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Blenderized Diets: Putting a Spin on Tube Feeding for Inborn Errors of Metabolism

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Disclosures

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Danielle Starin, MS, RD, LD

- Receiving an honorarium provided by Nutricia for today's presentation
- Consultant for Biomarin

This will not pose any conflict of interest for this CE-eligible presentation

Victoria DiBiasi, MS, RD, CDN

- Medical Affairs Advisor, Tube Feeding for Nutricia North America

This will not pose any conflict of interest for this CE-eligible presentation

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

Learning Objectives

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- Participants in this activity will learn to:
  - State the benefits and results of blenderized tube feeding as described in scientific publications.
  - Determine when blenderized tube feeding may be appropriate for certain patients with IEM
  - Construct a homemade blenderized tube feeding by following prescribed steps

History of Blenderized Tube Feeding (BTF)

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Prior to 1970s

Hospital Tube Feeding

Enteral patients in hospitals were fed real food that was blended.

1970s – 1990s

Commercial Formula

Formula becomes widely available. Considered safer, affordable, and easier to use in institutions.

2000s - Today

BTF Re-emerges

Studies show benefits of food vs formula.

Why Feeding Tubes?

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Considerations for Enteral Nutrition[1]

- Malnutrition and/or poor oral intake*
- Disorders of oral feeding, feeding/oral aversion*
- Poor growth velocity/inadequate growth*
- Severe gastroesophageal reflux*
- Disorders of digestion and/or absorption*
- Congenital abnormalities of gastrointestinal (GI) tract*
- Conditions with increased nutrient and/or metabolic requirements*
- Dysphagia - related to neurological disease, oropharyngeal dysfunction or another issue*

*Functioning GI tract

1. ASPEN Enteral Handbook, 2nd Edition. 2019, pg. 68-71.

Impact on Quality of Life

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Psychological Impact[1]

- Body image adjustment
- Miss social aspects of eating food, dining out and/or family mealtimes
- Difficulty accepting dependency on nutrition therapy

Physical Impact[1]

- Tube maintenance, visible tubing
- Challenging to travel out of house if on continuous feeds
- Daily tasks impacted

1. https://oley.org/page/PsychSocIssues_HEN

What is BTF?

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"Type of tube feeding used for patients who cannot tolerate semisynthetic formulas or who wish to consume whole foods. BTFs are formulated with a mixture of blenderized food sources, with or without the addition of commercial enteral formula."[1] - American Society for Parenteral and Enteral Nutrition (ASPEN)

1. ASPEN Enteral Handbook, 2nd Edition. 2019, p165.

Patient Motivation to Begin BTF

- ✓ Desire to add real food to feeding tube[1,2]
- ✓ Address signs of formula intolerance[1,2]
- ✓ Enjoy shared mealtimes with family and friends[1,2]

Patient/Caregiver request is driving increased use of BTF[1-3]

1. Hurt, et al. Nutr Clin Pract. 2015;30:824-829. 2. Johnson, et al. JACM. 2018;24:369-373. 3. Epp, et al. Nutr Clin Pract. 2017;32:201-205.

Why Clinicians are Using BTF

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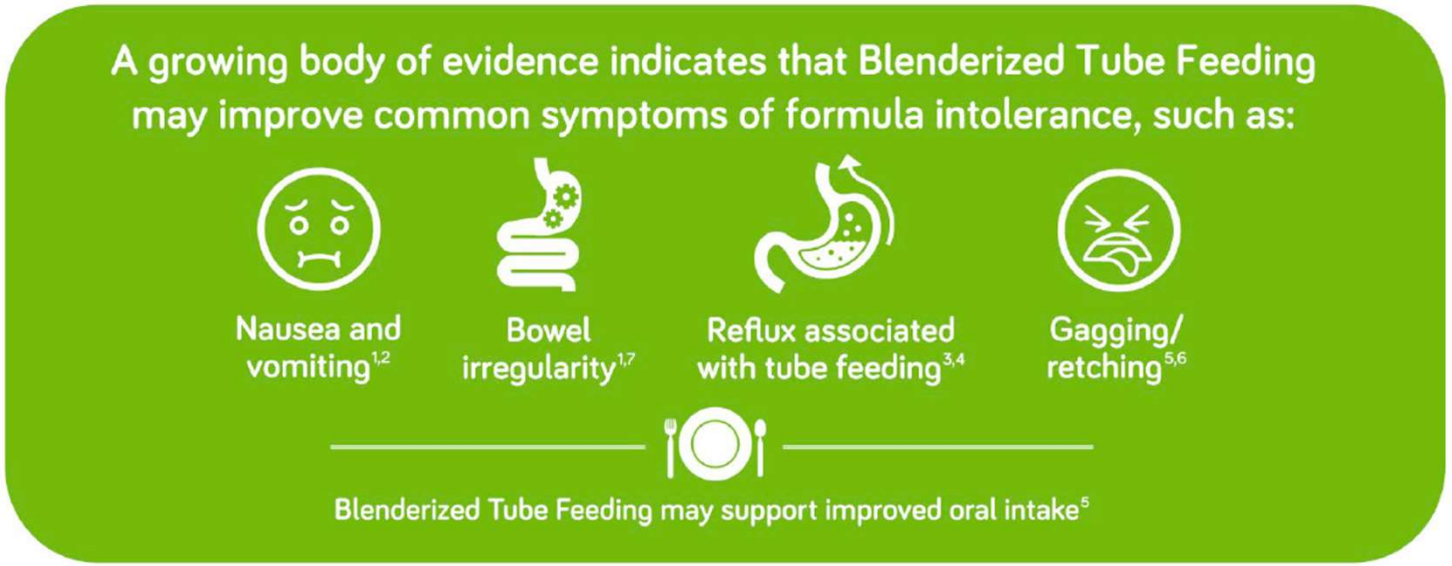
Clinical evidence supports blenderized tube feeding



