



A New Management Strategy for Infants with Poor Growth: Outcomes From the GROW-IN Study



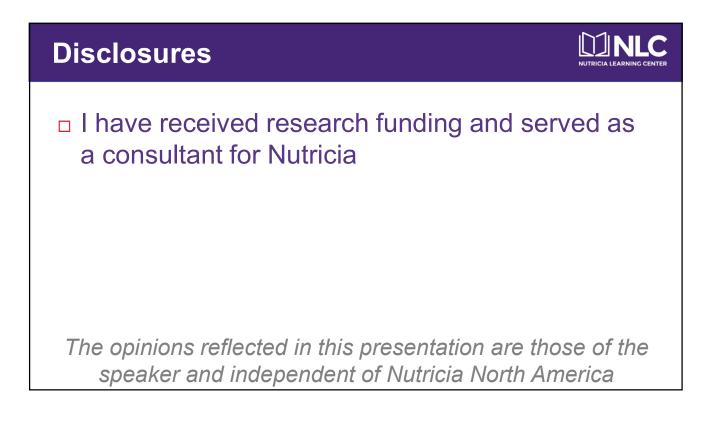
Presenter: Praveen Goday, MD - Professor of Pediatrics, Medical College of Wisconsin Program Director, Clinical Nutrition and Enteral Feeding Programs - Children's Wisconsin *Recording on <u>NutriciaLearningCenter.com</u> within ~2 weeks of live event*

Learning Objectives:

- Recognize that poor growth is common in infants with and without other medical problems
- Explain how insufficient energy intake is the most common cause of poor growth
- Discuss how an energy- and nutrient-dense formula is an innovative option to improve growth in infants with poor growth

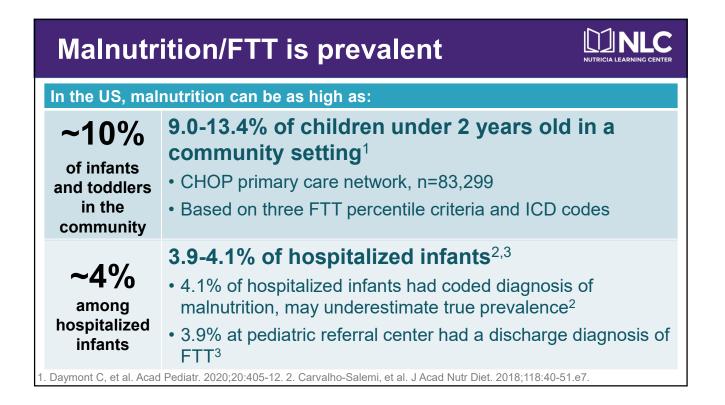
Notes:

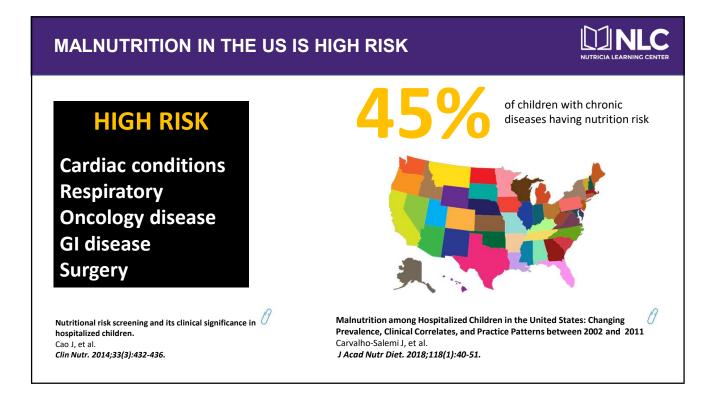
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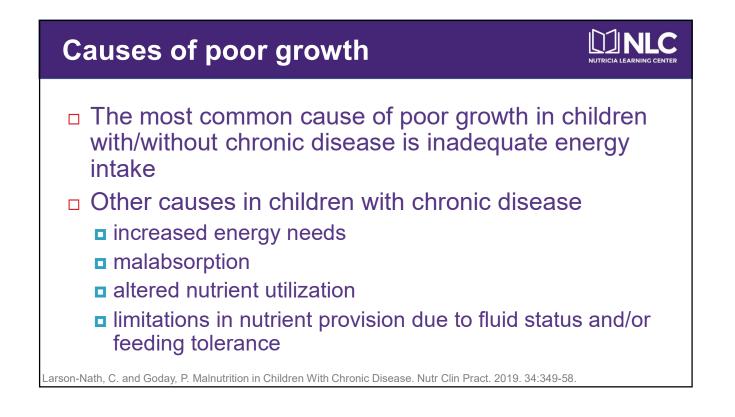


