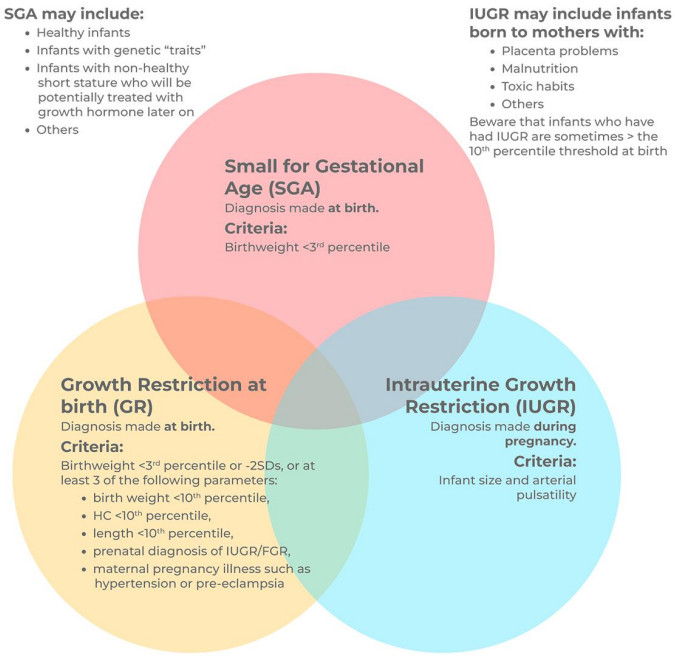
Post-Discharge Nutrition in Preterm Infants: Balancing Growth and Long-Term Health

Preterm Infants Have Unique Nutritional Needs

Advances in neonatal care have significantly improved preterm infant survival, but optimizing growth and nutrition after discharge remains a major challenge. Key goals include supporting catch-up growth, promoting neurodevelopment, and avoiding excessive weight gain that may lead to adverse metabolic programming later in life.[1]

Growth Classification and Parameters

Preterm births are classified in terms of Gestational Age (GA), anthropometrics and a new definition that combines anthropometric parameters with prenatal diagnosis of IUGR/fetal growth restriction (FGR) or maternal illness.



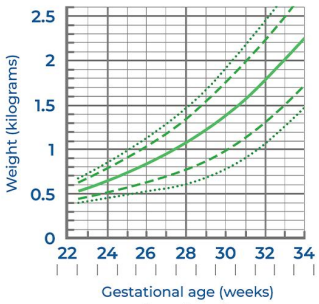
Adapted from: Haiden, et al. J Pediatr Gastroenterol Nutr. 2025;81:421–441.

Figure 1. The relationship between SGA, IUGR, and GR identified at birth

Monitoring Growth After Discharge

Growth monitoring in preterm infants relies on weight, length, and head circumference (HC) percentiles and their trajectories over time. Catch-up growth should be assessed in context, ensuring proportional increases in length and weight rather than rapid weight gain alone.[1,3,4]

To accurately track progress, use the Fenton growth chart for preterm infants up to around 44 weeks postmenstrual age, then transition to the World Health Organization (WHO) growth chart for term infants beyond that point. This combination ensures continuity in growth monitoring from Neonatal Intensive Care Unit (NICU) discharge through infancy.[1,3,4]



Critical Stages for Growth and Nutritional Needs

A timeline of the critical stages of growth and nutritional status of preterm infants include *birth, postnatal growth trajectory, nutritional status at discharge, need of catch up, growth target, and need of nutritional support.*

At birth, infants are assessed for nutritional adequacy and growth restriction. During the NICU stay, growth trajectories help identify adequate growth versus growth faltering (GF).[1]

After discharge, growth targets depend on the nutritional status at birth:[1]

- **Adequate at birth:** Aim for physiological growth according to the birth percentile (-1 SD).
- **Growth-restricted at birth:** Aim to recover to physiological percentiles (around -2 SD).

The need for catch-up growth is based on how well infants return toward their expected percentiles. Those who rise more than 1 SD above their birth trajectory need closer monitoring, while infants who remain below −2 SD are considered undernourished and require targeted nutritional support to move back within physiological percentiles.[1]

For very low birth weight (VLBW) infants, effective catch-up growth after discharge improves neurodevelopment, but must be monitored carefully to avoid potential long-term metabolic risks. The goal is steady, proportionate growth and not rapid weight gain.[2-5]

Catch-Up Growth Strategies

Persistent poor weight gain after a few days suggests the need for continued nutrition support. The period from the hospital discharge to the end of the first year of life can be divided into two phases (Figure 1):[1]

1) exclusive feeding with breastmilk or infant formula feeding, and
2) the introduction of complementary feeding alongside milk feeding with breastmilk or formula.

Breastfeeding remains the first option recommended for preterm infants. However, exclusive human milk feeding at discharge might not meet the increased calorie, protein, mineral, and vitamin requirements of preterm infants with GF in the NICU.[6]

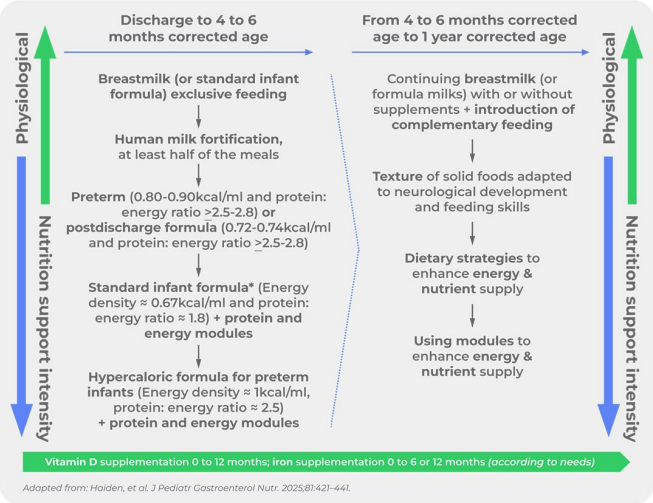


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Figure 2. Options for nutritional support after discharge showing practical options to improve energy and nutrient density before and after introduction of complementary food[1]