1. Spurlock, et al. Nutr Clin Pract. 2022;37:615-624. 2. Hron, et al. J Pediatr. 2019;211:139-145. 3. Kernizan, et al. JPGN. 2020;71:124-128. 4. Batsis, et al. Nutr Clin Pract. 2020;35:282-288. 5. Pentiuk, et al. JPEN. 2011;35:375-379. 6. Gallagher, et al. JPEN. 2018;42:1046-1060. 7. Schmidt, et al. Clin Nutr. 2019;38:332-240.

Clinical Considerations Before Implementing BTF

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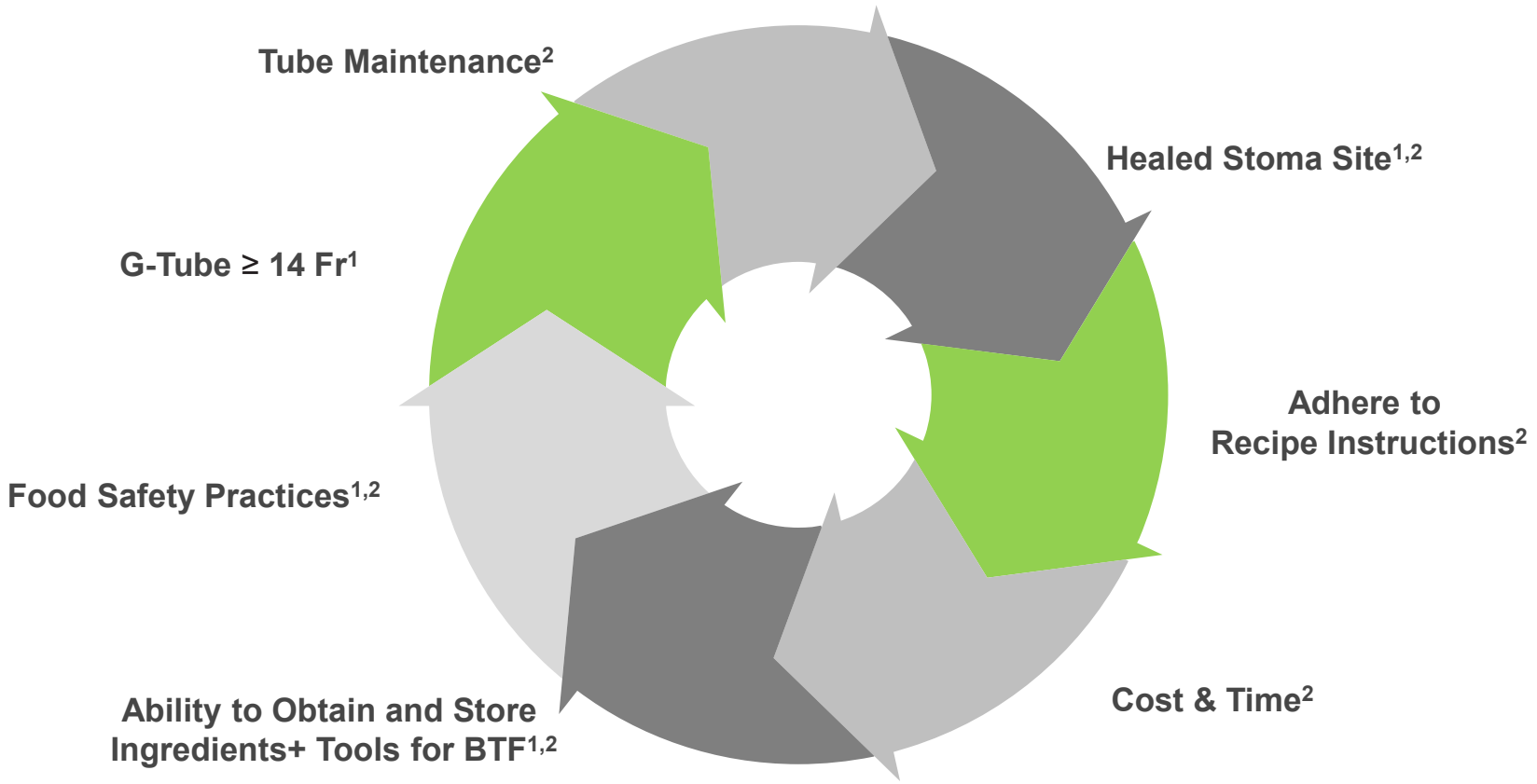

1. Koglmeier, et al. JPGN. 2023;76:109-117. 2. ASPEN Enteral Handbook, 2nd Edition. 2019, pg. 165, 203, 444-445.

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Review of BTF Literature

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Efficacy and Tolerance of Blended Diets in Children Receiving Gastrostomy Feeds

Irini D. Batsis, MD, Laura Davis, RD, Laura Prichett, PhD, MHS, et al.
Nutr Clin Pract. 2020;35:282-288.