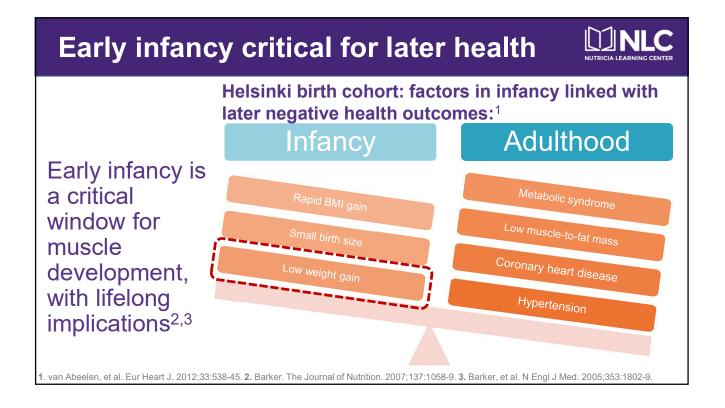
Poor growth in infancy About 5% of all infants in the US meet criteria for moderate/severe malnutrition Children with chronic disease are more likely to be malnourished Congenital heart disease – 15-65% Chronic kidney disease – 6-65%

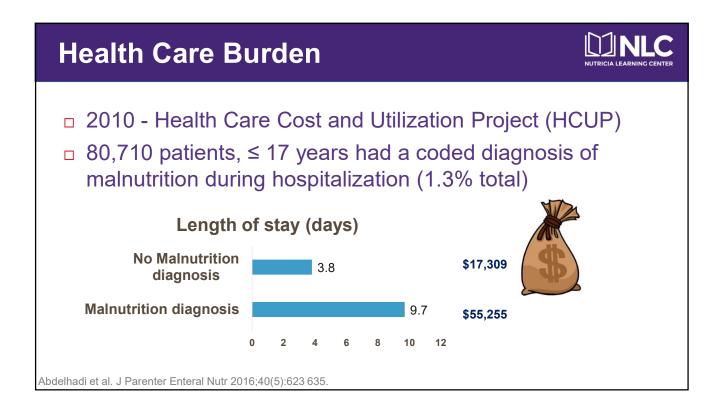
Toole BJ, et al. Congenit Heart Dis. 2014;9(1):15-25. Mastrangelo A, et al. Pediatr Nephrol. 2014;29(8):1349-1358.











Malnutrition diagnosis: Pediatric

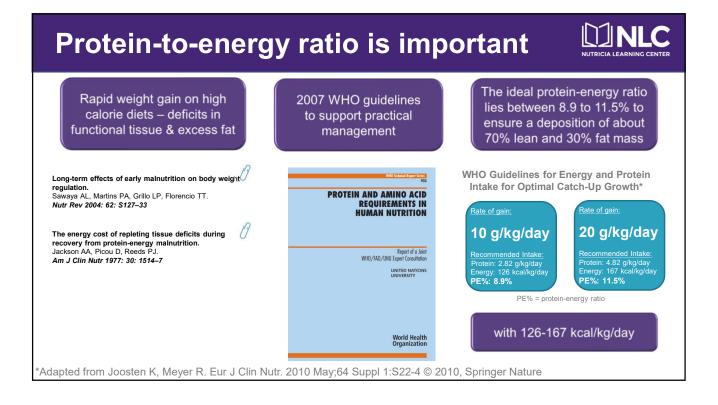
	Weight-for-height z score	BMI-for-age z score	Length-/height-for-age z score	Mid-upper arm circumference
Mild Malnutrition	-1 to -1.9 z score	-1 to -1.9 z score	No data	≥ -1 to -1.9 z score
Moderate Malnutrition	-2 to -2.9 z score	-2 to -2.9 z score	No data	≥ -2 to -2.9 z score
Severe Malnutrition	-3 or greater z score	-3 or greater z score	-3 z score	≥ -3 z score
	When <u>Two or More P</u>	<u>oints Available:</u>		
	When <u>Two or More P</u> Weight gain velocity	Points Available: Weight loss	Deceleration in weight-	Inadequate nutrient
	When <u>Two or More P</u> Weight gain velocity (<2 years of age) <75% ¹ of the norm ²	<u>oints Available:</u>		Inadequate nutrient intake 51-75% estimated
Primary Indicators	When <u>Two or More P</u> Weight gain velocity (<2 years of age)	Points Available: Weight loss (2-20 years of age)	Deceleration in weight- for-length/height z score	Inadequate nutrient intake

