

An Evidence-based Approach to Address Infant Malnutrition & Failure to Thrive (FTT)

Presenters: Nishant Patel, MD and Rosan Meyer, RD, PhD

Live event date: December 14, 2021 - A symposium during the NASPGHAN 2021 Annual Meeting





Learning Objectives:

- Learn how to identify infants with growth failure and compare to most recent research
- Compare US and European current practices of nutritional management of infants with failure to thrive
- Review the role of energy- and nutrient-dense formulas in managing infants with malnutrition based on current evidence
- Assess current research on how to transition infants to energy-dense formulas based on tolerance

Notes:		

Nutricia North America supports the use of breast milk wherever possible.

Disclosures



The opinions reflected in this presentation are those of the speaker and independent of Nutricia North America

Nishant Patel, MD

Pediatric Gastroenterologist Arnold Palmer Hospital – Center for Digestive Health and Nutrition

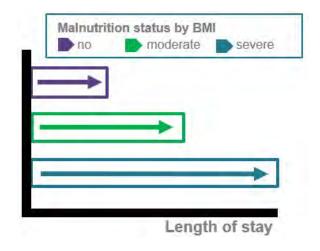
Honorarium provided by Nutricia



Poor growth in infancy must be addressed



Poor growth can increase hospital length of stay



Graphic reproduced from Hecht C, et al. Clin Nutr. 2015. © 2015, Elsevier Ltd and European Society for Clinical Nutrition and Metabolism

Poor growth in infancy must be addressed



Poor
nutritional
status can
increase risk
of
complications
&
co-morbidities

	Groups ¹			
Outcome	Well-nourished $(n = 85)$	Malnourished $(n = 90)$		
	n (c			
Infectious complications ²	24 (28)	39 (43)	0.042	
Noninfectious complications ²	7 (8)	10(11)	0.614	
Major complications ²	16 (19)	27 (30)	0.114	
Minor complications ²	14 (17)	28 (31)	0.033	
Nonprophylactic antibiotic use ²	27 (32)	34 (38)	0.404	
Unplanned reoperation ²	5 (6)	6(7)	0.831	
Unplanned readmission ²	5 (6)	12 (13)	0.096	
Postoperative length of stay (d) ³	5.3 ± 5.4	8.2 ± 10	0.001	

Secker DJ, Jeejeebhoy KN. Am J Clin Nutr. 2007;85(4):1083-1089

Poor growth in infancy must be addressed



Poor nutritional status can negatively impact short term outcomes

	Weight z scores (Weight percentiles)				
	Controls	Cases			
Birth	0 (50 th)	0 (50 th)			
Operation	-1.3 (9 th)	-1.34 (10 th)			
Last recorded weight	-1.2 (15 th)	-2.01 (2 nd)			

Reproduced from Eskedal LT, et al. Arch Dis Child. 2008 Jun;93(6):495-501 © 2008, BMJ Publishing Group & Royal College of Paediatrics and Child Health.

Poor growth in sick infants can have chronic impact NLC



Growth failure in infancy can be associated with long-term poor growth

Early life growth patterns persist for 12 years and impact pulmonary outcomes in cystic fibrosis 1 1 1 1 Dan B. Sanders ^{6,1}, Zhumin Zhang ⁶, Philip M. Farrell ^{6,4}, HuiChuan J. Lai ^{bicod, 6}, on behalf of the Wisconsin CF Neonatal Screening Group



Poor growth in sick infants can have chronic impact | | NLC |



ARTICLES

Association of Impaired Linear Growth and Worse Neurodevelopmental Outcome in Infants with Single Ventricle Physiology: A Report from the Pediatric Heart Network Infant Single Ventricle Trial

Chitra Ravishankar, MD¹, Victor Zak, PhD², Ismee A. Williams, MD, MS³, David C. Bellinger, PhD, MSc⁴, J. William Gaynor, MD², Nancy S. Ghanayem, MD³, Catherine D. Krawczeski, MD², Oaniel J. Licht, MD¹, Lynn Mahony, MD⁵, Jane W. Newburger, MD, MPH⁹, Victoria L. Pemberton, RNC, MS¹⁰, Richard V. Williams, MD¹³, Renee Sananes, PhD¹², Amanda L. Cook, MD¹³, Teresa Atz, MSN¹⁴, Svetlana Khaikin, BSc, MPH¹⁶, and Daphne T. Hsu, MD¹⁶, for the Pediatric Heart Network Investigators*



Growth failure in infancy can be negatively associated with long-term cognitive function

New malnutrition criteria in recent years



OUT with the OLD

Lack of uniform definition and standardized criteria



IN with the NEW

Indicators Recommended for the Identification and **Documentation of Pediatric Malnutrition (Undernutrition)**

- Standardized
- Diagnostic criteria
- Evidence-informed
- Consensus-derived

Mehta, et al. JPEN J Parenter Enteral Nutr. 2013. Becker. Nutr Clin Pract. 2015.

Pediatric Malnutrition Criteria



CAN IDENTIFY AND DIAGNOSE WITH THESE SINGLE DATA POINTS:

Weight-forheight z score BMI-for-age z score

Length-/heightfor-age z score

Mid-upper arm circumference z score

CAN ALSO SUPPORT WITH THESE **SERIAL** CRITERIA:

Weight gain
<2 years of age
Weight loss
2-20 years of age

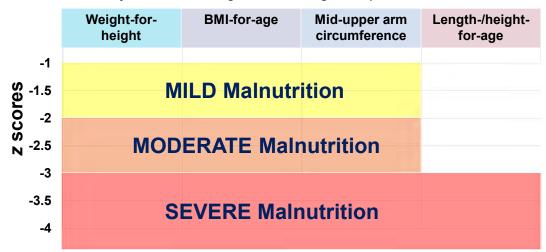
Length-/heightfor-age z score Inadequate nutrient intake

Becker. Nutr Clin Pract. 2015.