Objective: Determine the prevalence of GI symptoms in children receiving a blended diet via gastrostomy tube.

Efficacy and Tolerance of Blended Diets in Children Receiving Gastrostomy Feeds

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STUDY PARTICIPANTS

Twenty-three patients (n=23)

- 8 female, 15 male
- Ages 1-18
- 35% whole cow milk formula
- 30% hydrolysate formulas
- 35% amino acid-based formula

65% were already on a specialty formula of some kind

Underlying Diagnoses:
Neurological (70%)
GI (17%)
Pulmonary (9%)
Cardiac (4%)

"Typically one could expect medical providers to hesitate recommending whole food–based formulas to patients receiving elemental formulas because of anticipated difficulties with tolerance. Interestingly, the children in our study successfully transitioned to a blended diet even though about two-thirds were receiving protein hydrolysate or amino acid formulas."[1]

1. Batsis, et al. Nutr Clin Pract. 2020;35:282-288.

Efficacy and Tolerance of Blended Diets in Children Receiving Gastrostomy Feeds

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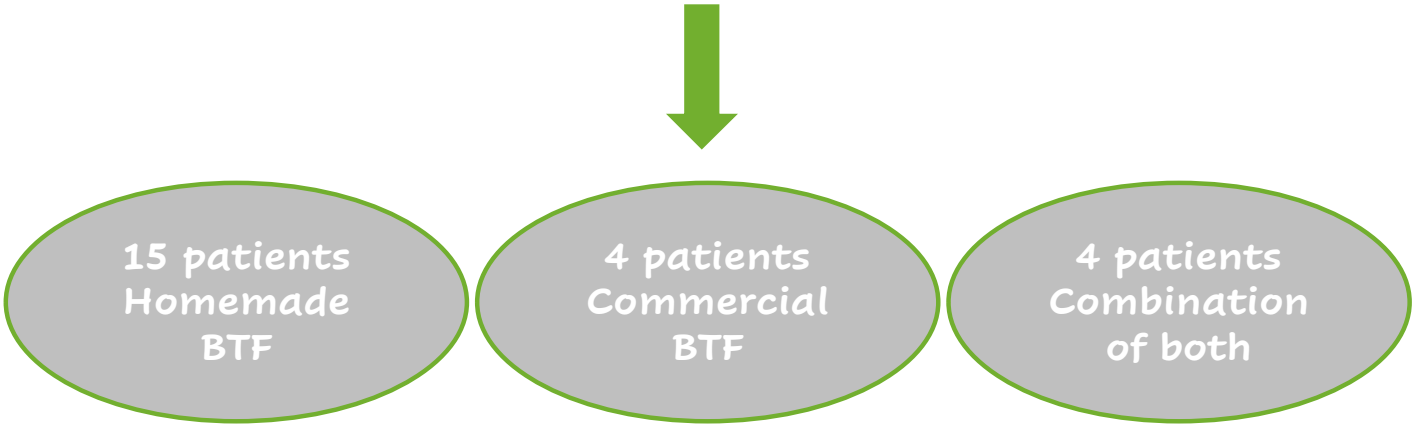
STUDY METHOD

"Patients were switched to a blended diet based on parental request and because the parents did not perceive their children to be tolerating their current standard formula *despite adjustments made to their feeding regimen and medications."*[1]



1. Batsis, et al. Nutr Clin Pract. 2020;35:282-288.

Transition to BTF

15-30
minutes

Bolus

Transition 3-7 days

Batsis, et al. Nutr Clin Pract. 2020;35:282-288.

Transition to BTF

15-30 minutes

Bolus

Transition 3-7 days

Bolus + overnight continuous

Daytime bolus converted to BTF.

Once tolerated, gradual switches made in nocturnal feeds, or the volume of overnight feeds was gradually added to the daytime boluses.

Batsis, et al. Nutr Clin Pract. 2020;35:282-288.

Transition to BTF

15-30 minutes

Bolus

Transition 3-7 days

Bolus + overnight continuous

Daytime bolus converted to BTF.

Once tolerated, gradual switches made in nocturnal feeds, or the volume of overnight feeds was gradually added to the daytime boluses.

Continuous

Daytime feeds switched to BTF bolus, over time nocturnal feeds added to daytime bolus

Batsis, et al. Nutr Clin Pract. 2020;35:282-288.

Results

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"…blended diets were well tolerated in gastrostomy-fed children and were associated with clinical improvement of upper GI symptoms."[1]

95% Improvements in upper GI symptoms

53% Improved Oral Intake

21% Developed mild constipation
Managed by:
Increasing water and intermittent polyethylene glycol

1. Batsis, et al. Nutr Clin Pract. 2020;35:282-288.

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Blenderized food tube feeding in very young pediatric patients with special healthcare needs

Shawna Walker, BS, RDN, Teresa W. Johnson, DCN, RDN,
Holly Carter, PhD, RN, et al.
Nutr Clin Pract. 2023;1-8.