WHO guidance for optimal catch-up

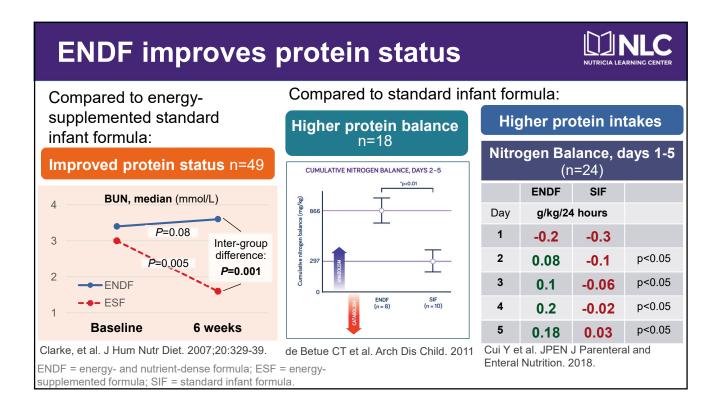
WHO guidelines for energy and protein intake for optimal catch-up growth¹

Rate of gain (g/kg/day)	Protein (g/kg/day)	Energy (kcal/kg/day)	Protein energy ratio (PE %)
10	2.82	126	8.9
20	4.82	167	11.5

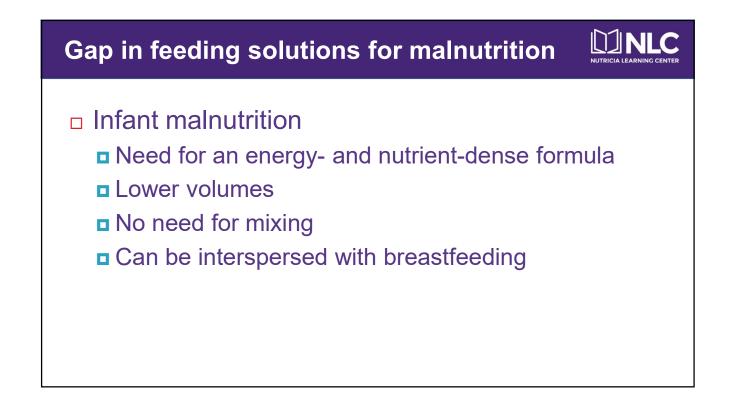
1. World Health Organization; Food and Agriculture Organization of the United Nations. Protein and amino acid requirements in human nutrition. 2007.



WHO = World Health Organization







Other Resear		
Randomized comparison of a nutrient-dense formula with an energy-supplemented formula for infants with faltering growth	Weight improvement with the use of protein and energy enriched nutritional formula in infants with a prolonged PICU stay	Tolerability and effects of the use of energy-enriched infant formula after congenital heart surgery: a randomized controlled trial
 No differences in tolerance (stool frequency, vomits) +0.29 median WAZ (<i>p</i>=0.007) 	 Constipation in only 5/70 infants, 3 infants treated for vomiting +0.48 mean WAZ (p<0.001) 	 Similar frequencies of general GI side effects Diarrhea more frequent in ENDF group Higher completion WAZ (p=0.042)
6 week, n=49	>14 days, n=70	30 days, n=59
Clarke, et al. J Hum Nutr Diet. 2007;20:329-39.	Eveleens, et al. J Hum Nutr Diet. 2019;32:3-10.	Scheeffer, et al. JPEN J Parenter Enteral Nutr. 2020;44:348-54.



The GROW-IN Study

Initial presentations of results:

Goday P, Lewis J, Sang C, et al. Energy- and protein-enriched formula improves weight gain in infants with poor growth. ASPEN Conference. 20-23 March; Virtual. JPEN J Parenteral Enter Nutr. 2021;45:S224-5(P143).

