergoing cancer

➤ Megestrol Acetate

- ✓ Approved for treat cachexia (demonstrated that is not a safe drug, with serious side effects including edema, thromboembolic events and sudden deaths, suppression of the adrenal axis, impaired glucose regulation, mood disorders, hyperlipidemia and testicular damage)

➤ Cyproheptadine

- ✓ Low doses of CH (0.1–0.3 mg/kg/day)
- ✓ Directly activating the hypothalamic appetite center
- ✓ Resulting in gastric fundic relaxation



Appetite stimulants are not recommended for most patients with FTT

Parenteral nutrition (PN)

- ✓ Unable to take in adequate calories due to anorexia
- ✓ Period of supplemental nasogastric feeding
- **Gastrostomy tube**
 - ✓ Enteral tube feeding is expected to exceed 4 to 6 weeks in duration
 - ✓ Motor dysfunction
- **Bolus feeds are more “physiologic” than continuous feeds**
 - ✓ Bolus feeds improve protein deposition
- **Continuous feeds**
 - ✓ Preterm infants or term infants
 - ✓ Mucosal damage or atrophy or, or if there is mucosal edema secondary to hypoalbuminemia
 - ✓ Short bowel syndrome

Successful Treatment

- Achieve an ideal weight-for-age
- Catch-up in length
- Accelerated growth maintained for four to nine months to resolve FTT
- Weight for height measurements above the 10th percentile with normal weight gain on two evaluations at least one month apart
- Relapses are possible continued observation

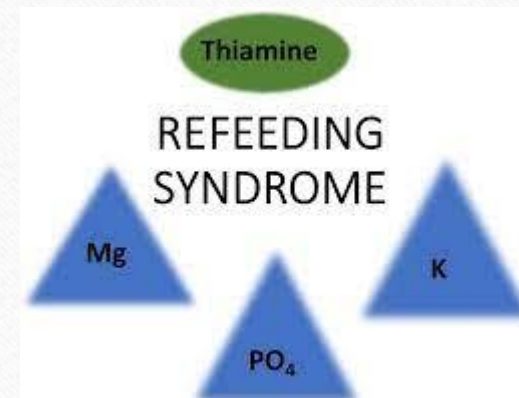


Complications

- Overcompensation for early FTT may lead to **obesity**
- **Rapid early weight gain** risk factors for adult **cardiovascular disease** and **obesity**
- Refeeding syndrome
- **Serum electrolyte disturbances** may also be seen with rapid feeding
- **2.0 g/kg/day** of protein should meet needs for catch-up growth