Classifying Pediatric Malnutrition



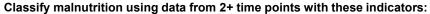
Classify malnutrition using z scores at single data points

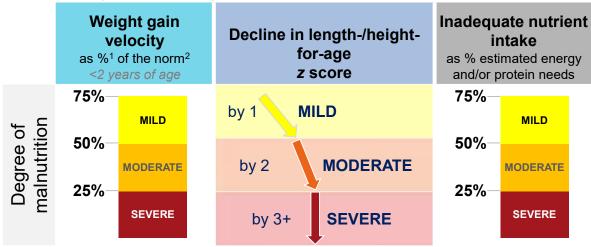


 $Reproduced from \ Becker \ P, \ et \ al. \ Nutr \ Clin \ Pract. \ 2015 \ Feb; 30(1): 147-61 \\ @ \ 2015, American \ Society for \ Parenteral \ and \ Enteral \ Nutrition.$

Classifying Pediatric Malnutrition







1. Guo S, et al. Pediatrics. 1991. 2. WHO data for patients <2 years. Reproduced from Becker P, et al. Nutr Clin Pract. 2015 Feb;30(1):147-61 © 2015, American Society for Parenteral and Enteral Nutrition.

Avoid non-consensus criteria:



No longer accepted malnutrition criteria in the US	Instead, evaluate:			
Growth percentiles	Z scores - these show deviation from norms			
• "Weight below 2 nd %ile"	Weight Z score			
 "Weight-for-height below 5th %ile" 	Weight-for-height Z score			
Triceps skinfold	Mid-upper arm circumference z score			
Insufficient weight gain	<2 years: Compare to expected weight gain			
Weight decreased across two major percentiles	velocity norms 2-20 years: Percent usual body weight lost			



Malnutrition: common in hospitals



~4% among hospitalized infants

Regional data¹

3.9% hospitalized children diagnosed with FTT

National data²

- **4.1%** hospitalized infants had malnutrition diagnosed²
 - may <u>underestimate</u> true prevalence

FTT = failure to thrive. 1. Schwartz ID. Pediatr Rev. 2000. 2. Carvalho-Salemi, et al. J Acad Nutr Diet. 2018.

Malnutrition: common in community





CHOP data¹

Up to 13% of children <2 years

- n=83,299
- FTT criteria or ICD codes

NHANES data²

Up to 25% of infants

- □ n=1,428
- Met 1+ z score criterion

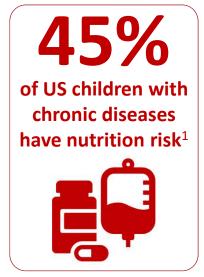
 MILD
 MODERATE
 SEVERE

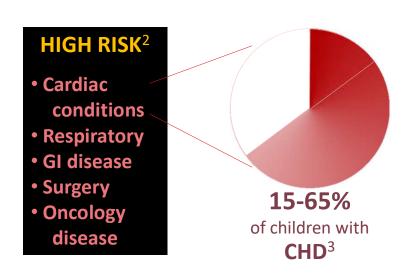
 21.0%
 3.4%
 0.7%

CHOP = Children's Hospital of Philadelphia; FTT = failure to thrive; ICD = international classification of diseases; NHANES = National Health and Nutrition Examination Survey 1. Daymont C, et al. Acad Pediatr. 2020. 2. Price AA, et al. Nutrients. 2020.

Malnutrition: more common in illness







1. Carvalho-Salemi J, et al. J Acad Nutr Diet. 2018. 2. Cao J, et al. Clin Nutr. 2014. 3. Toole BJ, et al. Congenit Heart Dis. 2014.

When we see poor growth, we need to act





PRINCIPLES TO ACHIEVE GOALS

- Monitor to ensure appropriate catch-up growth
- Adjust regimen as needed
- Use interventions that meet recommendations for quality as well as quantity
- Act at the right time
- Efficiently and effectively meet nutritional requirements
- Be aware of high-risk groups
- Screen effectively



Quality weight gain: Requires both calories AND protein



Managing poor growth is more than just "high" calories

Condition	Calorie % DRI	Protein % DRI
Cystic fibrosis	120-150% (≤ <i>200%</i>)	150-200%
Short bowel syndrome	150%	150%
CHD (pre-op)	100-140%	100%

Kyle UG, et al. Nutr Clin Pract. 2015.

MINLC Target ideal protein delivery PROTEIN AND AMINO ACID REQUIREMENTS IN HUMAN NUTRITION WHO expert protein Rapid weight guidelines gain on highcalorie diets^{1,2} Energy and protein intake for optimal deficits in catch-up growth functional Rate of Protein: gain Protein **Energy** tissue energy ratio (g/kg/day) (g/kg/day) (kcal/kg/day) Ideal percent energy excess fat 126 8.9% from protein: 10 2.82 ~9 to 12% 20 11.5% 4.82 167 1. Sawaya et al, 2004. 2. Jackson et al, 1977. Table Adapted from Joosten K, Meyer R. Eur J Clin Nutr. 2010 ©2010 Springer Nature

Should US clinicians be so creative?



Current US Practices for Infants with Growth Failure:

- Feed more volume, more often
- Concentrate formula powder
- Use a 24-kcal or preterm formula
- Use a "base" formula then add supplements, fortifiers, and/or modular nutrients

One or more options may be combined to meet energy and protein targets

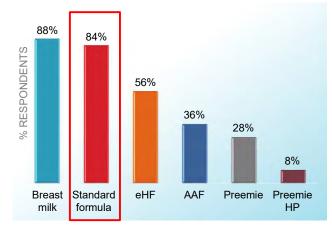
Simental S, 2020

Hospitalized infants with poor growth often get formula and/or modulars¹



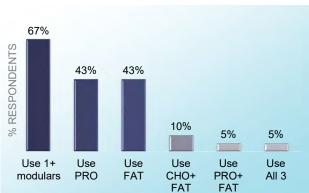
Common enteral nutrition sources

(n=25 RDs: each chose top 3)