Goday P, Lewis J, Sang C, et al. Energy- and protein-enriched formula improves weight gain in infants with poor growth with cardiac and non-cardiac etiologies. Poster presented at Annual Update on Pediatric and Congenital Cardiovascular Disease. 11-14 February; Virtual. Children's Hospital of Philadelphia. 2021.

Manuscript under review by JPEN J Parent Enter Nutr

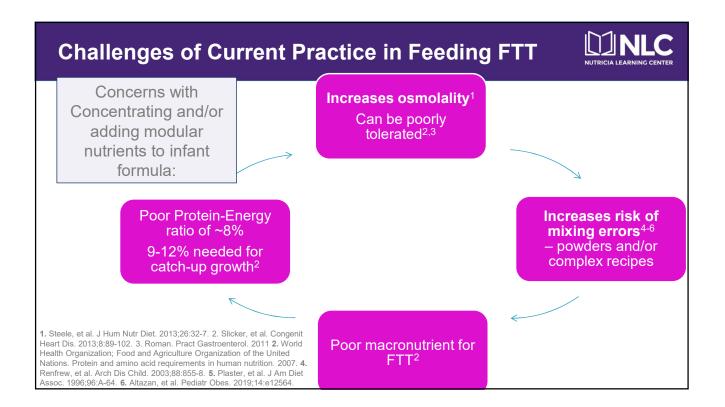
https://clinicaltrials.gov/ct2/show/NCT03563391

BACKGROUND: Challenges of Current Practice in Feeding Infants with Failure to Thrive

Concentrating and/or adding modular(s) to infant formula:

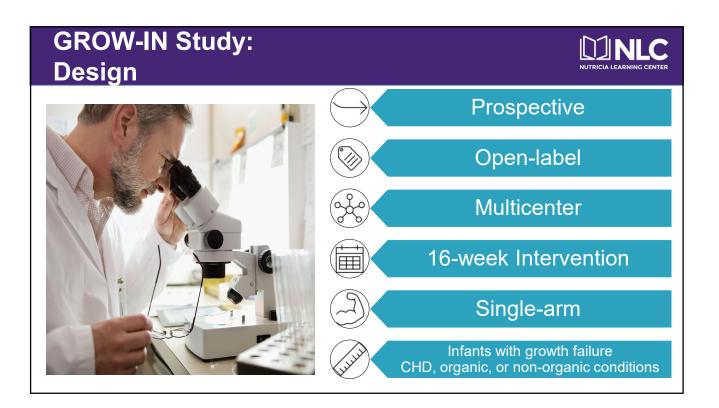
- 1. Increases osmolality,¹ can be poorly tolerated^{2,3}
- 2. Increases risk of mixing errors⁴⁻⁶ powders and/or complex recipes
- Macronutrient distribution not tailored for the needs of infants with failure to thrive²
- 4. Protein-Energy ratio of concentrated standard infant formula does not meet expert recommendations for catch-up growth:
 - only ~8% energy from protein vs. target of 9-12%²
- 5. Energy- and nutrient-dense liquid solutions exist in other countries

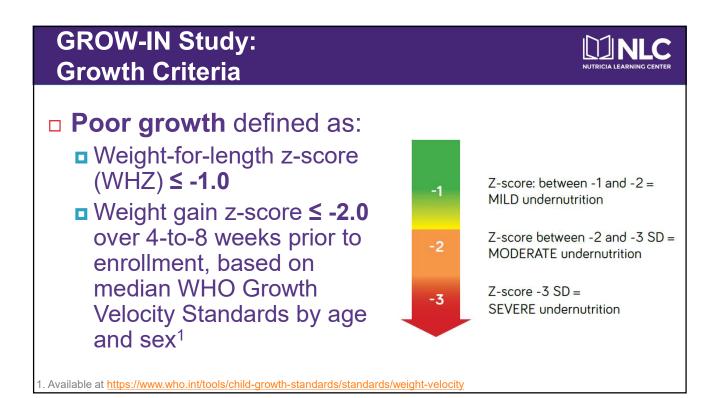
1. Steele, et al. J Hum Nutr Diet. 2013;26:32-7. 2. Slicker, et al. Congenit Heart Dis. 2013;8:89-102. 3. Roman. Pract Gastroenterol. 2011 2. World Health Organization; Food and Agriculture Organization of the United Nations. Protein and amino acid requirements in human nutrition. 2007. 4. Renfrew, et al. Arch Dis Child. 2003;88:855-8. 5. Plaster, et al. J Am Diet Assoc. 1996;96:A-64. 6. Altazan, et al. Pediatr Obes. 2019;14:e12564.



