

Nutrition Management of Term Infants with Growth Failure

What is Growth Failure?

- Otherwise known as failure to thrive, undernutrition, malnutrition, faltering growth, or weight faltering.
- Prevalence: About 5% of US infants meet the criteria for moderate or severe malnutrition
 - Acute or chronic disorders can cause growth failure at even higher rates.¹
- Malnutrition in infants is an imbalance between nutrient requirement and intake resulting in cumulative deficits of energy, protein, or micronutrients which potentially leads to negative effects on growth, development, and clinical outcomes.² See Figure 1.

References

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Figure 1. Defining Malnutrition in Hospitalized Children: Key Concepts

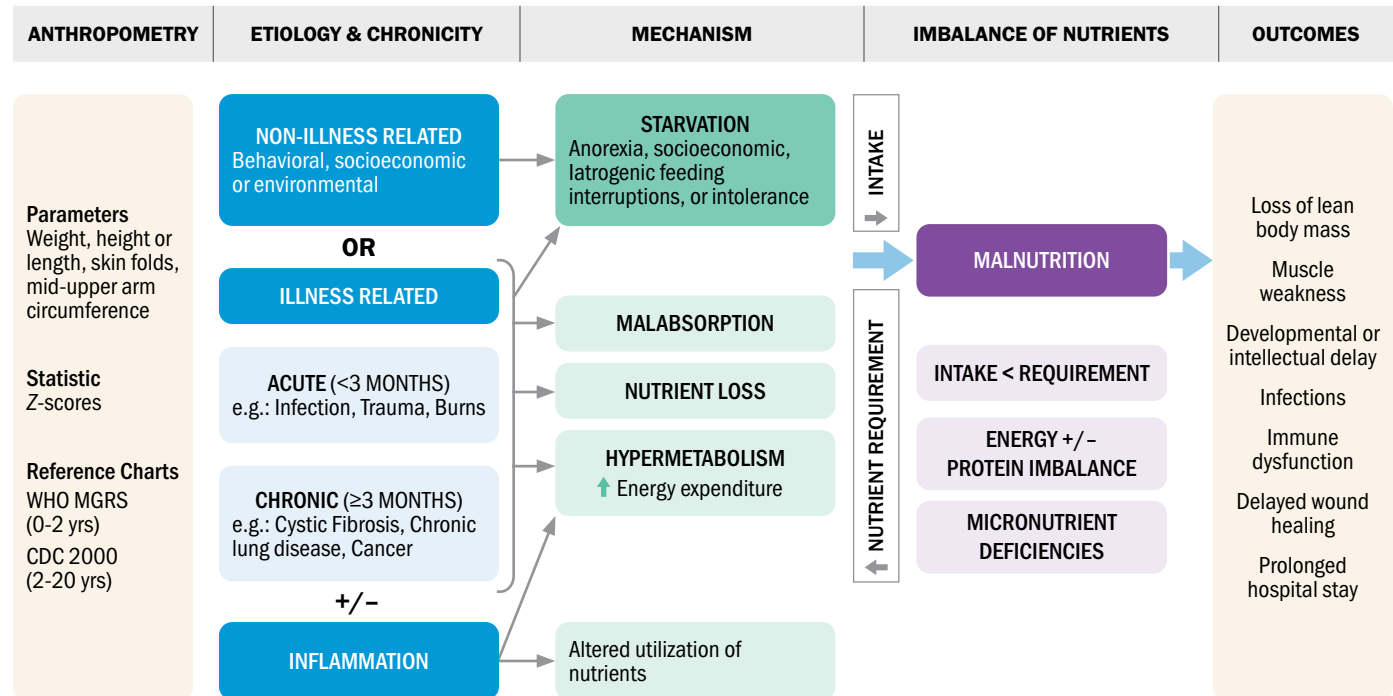


Figure 1 reprinted from Mehta NM, Corkins MR, Lyman B, et al. Defining pediatric malnutrition: a paradigm shift toward etiology-related definitions. *J Parenter Enter Nutr*. 2013;37:460-481. © American Society for Parenteral and Enteral Nutrition.

Primary Indicators of Pediatric Malnutrition When Single Data Point is Available

Indicator	Mild Malnutrition	Moderate Malnutrition	Severe Malnutrition
Weight-for-height z score	-1 to -1.9 z score	-2 to -2.9 z score	-3 or greater z score
BMI-for-age z score	-1 to -1.9 z score	-2 to -2.9 z score	-3 or greater z score
Length/height-for-age z score	No data	No data	-3 z score
Mid-upper arm circumference	Greater than or equal to -1 to -1.9 z score	Greater than or equal to -2 to -2.9 z score	Greater than or equal to -3 z score

BMI, body mass index Reprinted from Becker P, Carney LN, Corkins MR, et al. Consensus statement of the Academy of Nutrition and Dietetics/American Society for Parenteral and Enteral Nutrition: indicators recommended for the identification and documentation of pediatric malnutrition (undernutrition). *Nutr Clin Pract*. 2015;30:147-61.