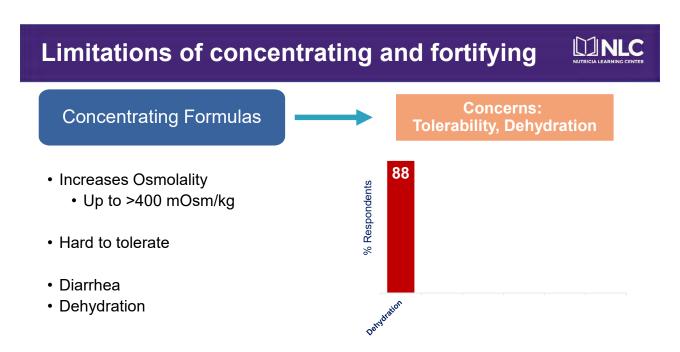


Modular(s) sometimes used to help meet 100% of protein +/or energy goals

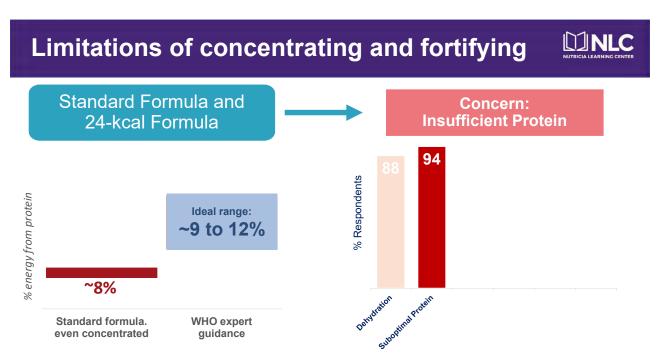
(n=21 RDs: each chose all that apply)



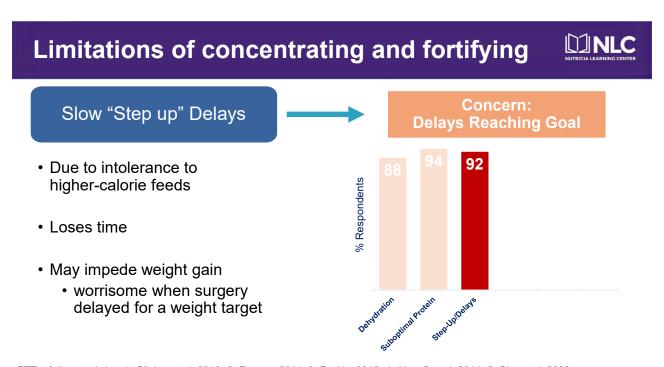
AAF = amino acid-based formula; CHO = carbohydrate; eHF = extensively hydrolyzed formula; Prem-HP = high-protein premature formula; PRO = protein; RD = registered dietitian. Nutricia supports the use of breast milk wherever possible. 1. Simental, 2020.



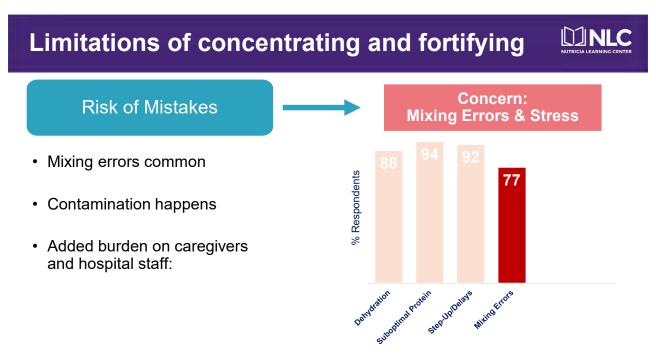
FTT = failure to thrive. 1. Slicker et al, 2013. 2. Roman, 2011. 3. Steele et al, 2013. 4. Pereira-da-Silva et al, 2008. 5. Fomon et al, 1999. 6. Simental S. 2020.



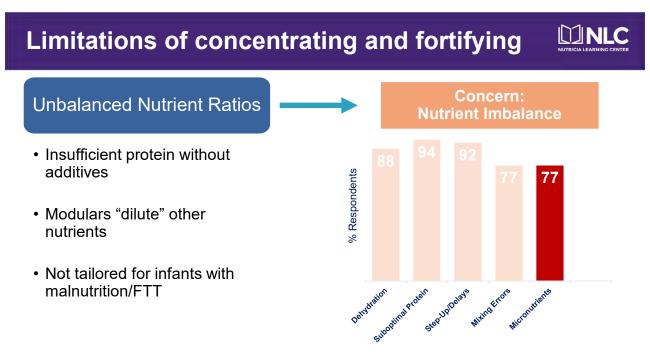
FTT = failure to thrive. 1. World Health Organization, 2007. 2. Simental S, 2020.



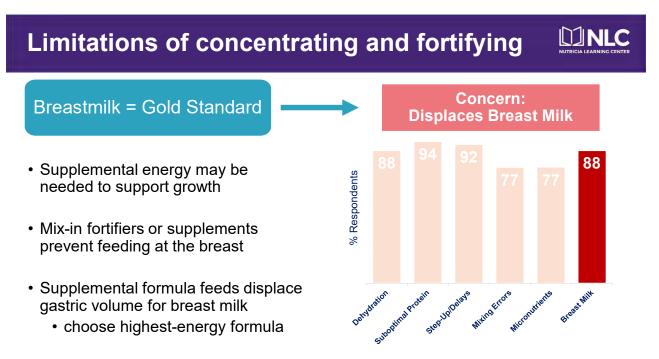
FTT = failure to thrive. 1. Slicker et al, 2013. 2. Roman, 2011. 3. Reddy, 2013. 4. Alsoufi et al, 2014. 5. Simental, 2020.



FTT = failure to thrive. 1. Renfrew et al, 2003. 2. Plaster et al, 1996. 3. Altazan et al, 2019. 4. Rocha Carvalho et al, 2000. 5. Fagerman, 1992. 6. Labiner-Wolfe et al, 2008. 7. Simental, 2020.