	OW-IN St ectives	udy:			
Evaluate a ready-to-feed, energy- and nutrient-dense formula:					e formula:
10	Primary	Improved weight gain in infants with growth failure		Weight-for-age z-score	
	Objective			Weight gain velocity	
	Secondary	Tolerance	Stool color, number, consistency		
\mathbb{Z}	Objectives		Vomiting	Gassiness	Crying
			Flatulence	Fussiness	Spit-up
		Anthropometrics Weight-for-le		length z-score	
			Length-for	-age z-score	
			HC-for-a	age z-score	
		Safety	Adverse ever	nts	
C = head circ	cumference. Clinical	trial approved by the Children's	Wisconsin Institution	al Review Board	

GROW-IN Study: Formula Composition					
WHO expert guidance:	•	~9-12% mote accelerated ht gain of 5-10 g/kg/d ¹	STUDY	24-calorie	Powdered formula mixed at 27 kcal/fl oz +FAT
		Concentration	FORMULA 30 kcal/fl oz	term formulas 24 kcal/fl oz	to 30 kcal/fl oz 30 kcal/fl oz
		Protein/100 kcal	2.6 g	~1.7 g	1.7-2.0 g
		% En as Protein	10.3%	~8%	~7%
		Osmolality mOsm/kg	360	370 or 380	379+-427+ ²
		Nutritionally complete for term infants with FTT	\checkmark	Yes (if unmodified)	×
EN = Energy. 1. World Health Organization; Food and Agriculture Organization of the United Nations. Protein and amino acid requirements in human nutrition. 2007. 2. Third party laboratory testing of standard infant formulas commercially available in United States. Eurofins, Madison, Wisconsin.					



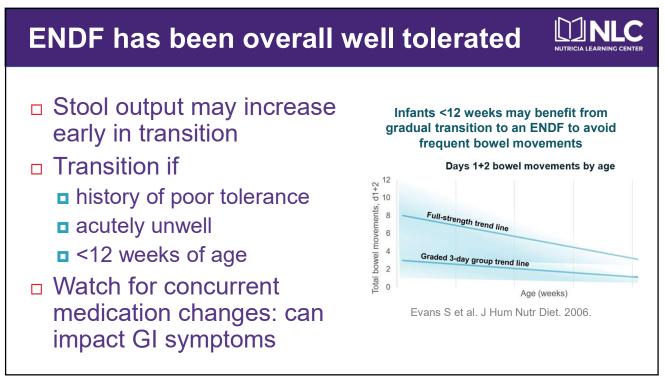


GROW-IN Study: Other Criteria

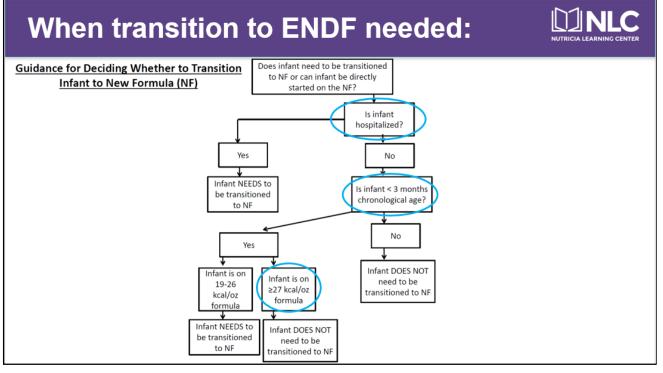
Inclusion Criteria:

- Infants must have attained term gestation (≥37 weeks gestational age) Infants, male or female
- Aged 1 through 8 months
- Infants with congenital heart disease or other organic/non-organic cause of growth failure
- Weight-for-length z score ≤ -1.0 or weight gain ≤ -2.0 z score based on WHO growth standards
- Infants expected to consume (or obtain via tube feeding), on average, 80% of their total energy intake from ENDF for 16 weeks









When transition to ENDF needed:

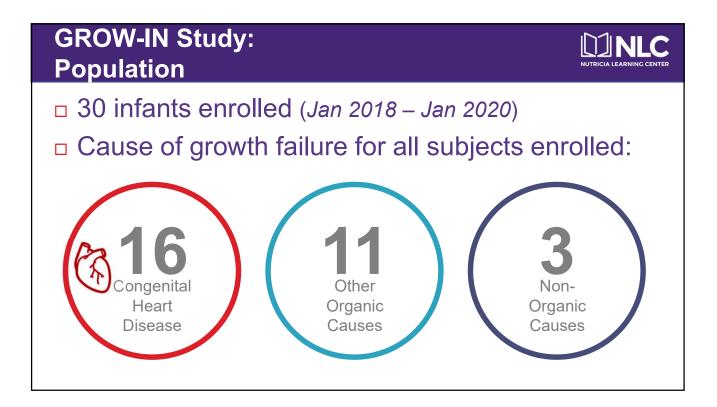


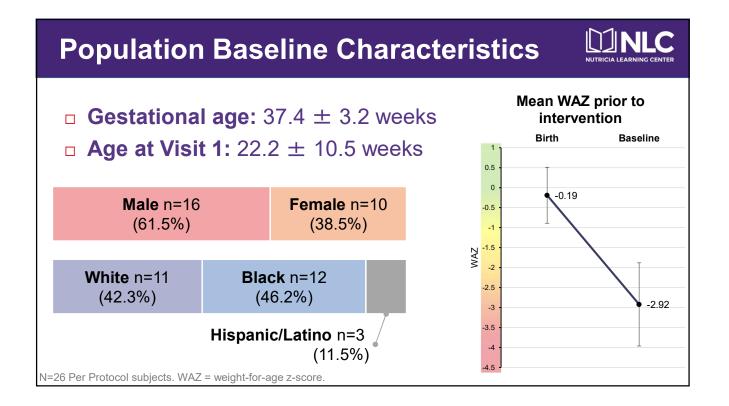
Infant <12 weeks and orally fed – FADE BY REPLACING FEEDINGS
Day 1: Give 3 feeds of original formula & remainder of feedings as ENDF
Day 2: Give 2 feeds of original formula & remainder of feedings as ENDF
Day 3: Give 1 feed of original formula & remainder of feedings as ENDF
Day 4: All feedings - ENDF

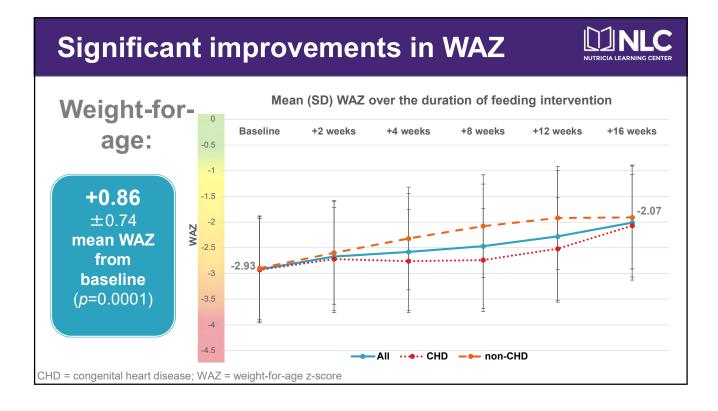
Child ≥12 weeks and requiring transition or any drip-fed child – FADE BY BLENDING

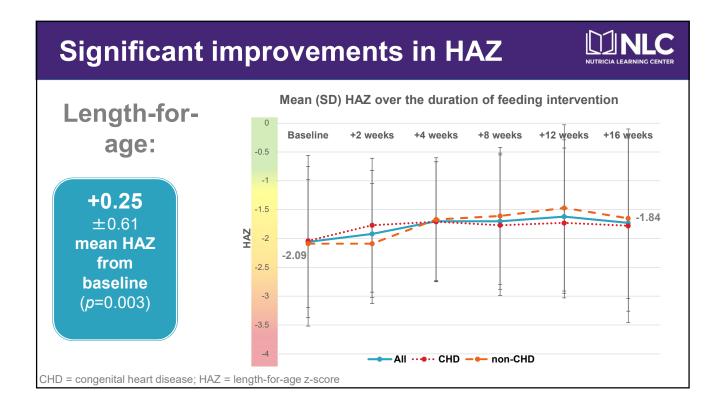
Day 1: 50% ENDF, 50% old formula
Day 2: 70% ENDF, 30% old formula
Day 3: 90% ENDF, 10% old formula
Day 4: 100% ENDF

Note: RD calculated percentages of ENDF and old formula based on volume, not calories. Intake targets set by site PI based on individual needs, age, and medical condition(s).