Human Milk Fortification	• Can be challenging for preterm infants who are directly breastfeeding • Finger feeder method allows fortification at the breast, helping meet higher nutrient needs without disrupting breastfeeding.[7]
Nutrient-Rich Feedings	• Preterm infants need higher-calorie, nutrient-dense feeds to support growth without increasing volume. • Balanced protein, fat, and carbohydrates ensure each calorie contributes effectively to healthy, proportional growth.[1]
Preterm Formula	• Supports greater gains in weight, length, and HC than standard term formulas, with average increases of about 500 g, 5–10 mm in length, and 5 mm in HC by 12–18 months post-term.[1] • Optimal post-discharge nutrition targets a protein-to-energy ratio of 2.5–3.0 until 6 months corrected age (CA), which improves linear growth from 3 months onward and leads to higher weight and HC at 12 months.[1-8]

Table 1. Post-discharge nutritional support[1-8]

Studies on Preterm Formulas

A study by Kwinta et al. (2024) showed that in VLBW infants, a two-stage preterm formula providing 3.6 g intact protein/100 kcal (Stage 1) until reaching 1800 g, then 2.8 g/100 kcal protein (Stage 2) for 30 days supported postnatal weight gain, adequate growth, normal cognitive development outcomes, and favorable protein and bone biomarkers.[9]

A study by Zemrani et al. (2025) involving 26 clinically stable preterm infants (BW<1500g) using Stage 1 and Stage 2 partially-hydrolyzed, protein-based preterm formulas with human milk oligosaccharides (PTF-HMO) showed that a two-stage HMO-containing formula is safe, supports age-appropriate growth, and provides good gastrointestinal tolerance through 60 days post-discharge.[10]

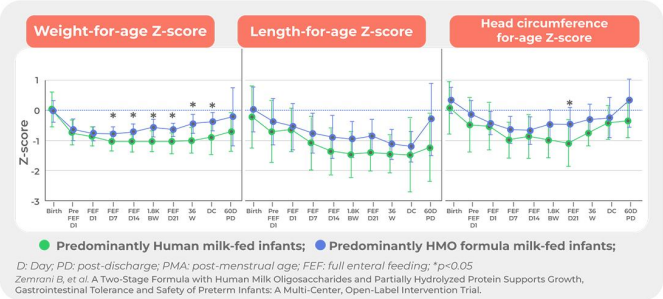

Figure 3. A two-stage preterm formula with HMOs supports age-appropriate growth in preterm infants[10]

Role of Vitamin D and Iron Supplementation

Preterm infants have high micronutrient needs. Vitamin D at 400–700 IU/day, up to 1000 IU/day is recommended to support bone mineralization and immune health until 12 months of age.[1,11]

Iron is essential for brain development and prevention of anemia hence should be given at 2-4 (6) mg/kg/day depending on birth weight & ferritin levels, from 2 weeks to 6-12 months.[1,11]

Introduction of Complementary Feeding

Preterm infants may face significant issues with acquiring feeding skills. Complementary feeding should begin at 4–6 months corrected age, based on readiness cues (good head control, reduced tongue thrust, interest in food). The timing should coincide with the infant's developmental cues rather than chronological age.[1,12]

Key Takeaways

Nutritional strategies for preterm infants after discharge are essential for:
- Optimal growth
- Neurodevelopment
- Prevention of noncommunicable diseases

Post-discharge management depends on:
- Growth status at birth
- Growth during the early postnatal period up to discharge

Options to enhance nutritional density for catch-up growth include:
- Human milk with human milk fortifiers
- Post-discharge formula
- Formula with high nutrient density

References:

1. Haiden N, et al.J Pediatr Gastroenterol Nutr. 2025;81:421-441; **2.** Beune IM, et al. J Pediatr. 2018;196:71-76.e1; **3.** Cordova EG, Belfort MB.Neoreviews.2020;21:e98-e108; **4.** Landau-Crangle E, et al. JPEN. 2018;42:1084-1092; **5.** Chainoglou A, et al. Children. 2022;9:1130; **6.** Rochow N, et al. Pediatr Res. 2016;79:870-9; **7.** Haiden N, Haschke F. New Ways to Provide a Human Milk Fortifier during Breastfeeding. Published in: Embleton ND, Haschke F, Bode L (eds): Strategies in Neonatal Care to Promote Optimized Growth and Development: Focus on Low Birth Weight Infants. 96th Nestlé Nutrition Institute Workshop, May 2021. Nestlé Nutr Inst Workshop Ser. Basel. Karger.2022; 96:101–106; **8.** Young L, et al. Cochrane Database Syst Rev. 2016;12:CD004696; **9.** Kwinta P, et al. Front Pediatr. 2024;12:1427050; **10.** Zemrani B, et al. A Two-Stage Formula with Human Milk Oligosaccharides and Partially Hydrolyzed Protein Supports Growth, Gastrointestinal Tolerance and Safety of Preterm Infants: A Multi-Center, Open-Label Intervention Trial. Abstract presented at the European Society of Pediatric Gastroenterology, Hepatology, and Nutrition 57th Annual Meeting. 2025 May 14-17; **11.** Embleton ND, et al. JPGN.2023;76:248-268; **12.** Crippa BL, et al. Nutrients.2020;12:3646.