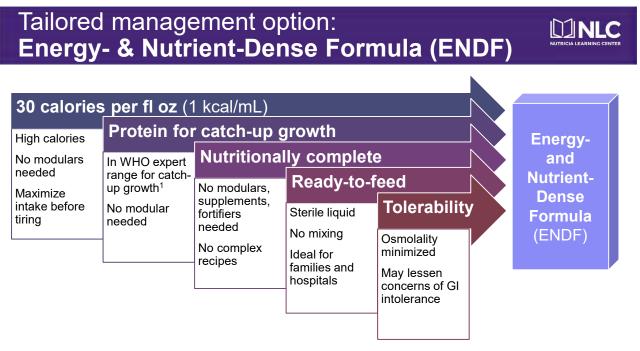


FTT = failure to thrive. 1. Simental, 2020.



FTT = failure to thrive. 1. Simental, 2020.





1. World Health Organization, 2007.

ENDF Uses

Nutricia Learning Center



CLINICAL NEED SCENARIOS

Increased energy and protein requirements

Catch-up growth for infants with malnutrition (undernutrition)

Poor growth on current regimen

High protein/calorie needs + fluid restriction

Higher protein needs during illness





ENDF Uses





RELATED DIAGNOSES AND CONDITIONS

Congenital Heart Disease

Chronic Lung Disease

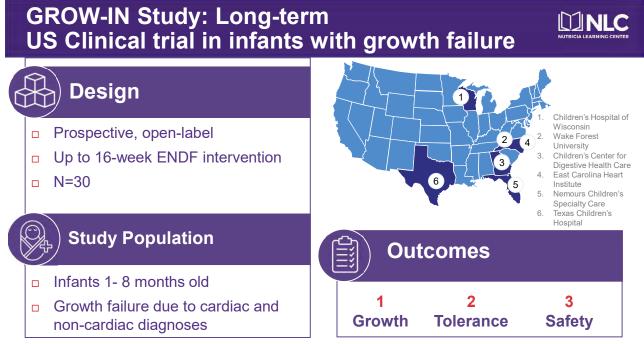
Cystic Fibrosis

Neurological Syndromes

Respiratory Syncytial Virus

Non-diseaserelated Failure to Thrive





ENDF = energy- and nutrient-dense formula. 1. Goday et al, JPEN J Parenteral Enter Nutr, 2021. 2. Goday et al, Children's Hospital of Philadelphia, 2021.

GROW-IN Study: Population

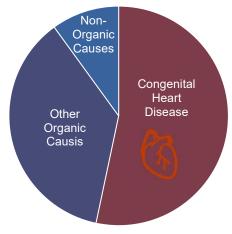


POOR GROWTH DEFINED AS EITHER:

Weight-for-length z-score
≤ -1.0

Weight gain z-score
≤ -2.0
over 4-8 weeks
prior to enrollment¹

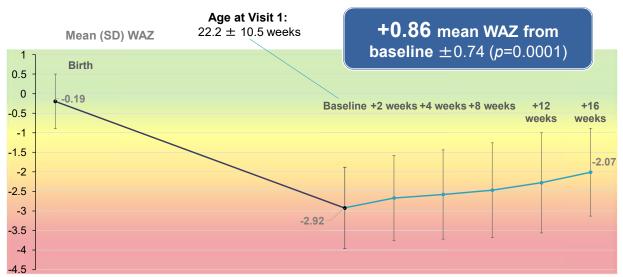
Causes of growth failure



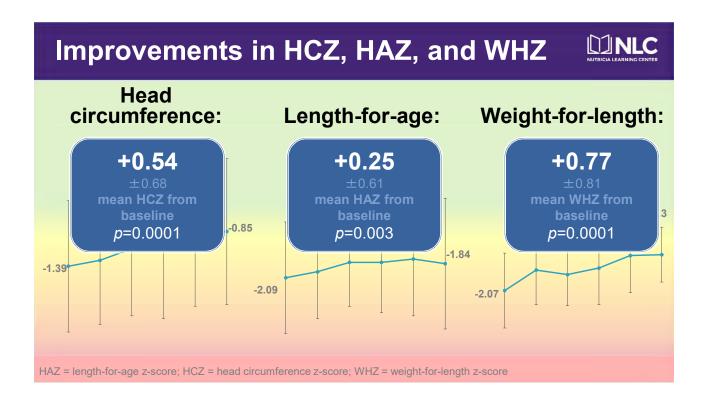
^{1.} Based on median WHO Growth Velocity Standards by age and sex: https://www.who.int/tools/child-growth-standards/standards/weight-velocity

Significant WAZ recovery with ENDF





N=26 Per Protocol subjects. CHD = congenital heart disease; WAZ = weight-for-age z-score



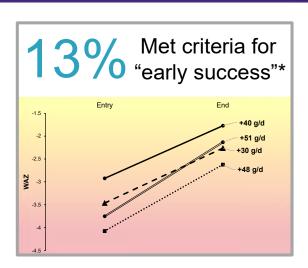
Most infants achieved appropriate rate of catch-up growth



Achieved weight gain velocity >WHO median:

83% At ≥1 time point

67%
For overall study period



^{*}Early success = WHZ ≥0 or weight velocity > +2 z-score for age at two consecutive visits: transitioned to lower energy-density formula

ENDF was well tolerated



No change ≈ from ≈ baseline	↓ Significant ↓ decreases	Stool consistency
VomitingFlatulenceFussinessStools/day	 Spit up frequency ⅓ Gassiness ⅓ Crying ⅓ 	Significantly different from baseline at 2 and 4 weeks
No significant differences from baseline observed for the per protocol group at any visit	Vs. baseline, frequency of spit up lower at 4-16 weeks, crying decreased at 4 & 16 weeks, gassiness decreased at 12 & 16 weeks (p<0.05)	Compared to baseline (p<0.05). More watery stools from visit 2 on, in line with reports for healthy, breastfed infants 1.2

^{1.} Piemontese, et al. PLoS One. 2011;6:e28010. 2. Rodriguez-Herrera, et al. Nutrients. 2019;11.