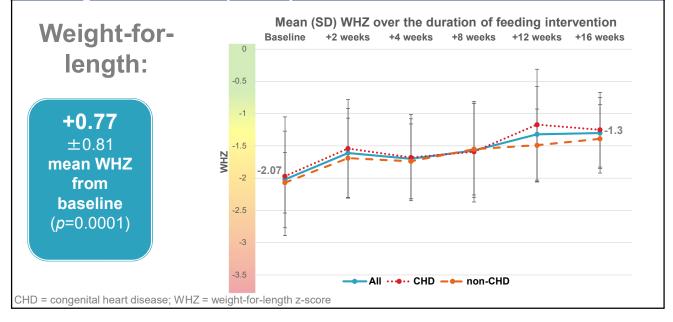


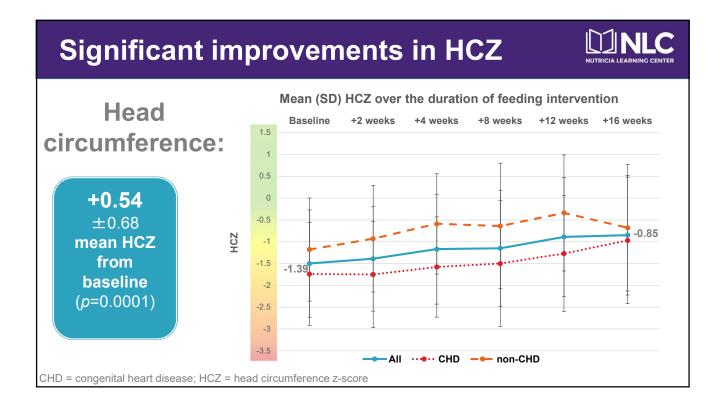


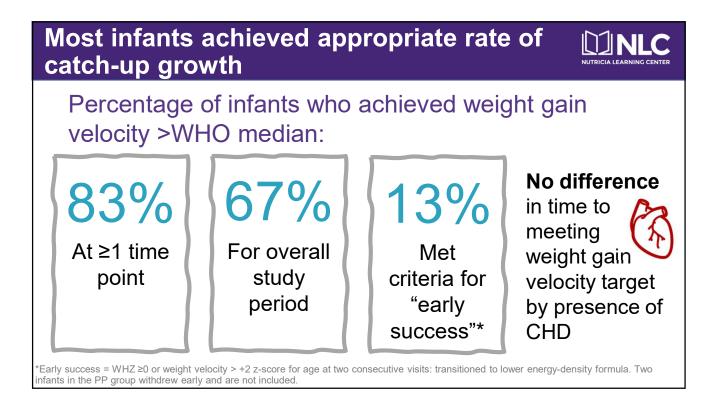


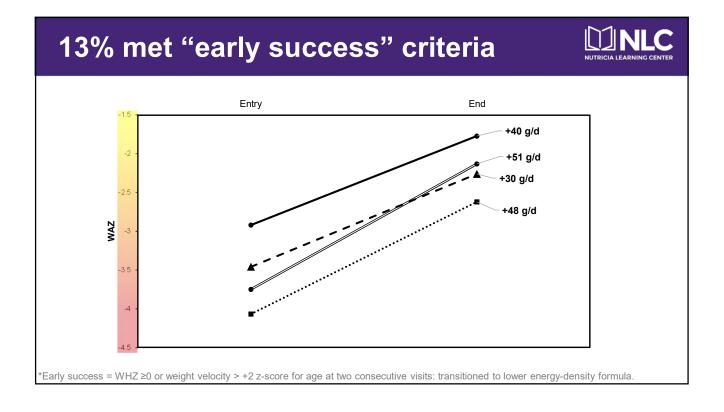


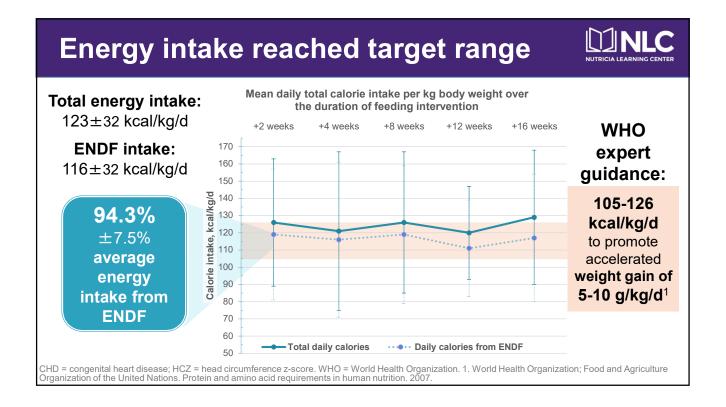
Significant improvements in Weight-for-Length z-score (WHZ)