Objective: Retrospective review of medically complex children transitioned to BTF. Outcome variables of interest included growth, GI symptoms, GI medication use, and oral intake.

Blenderized food tube feeding in very young pediatric patients with special healthcare needs

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STUDY PARTICIPANTS

Thirty-four patients (n=34)
- 18 female, 16 male
- Aged ≤36 months

STUDY METHOD

Formula before BTF
- 11 Bovine-based
- 13 Amino acid-based
- 8 Hydrolysate-based
- 1 Human milk
- 1 Goat milk

6 patients Homemade BTF

28 patients commercial BTF

Underlying Diagnoses

GI (38.2%)
Neuromuscular (20.6%)
Multiple (23.5%)
Metabolic/Genetic (8.8%)
Congenital Cardiac (5.9%)
Pulmonary (2.9%)

Blenderized food tube feeding in very young pediatric patients with special healthcare needs

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*"BTF may be prepared from a variety of whole foods with and referred to in this article as whole-food BTF (WFBTF). Alternately, BTF may be commercially prepared food–**based** tube feeding, which are **formulations** of a food mixture referred to in this article as commercial BTF (CBTF)."*[1]

"WFBTF options included homemade formulations prepared by caregivers using recipes developed by the RDN managing the patient's nutrition care. Another WFBTF used by caregivers in this study is a commercially available product containing only blended whole foods available in 6 varieties…All varieties were used in feeding."[1]

1. Walker, et al. Nutr Clin Pract. 2023;1-8.

Results

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"Twenty-five children increased oral food intake after BTF initiation, with 54.5% reporting 20%–40% increase over baseline and 21.2% reporting 60%–100% increase in oral skills." [1]

"…reported symptoms of gagging and retching were reduced in 100% of the children." [1]

57.6%
DECREASED EMESIS

75.8%
DECREASED CONSTIPATION

60.6%
DECREASED REFLUX

48.5%
DISCONTINUED ALL GI MEDICATIONS

1. Walker, et al. Nutr Clin Pract. 2023;1-8.

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Viscosity of Commercial Food Based Formulas and Home Prepared Blenderized Feeds

Bridget Hron, MD, MMSc and Rachel Rosen, MD, MPH

J Pediatr Gastroenterol Nutr. 2020;70(6):124-128.

Objective: Quantify the differences in viscosity of a range of commercial food-based formulas and home prepared BTF used as enteral feedings to manage reflux and reflux-related aspiration.

Viscosity and BTF

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Objective: To quantify differences in viscosity of commercial food-based formulas and homemade BTF

Thick feeds may be beneficial to reduce gastroesophageal reflux disease

Viscosity of home and commercial BTF varied greatly

Hron B, et al. J Pediatr Gastroenterol Nutr. 2020;70(6):124-128.

Viscosity and BTF

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Digital Viscometer

International Dysphagia Diet Standardization Initiative (IDDSI) syringe flow test

Viscosity	Commercial BTF Products
Thin	2
Slightly Thick	1
Mildly Thick	1
Moderately Thick	4
Extremely Thick	3

Home BTF blends varied from mildly thick to extremely thick (created from whole foods).

"Low viscosity formulas…may not be ideal for patients fed via gastrostomy with significant reflux, in whom extremely thick or possibly moderately thick liquids may have a beneficial impact."[1]

1. Hron B, et al. J Pediatr Gastroenterol Nutr. 2020;70(6):124-128.

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Stir, Shake or Blend: A Comparison of Methods Used to Reduce Viscosity of Blenderized Tube Feedings

Sharon Weston, MS, RD, CSP, LDN, Alex Crespo, and Catharine Harwin

J Pediatr Gastroenterol Nutr. 2022;75(1):110-112

Stir

Shake

Blend

"Excess thinning could potentially result in diminishing the clinical benefits that BTFs incur due to viscosity."

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Utilizing Blenderized Tube Feeding in IEMs

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Can a blended diet be safely recommended to a patient with an inborn error of metabolism?

Is there any reason to?

Got a tube? Consider the blender!

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- Conditions where BTF may be considered:
  - Urea Cycle Disorders (UCD)
  - Organic Acidemias (OA)
  - Maple Syrup Urine Disease (MSUD)
  - Post-transplant
  - Glutaric Acidemia Type 1 (GA-1)
  - Galactosemia

Consider Everyone's Goals

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Dietitian and Medical Team

- Medical stability
- Growth
- Optimized nutrition
- Improvement in GI concerns
- Reduced dependence on enteral feeds

Family

- Greater inclusion of the tube fed person in the family meal
- "normalcy"
- A "natural" diet
- Reduced reliance on enteral formulas

Assess Whether Your Patient is a Candidate

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- Medically stable
- Age
  - 6 months+ for partial BTF
  - 12 months+ for full BTF
- Family's means and capacity
  - Time, money, storage, ability to understand the risks and follow the instructions

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Case Study 1:

Commercially Available Blended Tube Feeding Product for Propionic Acidemia Patient