Summary – Nishant Patel, MD



- Malnutrition and poor growth are common
- Poor growth in infancy must be addressed
- Use malnutrition consensus criteria in US
- Tailored interventions to minimize risks and support appropriate growth

Conclusions: GROW-IN Trial





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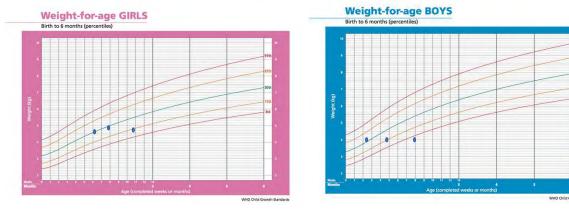
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- 8. Fagerman KE. Nutr Clin Pract. 1992;7:31-6.
- 9. Fomon SJ, et al. J Pediatr. 1999;134:11-4.
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- Schwartz ID. Pediatr Rev. 2000;21:257-64; quiz 64.
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 - http://www.who.int/childgrowth/standards/w_velocity/en/index.html
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Nutritional Management of Malnutrition & Failure to Thrive – From Research To Practice



Rosan Meyer (RD, PhD)

Growth charts: World Health Organization; 2006. Licence: CC BY-NC-SA 3.0 IGO.

2021

Disclosures

- Academic lectures for:
 - Danone/Nutricia
 - Mead Johnson
 - Nestle
 - Abbott
- Nutrition board member: Abbott and Nestle Clinical Nutrition

The opinions reflected in this presentation are those of the speaker and independent of Nutricia North America

Objectives

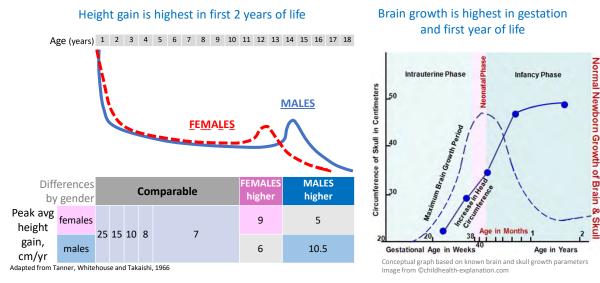
- 1) European practices of nutritional management of infants with failure to thrive
- 2) The importance of the energy protein ratio and dietary management options
- 3) Current research on growth monitoring and transitioning of feeds

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Terminology

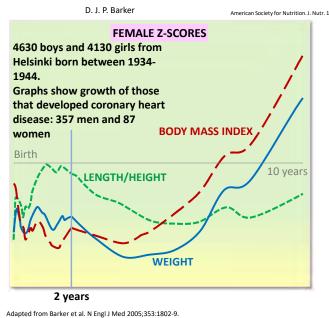
- Failure to thrive or Faltering growth or Malnutrition
- Terminology in Europe slowly changing to use faltering growth
 - To indicate that this is not a "failure" in parenting
 - Reduce the stigma associated with "failure"
- Malnutrition is not seen in Europe as the same as Failure to Thrive
 - Has its own definition (WHO)
 - Malnutrition covers both under and over nutrition

Why do we want to promote catch-up growth?

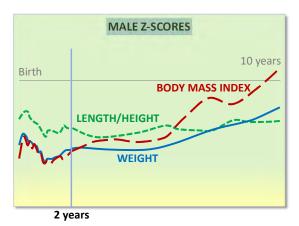


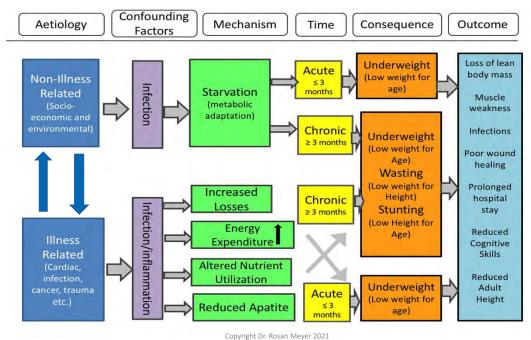
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Introduction: The Window of Opportunity



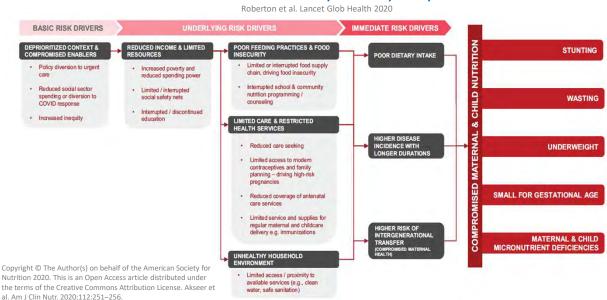
Excessive catch-up growth in early childhood linked to cardiovascular disease in adulthood





Adjusted from Mehta et al. JPEN J Parenter Enteral Nutr 2013 37: 460

As a result of COVID, prevalence of wasting could increase by 10–50% with an excess of ~40,000–2,000,000 child deaths



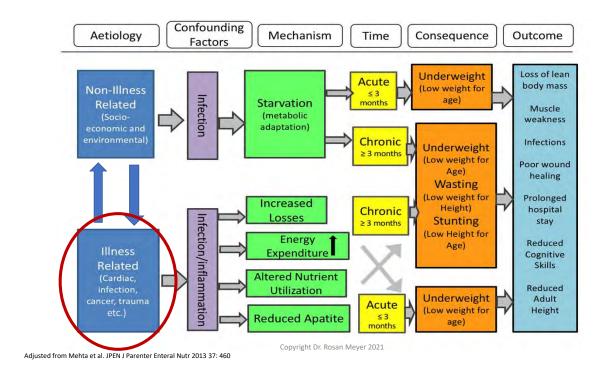
Available Guidelines



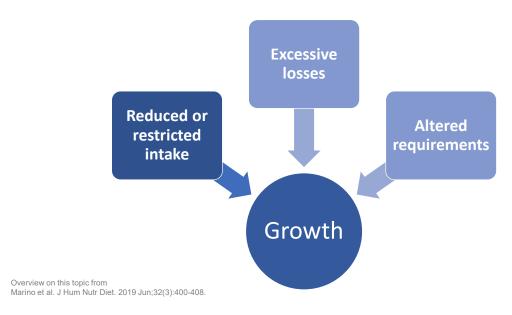
Overarching Nutritional Goals

- Individualize nutritional management
 - Consider aetiology of growth faltering
- Optimize medical management (if poor growth is illness driven)
- Ensure optimal nutritional assessment
 - Enables formulation of nutritional intervention