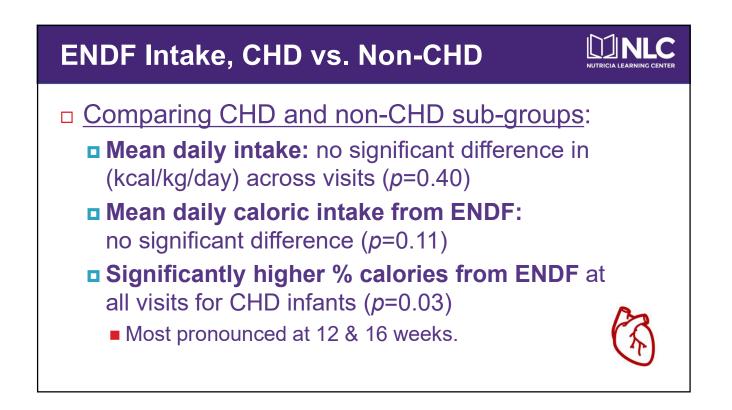




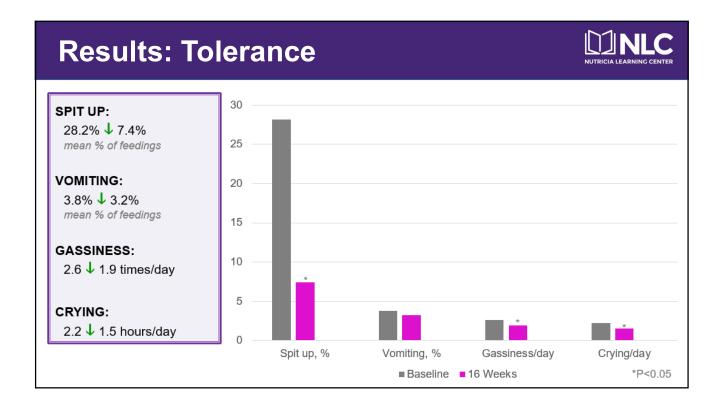








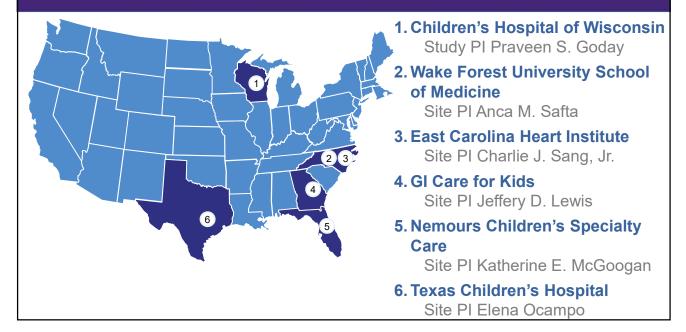
ENDF was well tolerated		
No change from baseline	Significant decreases from baseline	Stool consistency
 Frequency of vomiting Flatulence Fussiness Number of stools per day 	 Frequency of spit up Gassiness Crying 	Significantly different from baseline at 2 and 4 weeks
No significant differences from baseline observed for the per protocol group at any visit	Compared to baseline, frequency of spit up was lower at 4 to 16 weeks, crying was decreased at 4 and 16 weeks, and gassiness was decreased at 12 and 16 weeks (all p<0.05).	Stool consistency was significantly different from baseline at 2 and 4 weeks (p<0.05)



Conclusions Energy- and nutrient-dense formula: Positively impacts growth most infants achieved appropriate rates of growth with various underlying causes of malnutrition Well tolerated Safe 1. Goday P, et al. ASPEN Conference. 20-23 March: Virtual. JPEN J Parenteral Enter Nutr. 2021;45:S224-5(P143), 2. Goday P, et al. Presented at Annual Update on Pediatric and Competital Cardiovascular Disease. 11-14 February: Virtual. Children's Hospital of Philadelphia. 2021. 3.

Thank you





Feedback, Please! Certificate of Attendance



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