Case study 1: Transitioning a PA Patient to Commercially Available BTF Product

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- Patient information
  - 4 yo, ex 29 wk triplet
  - Blind
  - Limited speech
  - Hx of multiple admissions
- BMI > 95th percentile
- Frequent vomiting and hx of GERD
- Mostly enterally fed with some PO

Case study 1: Transitioning a PA Patient to Commercially Available BTF Product

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Reason for started BTF

- Desire for a more 'natural' feeding plan
- Desire to decrease vomiting and bowel issues
- Reassess need for medical food based on protein tolerance
- Chose a more traditional style BTF product over a semi-blended formula containing meat and/or dairy because Halal product needed

Starting formula plan

Formula recipe

Standard powdered infant formula
MMA/PA infant formula
Protein-free modular

Formula provided

1100 kcal (85% needs)
17.2 g total protein (0.91 g/kg)
5.4 g medical protein (PE) (0.29 g/kg)
11.8 g natural protein (0.62 g/kg)

Remaining needs met PO

Transition Plan

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STEP 1: Switched from infant formula to standard pediatric formula to determine tolerability

STEP 2: Added commercially available BTF product to day feeds

STEP 3: Reduced MMA/PA medical food and increased commercially available BTF

STEP 4: Increased rate of daytime feeds to begin weaning night feeds

Replacing Animal Protein with Plant-Based Protein Allowed for Increased Intact Protein Intake

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Standard Pediatric Formula, Protein-Free Modular, and MMA/PA Medical Food

Food Name	Units	Quantity	Energy (kcal)	Protein (g)	Fat (g)	Isoleucine (g)	Methionine (g)	Threonine (g)	Valine (g)	MEDICAL
MMA/PA Infant Formula	1.00 grams	40.00	189.20	5.40	9.20	0.004	0.000	0.000	0.000	Y
Protein-Free Modular	1.00 grams	60.00	306.00	0.00	16.80	0.000	0.000	0.000	0.000	Y
Pediatric Enteral Formula 1.0 kcal/mL	1.00 237 mL serving	2.00	480.00	14.00	18.00	0.738	0.331	0.622	0.808	N
Total			975.2	19.4	44.0	0.742	0.331	0.622	0.808	0

Standard Pediatric Formula, Protein-Free Modular, and Plant-Based BTF Product

Food Name	Units	Quantity	Energy (kcal)	Protein (g)	Fat (g)	Isoleucine (g)	Methionine (g)	Threonine (g)	Valine (g)	MEDICAL
Plant-Based BTF Product	1.00 pouch	1.00	330.00	11.00	19.00	0.147	0.054	0.116	0.153	N
Protein-Free Modular	1.00 grams	85.00	433.50	0.00	23.80	0.000	0.000	0.000	0.000	Y
Pediatric Enteral Formula 1.0 kcal/mL	1.00 237 mL serving	1.00	240.00	7.00	9.00	0.369	0.166	0.311	0.404	N
Total			1,003.5	18.0	51.8	0.516	0.220	0.427	0.557	0

Plant-Based Commercially Available BTF product has significantly lower offending AAs per Gram of Protein

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Compared to a Standard Milk-Protein Based Pediatric Enteral Formula

Food Name	Units	Quantity	Energy (kcal)	Protein (g)	Fat (g)	Isoleucine (g)	Methionine (g)	Threonine (g)	Valine (g)
Pediatric Enteral Formula 1.0 kcal/mL	1.00 237 mL serving	1.00	240.00	7.00	9.00	0.369	0.166	0.311	0.404
Plant-Based BTF Product	1.00 pouch	0.73	240.90	8.03	13.87	0.107	0.039	0.085	0.112
Total			480.9	15.0	22.9	0.476	0.205	0.396	0.516

In 240 kcal, the plant-based BTF product provides 1 more gram of intact protein, but more than 3X less ILE, MET, THR, and VAL.

For this reason, the patient could meet protein need with all intact protein and MMA/PA medical food could be removed from their regimen.

Please not that this will not be the case for all patients or for all disorders.

After a steep increase on previous diet, weight leveled off upon transitioning to BTF regimen