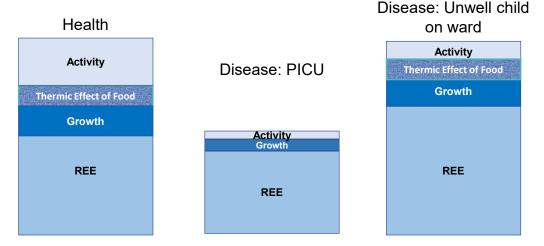
- Set nutritional aims that achieve catch-up of ideal lean and fat mass ratio:
 - Energy, protein
 - Micronutrients correct for any known deficiencies
- Support normal oral motor skill development
- Avoid psychological sequelae as a result dietary care plans
- Monitor....and monitor



Growth velocity may be disrupted due 3 Primary Factors

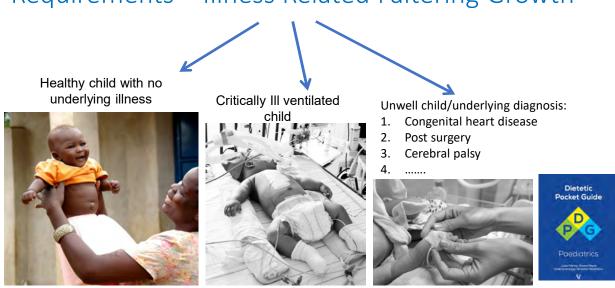


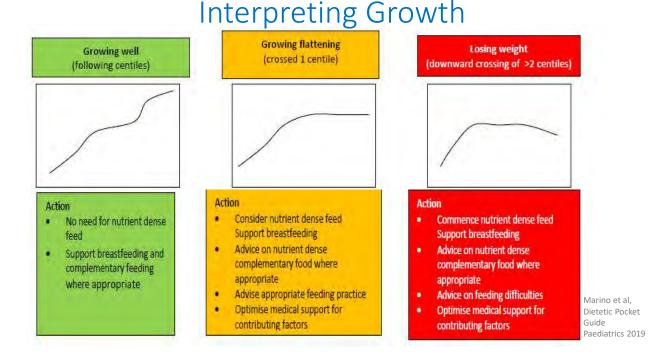
Energy Requirements Can Change with Disease



Kerklaan et al, JPGN 2016. DRVs for Energy, SACN 2011. EFSA Journal, 2013;11:1-112. Meyer et al. Nutr Clin Pract 2012 27:669-76.

Choose the Right Method to Estimate Requirements – Illness Related Faltering Growth





WHO/FAO/UNO General Recommendations

- Golden et al: Guidelines for the management of mild malnutrition
- 2007 WHO/FAO/UNU published guidelines for protein for catch-up growth

WHO guidelines for energy and protein intake for optimal catch-up growth ¹					
Rate of gain (g/kg/day)	Protein (g/kg/day)	Energy (kcal/kg/day)	Protein energy ratio (PE %)		
1	1.02	89	4.6		
2	1.22	93	5.3		
5	1.82	105	6.9		
10	2.82	126	8.9		
20	4.82	167	11.5		

 Ensure that nutritional aim is <u>suitable for the diagnosis</u>, <u>practical</u> and safe

WHO/FAO/UNU Expert Consultation 2007. Golden MH, Food Nutr Bull. 2009. Golden, Indian Pediatr. 2010.

Vitamins and Minerals for Catch-up Growth

Type I Nutrients:

Biochemical functions
Susceptible to stress and
Infections
Vitamins and mineral
Trace Elements
Not malnourished with
Just type 1 nutrient
deficiency

Faltering Growth

"It would be inappropriate to give only type II nutrients in an attempt to reverse wasting or stunting and ignore the high prevalence rates of many of the type I nutrient deficiencies."

Type II Nutrients

Growth nutrients
Energy (fat/carbohydrates)
Amino acids
Water
Sodium, Chloride
Iron, Iodine
Zinc, Phosphorus

Golden MH, Food Nutr Bull. 2009

Dietary Management in Breastfed Infants with Failure to Thrive/Faltering Growth

- Important to support breastfeeding as per WHO guidelines
 - Ensure optimal breastfeeding technique
 - · ? Expressing breastmilk for top up
- Rana et al. 2020: Systematic review on feeding interventions in infants < 6 months with growth faltering
 - Cup feeding in breastfed infants had a positive impact (only 2 studies) but ? practical
 - Macronutrient fortified formula, cream supplementation, and fortified human milk formula had positive effects (weight gain) on certain infants.
 - Interventions comparing human breastmilk/ donor milk with formula had mixed effects.

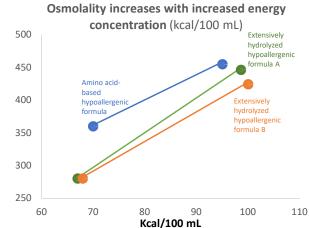
Rana et al. Nutrients 2020, 12, 2044;2-30

Management of Formula Fed: Concentration and **Additions**

• Energy: Protein ratio disturbed ++ (as low as 6% of energy from protein)

- Weight gain = fat mass and limited LBM
- Dehydration = ↑ Renal Solute Load
- Diarrhoea + vomiting
 - Osmolality ↑ (> 400 mOsm/kg)
 - · Fat content
- Accuracy of mixing at home
- Taste??