Nutrition Management of Infant Growth Failure

Ideal protein-energy ratio for optimal catch-up growth is 8.9-11.5%.³

- At least 126 kcal/kg/d and 8.9% energy from protein (i.e. 2.8 g/kg/d) are needed to support infant growth recovery with appropriate lean to fat tissue deposition at 10 g/kg/d.³
- All rates of catch-up, there will be some increase in the ratio of protein to energy requirement, over and above that appropriate to the age of the child.⁴

Challenges with feeding infants with growth failure:

Osmolality – Modularity increase osmolality and can cause intolerance.^{5,6}

Nutrition Profile – Standard infant formula macronutrient distribution is not designed for infants with growth failure – these infants need higher protein: calorie ratio.⁵

Mixing Errors – Powders and complex recipes can lead to mixing errors.^{7,9}

Catch-up growth may need additional protein/energy intake:

Calorie Needs for Growth Failure:¹⁰

$$\text{Kcal/kg/day} = \frac{\text{IBW (kg)} \times \text{kcal/kg/day (DRI for age)}}{\text{Actual wt (kg)}}$$

Protein Needs for Growth Failure:¹¹

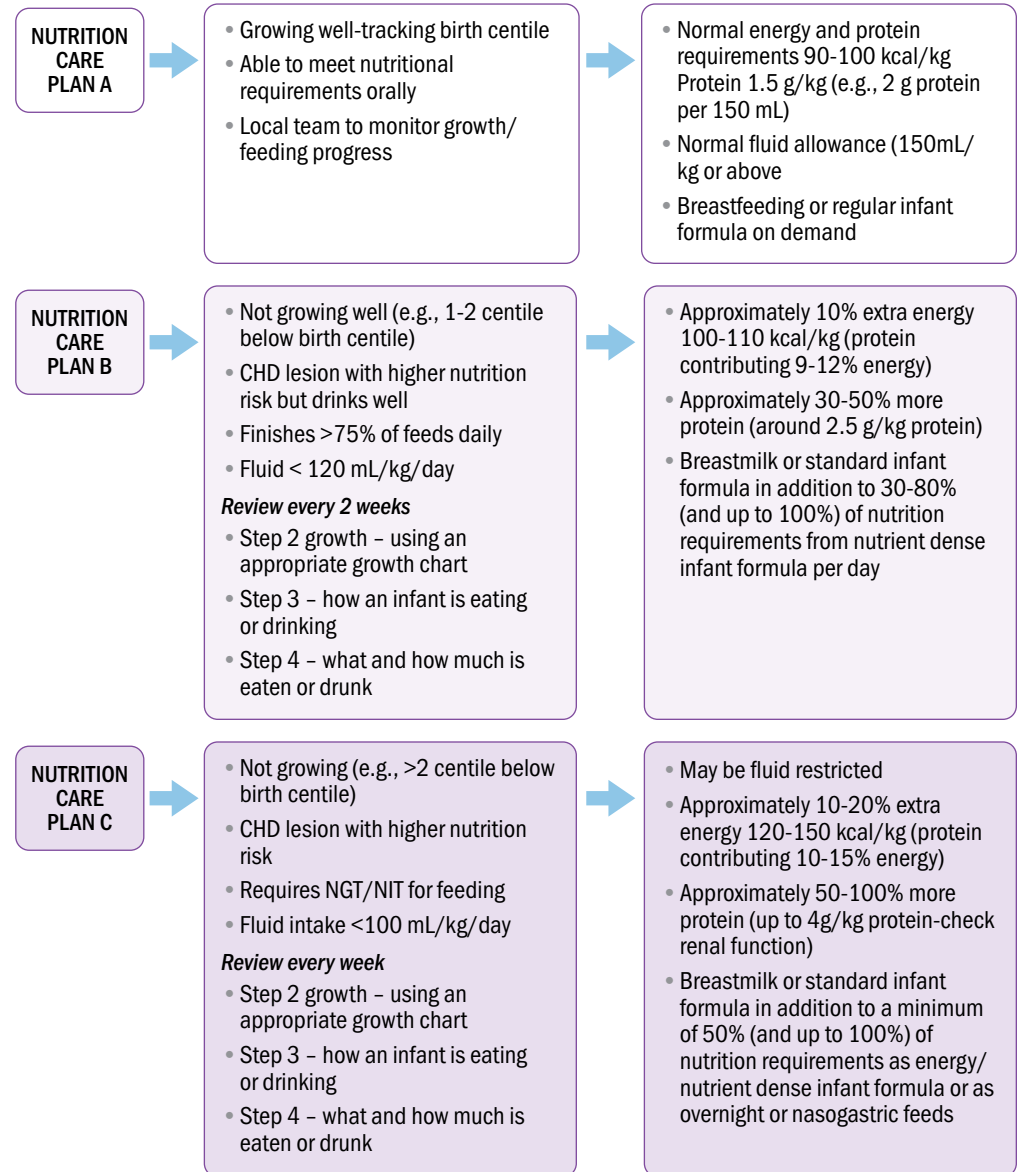
2-3g/kg/day (illness/surgery)

Suggest Energy-Dense Formula to Manage Growth Failure

- 30 kcal/fluid ounce to support high energy needs and fluid restriction
- 2.6 g of protein/100 kcal
- Lower osmolality (AAP suggests <400mOsm/L)
- Well-tolerated and supports growth¹²
- Ready-to-feed sterile liquid
- Nutritionally complete
- Can be used to supplement infants consuming breastmilk

See ASPEN Enteral Formula Guide at nutritioncare.org/ENformulaGuide.

Consensus-based Pre-operative Nutrition Pathway



Reprinted with permission from Marino LV, Johnson MJ, Davies NJ, et al. Improving growth of infants with congenital heart disease using a consensus-based nutritional pathway. *Clin Nutr.* 2020 Aug;39(8):2455-2462.