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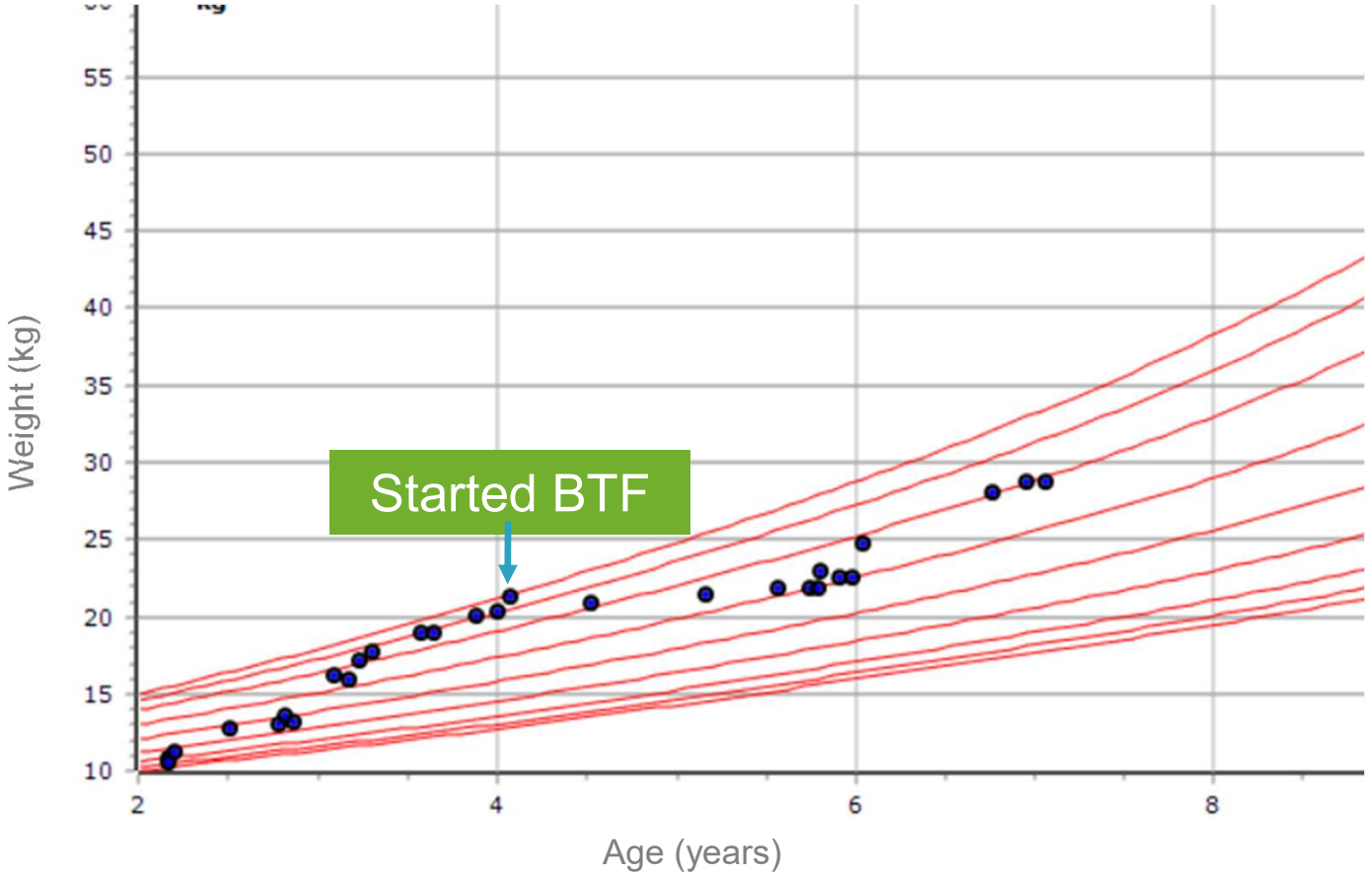

Improvements Noted After Starting Blended Diet

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Family Reports

- Pt reports less belly pain with feeds
- Pt doesn't grimace when burps after feeds
- Taking more foods PO

Medical Team Notices

- Improvement in body composition and weight
- Decreased admissions (hard to say for certain)

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Case Study 2:
Homemade Blended Tube Feeding for Glycogen Storage Disease Type 1a Patient

Case study 2: Designing a BTF Plan for a GSD1a Patient

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- 18 mo, currently on a pea protein-based toddler formula. Doesn't take anything PO.
- Family motivation
  - Natural diet that's more healthy
  - Mom wanted to cook for her baby
  - "Naturopathic neurologist" told them pt had sensitivities
- Discussion of foods available to the family
  - Family buys a half cow from organic farm each year
  - Typical family meals are mostly whole foods and homemade
  - Has a Costco membership
- Discussion of equipment available to family
  - High power blender
  - Deep freezer and extra fridge
- Discussion of the time commitment
  - Mom stays home with kids

Where Do I Start?

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STEP 1: What is the offending nutrient?

STEP 2: Use a guide of food groups and portion sizes at varied calorie levels from a trusted source (e.g., USDA MyPlate, previous BTF recipe, meal pattern guides)

STEP 3: Create a draft recipe

STEP 4: What nutrients are lacking?

STEP 5: Correct macro and micronutrient deficiencies

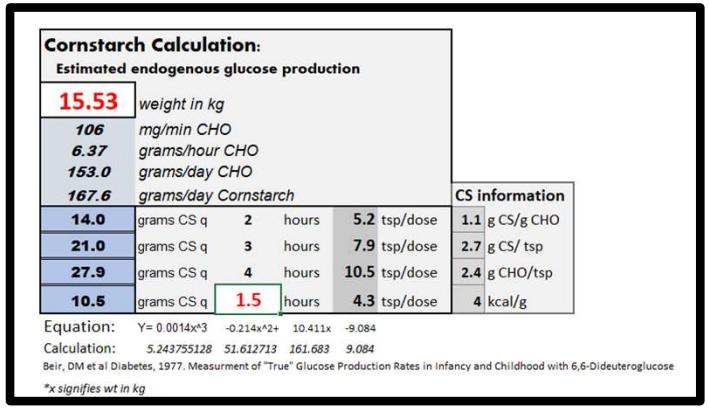
STEP 6: Meet fluid needs

STEP 1: Offending Nutrient

Weight: 15.53 kg
Age: 18 mo
Already been introduced to a variety of purees

Needs:

- 1300 kcal
- CHO: 60-70% of kcal
  - Carb = 780 kcal = 195 g CHO (60% kcal)
- PRO: 10-15% of kcal
  - Protein = 169 kcal = 42 g protein (13% kcal)
- Remainder from fat
  - Fat = 351 kcal = 39 g fat (27% kcal)
- 1250 ml fluid



Cornstarch Calculation:

Estimated endogenous glucose production

15.53	*weight in kg*						
106	*mg/min CHO*						
6.37	*grams/hour CHO*						
153.0	*grams/day CHO*						
167.6	*grams/day Cornstarch*					**CS information**	
14.0	grams CS q	2	hours	5.2	tsp/dose	1.1	g CS/g CHO
21.0	grams CS q	3	hours	7.9	tsp/dose	2.7	g CS/ tsp
27.9	grams CS q	4	hours	10.5	tsp/dose	2.4	g CHO/tsp
10.5	grams CS q	1.5	hours	4.3	tsp/dose	4	kcal/g

Equation: Y= 0.0014x^3 -0.214x^2+ 10.411x -9.084

Calculation: *5.243755128 51.612713 161.683 9.084*

Beir, DM et al Diabetes, 1977. Measurment of "True" Glucose Production Rates in Infancy and Childhood with 6,6-Dideuteroglucose

**x signifies wt in kg*

GIR = 6.37 g CHO per hour (via Bier equation)

Corn starch (CS) = 168 g CS per day
168 g CS*(3.8 kcal/g)= 638 kcal from CS
638 kcal /(4 kcal/g) = 159.6 g CHO from CS

195 g total CHO – 160 g CS CHO = 35 g CHO from food

GIR/CS calculator courtesy of Rebecca Janda, RD and Mary Sowa, MS, RD

What's the Next Step?

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STEP 1: What is the offending nutrient?

STEP 2: Use a guide of food groups and portion sizes at varied calorie levels from a trusted source (e.g., USDA MyPlate, previous BTF recipe, meal pattern guides)

Recommended Portions of the Five Food Groups using MyPlate					
Age group		12 mos	→		3 yrs.
Daily kcal target		900	1000	1200	1400
MyPlate Food Groups	Dairy	2 c.	2 c.	2½ c.	2½ c.
	Protein	2 oz.	2 oz.	3 oz.	4 oz.
	Fruit	1 c.	1 c.	1 c.	1½ c.
	Vegetables	1 c.	1 c.	1½ c.	1½ c.
	Grains	2½ oz	3 oz.	4 oz.	5 oz.

https://www.myplate.gov/myplate-plan

STEP 2: Start with Food Groups

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- Recommendation "start with the dairy product or formula"
  - Family wants no commercially available formula, only whole foods
    ::: Dietitian pulls their hair out :::
- Solution- Start with cornstarch and skip dairy

Recommended Portions of the Five Food Groups using MyPlate					
Age group		12 mos	→		3 yrs.
Daily kcal target		900	1000	1200	1400
MyPlate Food Groups	Dairy	2 c.	2 c.	2½ c.	2½ c.
	Protein	2 oz.	2 oz.	3 oz.	4 oz.
	Fruit	1 c.	1 c.	1 c.	1½ c.
	Vegetables	1 c.	1 c.	1½ c.	1½ c.
	Grains	2½ oz	3 oz.	4 oz.	5 oz.

https://www.myplate.gov/myplate-plan

What's the Next Step?

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STEP 1: What is the offending nutrient?

STEP 2: Use a guide of food groups and portion sizes at varied calorie levels from a trusted source (e.g. USDA MyPlate, previous BTF recipe, meal pattern guides)

STEP 3: Create a draft recipe

STEP 4: What nutrients are lacking?

STEP 5: Correct macro and micronutrient deficiencies

STEP 6: Meet fluid needs

STEP 3: Draft Recipe

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- Creating a draft recipe:
  - Cornstarch
  - 3-4 oz protein
    - Started with chicken breast
  - 4-5 oz grains
    - Started with brown rice
  - 2.5-3 cups VEGGIES and fruit
    - Started with spinach, squash and avocado

GSD1a diet restrictions

- Not all fruits and veg can be used
- Whole grains
- No dairy
- Higher protein
- Make a list of allowed/ restricted foods for the family

What's the Next Step?

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STEP 1: What is the offending nutrient?

STEP 2: Use a guide of food groups and portion sizes at varied calorie levels from a trusted source (e.g. USDA MyPlate, previous BTF recipe, meal pattern guides)

STEP 3: Create a draft recipe

STEP 4: What nutrients are lacking?