This should be avoided due to better lean:fat mass ratio with protein:energy ratio > 8.9%



Powdered

Powdered

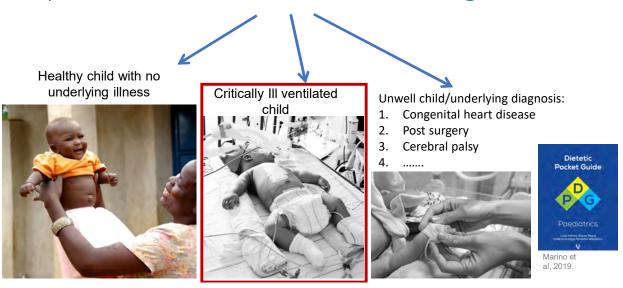
Energy- and

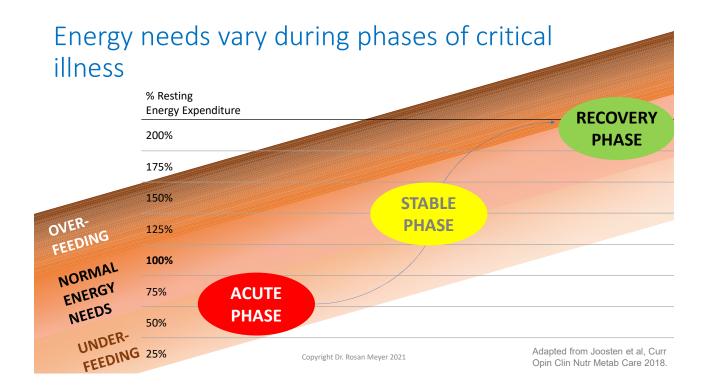
Copyright Dr. Rosan Meyer 2021 Jeffs. J R Coll Gen Pract. 1989;39:113. Meyer et al. Pediatr Allergy Immunol 2012: 23: 307–314.

Cost may be a factor in inpatient settings

infant infant **Nutrient-dense** e-SPEN Journal 2013 Original article formula + formula + Formula, Factor unflower oil MCT oil Ready-to-feed Cost comparison between **Bottles** powdered versus energy dense Tape infant formula for Autoclave bags Label stickers undernourished children in a Blast chillers hospital setting Refrigeration Thermometer L.V. Marino R. Meyer, M.L. Cooke Autoclave Gloves Masks Aprons Tech support Hourly salaries € 23,288.15 € 23,288.15

Choose the Right Method to Estimate Requirements – Illness Related Faltering Growth

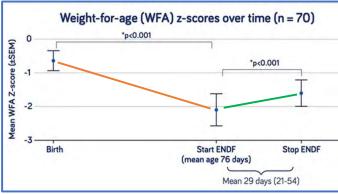




ENDF can support growth, well tolerated

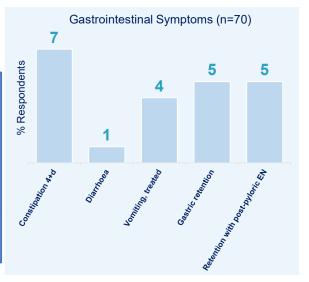
Journal of **Human Nutrition** and **Dietetics RESEARCH PAPER** Weight improvement with the use of protein and

energy enriched nutritional formula in infants with a prolonged PICU stay R. D. Eveleens, D. K. Dungen, S. C. A. T. Verbruggen, J. M. Hulst & K. F. M. Joosten



ENDF: 100 kcal/100 ml and 2.6 g protein/100 ml

• Mostly post cardiac surgery



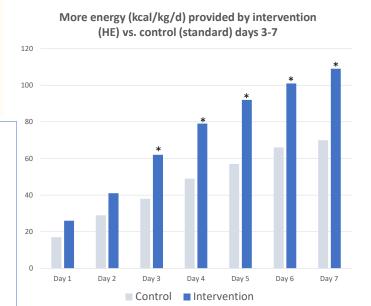
High-energy nutrition in paediatric cardiac critical care patients: a randomized controlled trial

Huiwen Zhang ,Ying Gu,YaPing Mi,Yun Jin,Weijia Fu and Jos

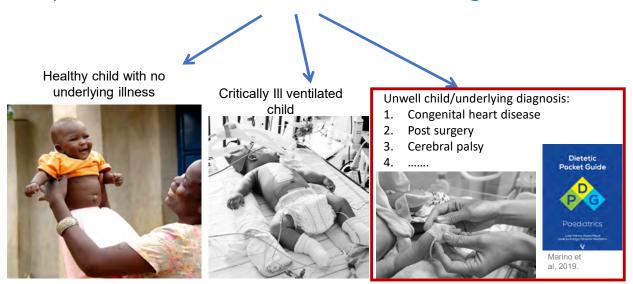
Chinese RCT: 59 critically ill children Standard vs high energy (HE) enteral nutrition

Significant differences (in HE group):

- Higher energy intakes
- Less weight loss
- · More frequent mild feeding intolerance



Choose the Right Method to Estimate Requirements – Illness Related Faltering Growth



Original article - Clinical Nutrition

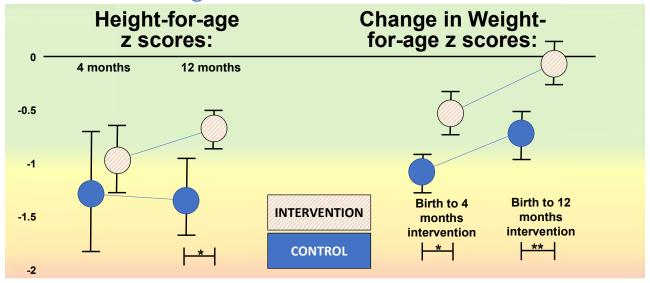
Improving growth of infants with congenital heart disease using a consensus-based nutritional pathway

Luise V. Marino, Mark J. Johnson, Natalie J. Davies, Catherine S. Kidd, Julie Fienberg, Trevor Richens, Tara Bharucha, R. Mark Beattie Anne-Sophie E. Darlington