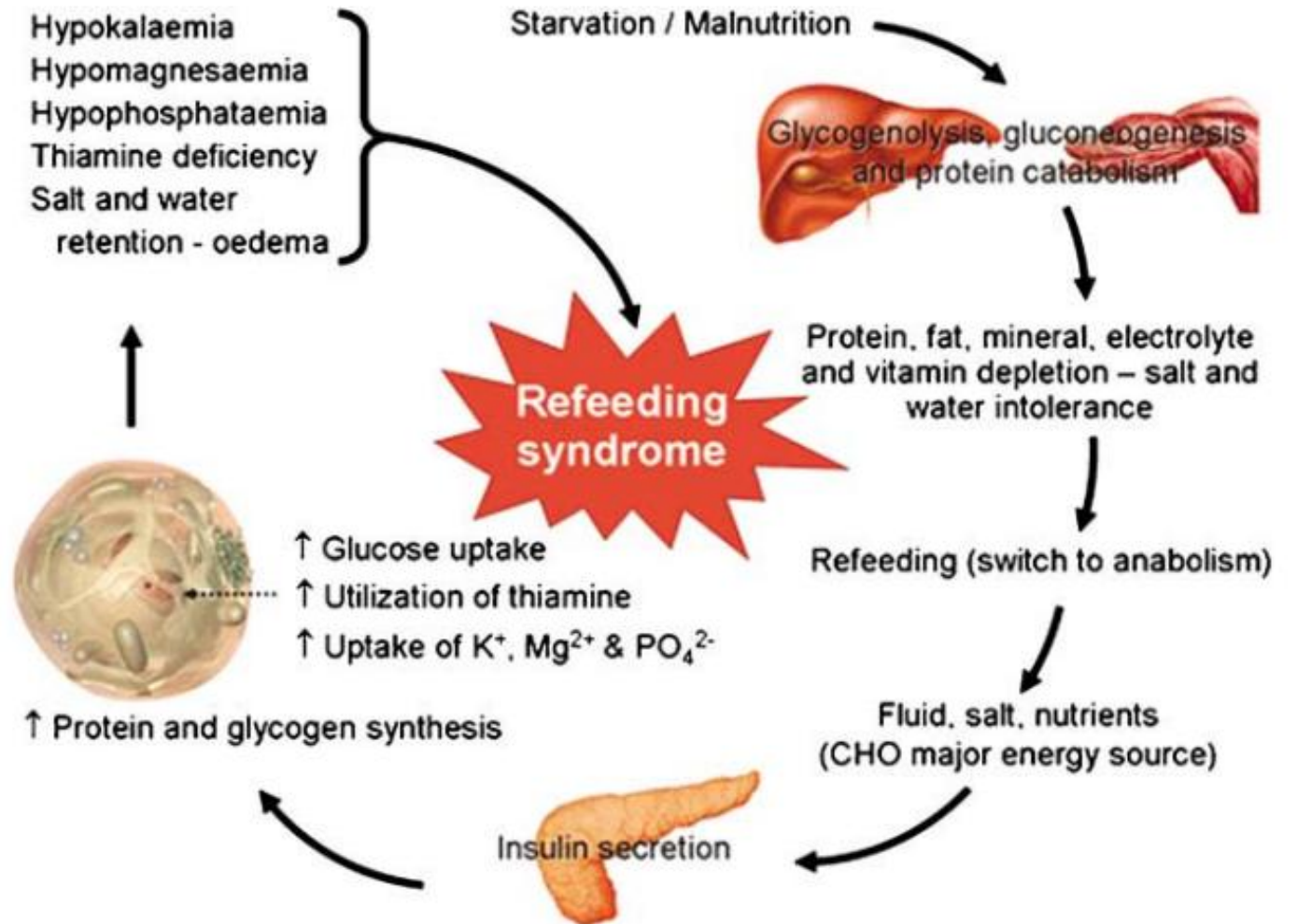
Refeeding Syndrome

- Potentially fatal
- May occur within hours or days of initiating nutrition
- Increase in caloric intake stimulates insulin production which leads to intracellular uptake of phosphorus, glucose and water causing fluid and electrolyte abnormalities:
 - ✓ Hypokalemia
 - ✓ Abnormal sodium and fluid levels
 - ✓ Hypomagnesemia
 - ✓ Hypophosphatemia
 - ✓ Thiamine deficiency
- To avoid refeeding syndrome
 - ✓ Start calories at 75% of required caloric intake
 - ✓ Gradually increase over 3-5 days



Refeeding Syndrome

Heart failure
Fatigue
Weakness
Confusion
Inability to breathe
High blood pressure
Seizures
Heart arrhythmias
Coma
Death



Pathogenesis and features of the refeeding syndrome.

Psychosocial short stature

➤ Etiology :

- ✓ Psychological factors
- ✓ Endocrine dysfunction
- ✓ nutritional factors

➤ Signs and symptoms :

- Bizarre behaviors centered on food and water(Polyphagia, Polyphagia, vomiting)
- Sleep disturbances
- Abnormal behaviors
- Developmental delays

➤ Children are often shy and passive and are typically depressed and socially withdrawn.

➤ Treatment :

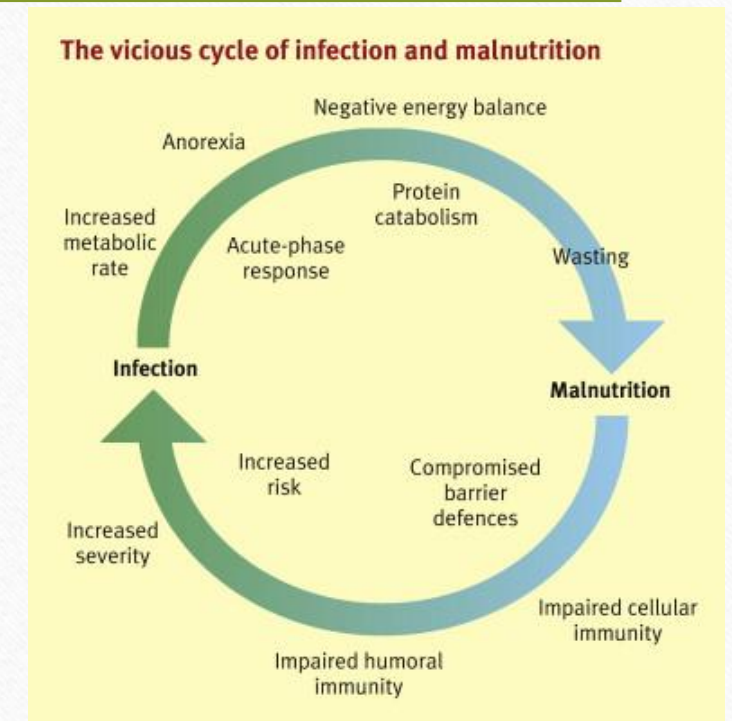
- ✓ removal of the child from the adverse environment



Malnutrition-infection cycle

- Malnutrition causes defects in host defenses.
- Infection increases the metabolic needs of the patient and is often associated with anorexia.
- Recurrent infections exacerbate malnutrition, which leads to greater susceptibility to infection.

Children with FTT must be evaluated and treated promptly for infection and followed closely.



Morbidity/mortality

- In developing countries, malnutrition is a significant cause of mortality, whether directly or secondary to complications (eg, infection)
- Long-term cognitive deficits

Management

- Goal: increase calorie intake to enable weight gain
 - ✓ Higher daily weight gain goal than that of typically developing child
 - ✓ Increase caloric intake by 50% greater than basal requirement
 - Example: typically developing 1 yr old child requires 100 kcal/kg/day; in FTT child would increase goal to 150 kcal/kg/day for catch up growth
- Nutrition consultation
- Multivitamin including iron and zinc

Management

➤ Strategies for increasing calories in:

✓ Infants

- Frequent feedings
- Addition of high calorie additives such as rice cereal or baby oatmeal

✓ Toddlers

- Frequent meals
- Energy dense foods
- Adding extra calories to foods

➤ Appetite stimulants

- ✓ Cyproheptadine (Periactin)
- ✓ Megestrol (Megace)

➤ 4-6 weeks after initiation of intervention

- ✓ If no weight gain, then initiate NG feeds to supplement PO intake

Thank you