STEP 5: Correct macro and micronutrient deficiencies

STEP 6: Meet fluid needs

STEP 4: Assess Nutrient Profile

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Needs:

- 1300 kcal
- 60-70% kcal from CHO
- 10-15% kcal from Protein
- 15-30% kcal from Fat

- 1250 ml fluid

Macronutients			%DRI
Energy	1078.3	kcal	84
Protein	50.6	g	389
% Energy as Protein	19	%	
Fat	7.1	g	
% Energy as Fat	6	%	
Carbohydrate	195.3	g	150
% Energy as CHO	72	%	
Dietary Fiber	6.1	g	32
Sugars	2.1	g	
Cholesterol	119.0	mg	

Fatty Acids			%DRI
Linoleic Acid*	0.52	g	7
ALPHA Linolenic Acid*	0.02	g	3

STEP 4: Assess Nutrient Profile

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Needs:

- 1300 kcal
- 60-70% kcal from CHO
- 10-15% kcal from Protein
- 15-30% kcal from Fat

- 1250 ml fluid

Vitamins			%DRI
Vitamin A(RAE)	340.2	mcg	113
Vitamin A	6660.9	IU	
Vitamin C	28	mg	187
Vitamin D	0	mcg	0
Vitamin D	7.0	IU	
Vitamin E(alpha-TE)	2.0	mg	33
Vitamin K	294	mcg	980
Thiamin	0.44	mg	88
Riboflavin	0.40	mg	80
Niacin	23.8	mg	397
Vitamin B6	1.21	mg	242
Folate	160	mcg	107
Dietary Folate Equivalants	160	mcg	
Vitamin B12	0.5	mcg	56
Pantothenic Acid	2.20	mg	110
Biotin*	~	mcg	
Choline	154	mg	77

Minerals			%DRI
Calcium	104	mg	15
Copper	0.4	mg	118
Iron	5.0	mg	71
Magnesium	167	mg	209
Manganese	2.23	mg	186
Molybdenum*	~	mcg	
Phosphorus	554	mg	120
Selenium	52.6	mcg	263
Potassium	1062	mg	53
Zinc	3	mg	100
Sodium	175	mg	22
Iodine*	~	mcg	

What's the Next Step?

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STEP 1: What is the offending nutrient?

STEP 2: Use a guide of food groups and portion sizes at varied calorie levels from a trusted source (e.g. USDA MyPlate, previous BTF recipe, meal pattern guides)

STEP 3: Create a draft recipe

STEP 4: What nutrients are lacking?

STEP 5: Correct macro and micronutrient deficiencies

STEP 6: Meet fluid needs

STEP 5: Meeting Macro & Micro Needs

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- Correcting macronutrients
  - Need fat and EFA- add avocado, walnuts, flaxseed oil, corn oil
- Correcting micronutrients
  - Complete multivitamin
  - Soy milk
  - *Salt and/or Lite Salt*
  - *Calcium carbonate (Tums)*

What's the Next Step?

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STEP 6: Meet fluid needs

STEP 6: Fluids

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- Fluid needs: 1250 ml
- Added soy milk and bone broth to formula
- Additional water
- Consider concentration and volume load

Note on fluids: consistency is one of the biggest challenges with homemade BTF.

Final Starter Recipe

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- 12 oz unsweetened soy milk
- 4 oz bone broth
- 1 cup cooked chicken breast (skinless, poached or roasted)
- ¾ cup cooked brown rice
- 2 cups fresh spinach (or other leafy green)
- ½ cup cooked zucchini (or other non-starchy vegetable)
- 2 tsp corn oil
- 1 tsp flaxseed oil
- 1 tablet kids complete multi vitamin

- Add water to make final volume = 35 oz (Please take note of the amount of additional water added to get there, as reference for future recipes)

Pro Tips for This Recipe

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- Bulk prep-
  - Recommend making single food or single food group mixes (such as spinach and zucchini) so you can mix and match later
    - Steam or cook in a small amount of water
    - Can blend with the cooking liquid to use the nutrients lost in the cooking process
    - Can make these as thick as you like and add more liquid later. This will save storage space
  - Grain group- cook a large batch in the crock pot, blend with cooking liquid until very smooth and freeze in cubes.
- All measurements are based on raw amounts. You can cook the food then blend it and freeze in ice cube trays. If 6 oz chicken = 6 fl oz after processing, then 1 fl oz = 1 oz chicken = 1 portion meat
- Freeze in 0.5 or 1 oz portions for easier portioning later

Pro Tips for This Recipe

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- Grind nuts, seeds, vitamins in a coffee grinder before blending
- Flaxseeds- blend with water, let mix settle, remove and unblended bits.
- Vitamin- crush in a coffee grinder before adding to the blender
- To prepare- Thaw items, add in oils and vitamins, blend and ready for the day. Shake or stir before each feed.
- Additional water flushes might be needed (depending on consistency of feed)

Starting BTF

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- Slowly introduce each food group (see JAND resource)
- Track disease specific matrices (ex. blood glucose, leucine levels)
- Track bowel and urinary habits
- Monitor weight
- Ensure fluid needs are met
- Close communication with medical team

Metabolic Dietitian Toolkit to build a homemade BTF recipe

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- General BTF guides
  - "The registered dietitian nutritionist's guide to homemade tube feeding" JAND, 2016
  - *Homemade Blended Formula Handbook*, Marsh Dunn Klien and Suzanne Evans Morris
- Recommended portions of food groups at various calorie amounts
- Disease specific calculators
  - GIR and CS for GSD
  - LCT/MCT/EFA for FAOD
- EFA content of oils
- Macronutrient food tables
  - CHO- Diabetes resources
  - Protein- Resources from PKU, Pinterest/google search
- Product guides from formula companies

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