	Nutrition	Energy Needs		Protein Needs		Fluids	Enteral nutrition sources
Clinical scenarios	Care Plan		kcal/kg/d	%EN	g/kg/d		
• Growing well • Can meet nutrient needs PO	Α	Normal	90-100		pecial erations	Normal, e.g. 150 kcal/kg/d	Breast milk or standard infant formula on demand
 Not growing well CHD lesion + higher nutrition risk, feeding well Finishes >75% of feeds PO Fluid intake <120 mL/kg/d 	В	+ ~10%	100-110	9-12	~2.5		Breast milk or standard infant formula + 30-80% of nutrition from ENDF
 Not growing CHD lesion + higher nutrition risk Needs NG/NJ tube Fluid intake <100 mL/kg/d 	С	+ ~10-20%	120-150	10-15	<4	May be restricted Check renal function	Breast milk or standard infant formula + 50-100% of nutrition from ENDF or as ON or NG feeds

CHD = congenital heart disease; %EN = Percent total energy; ENDF = energy- and nutrient-dense formula; NG = nasogastric; NJ = nasojejunal; ON = overnight; PO = by mouth

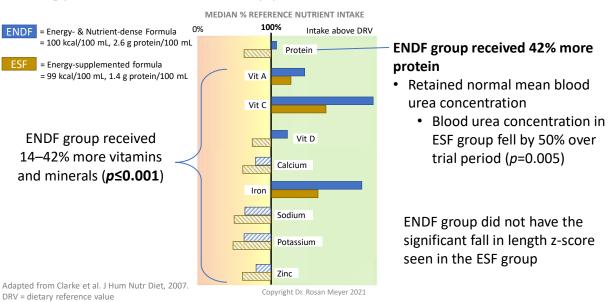
Consensus-based nutritional pathway improved growth outcomes



Marino et al, Clin Nutr, 2020.

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Energy-dense Formula Supports Protein/Micronutrient Intake



Original article - Clinical Nutrition

6

Improved growth, tolerance and intake with an extensively hydrolysed peptide feed in infants with complex disease

Chris Smith, Helen McCabe, Sarah Macdonald, Lara Morrison, Ruth Prigg, Sarah Trace, Jennifer Livingstone, Julia Callan, Jacqui Cotton, Gary Hubbard, Rebecca J. Stratton

+0.61 kg ±0.31 kg p=0.0001

- Infants with faltering growth
- At least 30% of intake to be met by enteral feeding
- Included:
 - Children with complex disease
 - Congenital heart disease
 - Chronic lung disease
 - SCID

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+1.89 cm ±1.77cm kg p=0.0001

Icons created by rivercon from Noun Project. Clin Nutr 37 (2018) 1005e1012. SCID = severe combined immunodeficiency

Transitioning to Energy Dense Feeds

Any infants where failure to thrive/malnutrition is present

Healthy child with no underlying illness



Critically III ventilated



Unwell child/underlying diagnosis:

- 1. Congenital heart disease
- 2. Post surgery
- 3. Cerebral palsy
- 4.

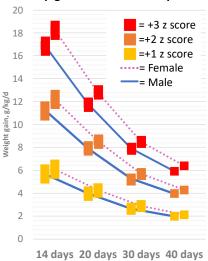




Marino et

Monitoring Catch-up Weight Gain

Daily weight gain needed to achieve catch-up growth over certain periods

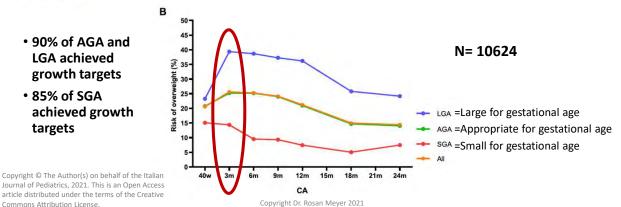


- Regular monitoring is essential for catchup growth:
 - Frequency of monitoring depends on the aimed catch-up rate, age, access
- · How much is too much?
 - Research better established in neonates
 - Monitor growth regularly so that it does not exceed aimed growth gain rate

Adapted from Golden M.H. Food Nutr Bull. 2009 Garner, et al. Arch Dis Child. 2000 Shoham et al. Food Nutr Bull. 2009

Postnatal growth of preterm infants during the first two years of life: catch-up growth accompanied by risk of overweight

Junyan Han^{1,2†}, Yuan Jiang^{1,2†}, Jun Huang³, Yue Zhang³, Ying Zhang³, Yi Zhang^{1,2}, Xiaotian Chen^{1,2}, Yun Li^{3*†} and Weili Yan^{1,2*†}



Monitoring Catch-Up Weight-for-age GIRLS



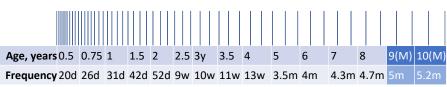


Monitoring Catch-up Length/Height Gain

- Himes 1999: highlights frequency of length/height measurement
- Soliman et al 2019: 39% catch-up growth after 4 months and rest after 9 months
- Measurement should:
 - Use the correct equipment
 - The WHO technique
 - Lying down until 2 years of age
 - Standing up >2 years of age









Minimum intervals for length/stature of children – Adapted from Himes 1999.

Transitioning of Feeds

- Transitioning may occur:
 - · Back to full breastfeeding
 - · Back to a standard formula
 - In older infants > 1 year of age, this may also include a transitioning to full cream cow's milk as drink
- Discuss transitioning already with parents when weight starts catching up to prepare them
- Start transitioning just before achieving aim growth parameters or when a child has achieved this
 - Provide a clear plan how to transition and monitor

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Conclusion

- Failure to thrive should be managed using an individual approach depending on the underlying cause
- Guidelines have been published providing ideal energy and protein requirements BUT important to set an achievable goal
 - · This may change depending on the diagnosis
- Support breastfeeding also in infants with failure to thrive
- Energy dense feeds helps with catch-up growth at optimal lean:fat mass ratio
- Ensure that both type 1 and type II nutrients are met
- Think not only of now but future with nutritional advice:
 - Avoid excessive catch-up therefore monitor
- Transition in a timely way and provide clear advice on how to achieve this

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