THE TREND CONTINUES: RESOURCES FOR BLENDERIZED TUBE FEEDING
Lisa Epp, RDN, LD, CNSC

DISCLOSURES
I have a commercial relationship with Halyard Health as a consultant/member of speaker’s bureau, etc. and will provide practice recommendations that are based on formal structured review of the literature.
OBJECTIVES

▪ Evaluate who is using blenderized tube feeding (BTF).
▪ Be able to list tools needed to make and administer BTF.
▪ Construct homemade recipes for BTF.
▪ Discuss differences between the premade whole food formulas.

WHO IS BLENDING?
MAYO PATIENTS BLENDING

- Authors conducted a study of Mayo patients (54 adults).
- BTF was used by 55.5% of patients (30 adults).
- 90% expressed a desire to use BTF if provided with adequate information.


MAYO PATIENTS BLENDING

- GI symptoms
  - 83% had no symptoms on BTF
  - 67% had no symptoms on commercial formula

Results: BTF is tolerated as well as commercial formulas.
### WHY?

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is more natural</td>
<td>12 (43%)</td>
</tr>
<tr>
<td>I like eating what my family eats</td>
<td>10 (33%)</td>
</tr>
<tr>
<td>It makes me feel &quot;normal&quot;</td>
<td>9 (30%)</td>
</tr>
<tr>
<td>I can tolerate it better</td>
<td>9 (30%)</td>
</tr>
<tr>
<td>I don’t like the ingredients of commercial formulas</td>
<td>9 (30%)</td>
</tr>
<tr>
<td>I have food allergies</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Other reasons</td>
<td>6 (2%)</td>
</tr>
</tbody>
</table>

### WHY NOT?

<table>
<thead>
<tr>
<th>Reasons for not using blenderized tube feeding</th>
<th>Number of Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am concerned about the safety of the blenderized tube feeding</td>
<td>3 (11%)</td>
</tr>
<tr>
<td>I do not know how to prepare blenderized tube feeding</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>I was not aware of blenderized tube feeding</td>
<td>10 (37%)</td>
</tr>
<tr>
<td>It takes too much time to prepare blenderized tube feeding</td>
<td>4 (15%)</td>
</tr>
<tr>
<td>It is expensive</td>
<td>0</td>
</tr>
<tr>
<td>Other reasons</td>
<td>7 (26%)</td>
</tr>
</tbody>
</table>
OLEY FOUNDATION SURVEY

Pediatrics (125 respondents)
- 89.6% of pediatric patients used BTF
- 71% of total daily intake
- 75% used homemade blends
- 90.2% reported no weight loss when using BTF compared to 58.9% reported no weight loss when using commercial formulas

Adults (91 respondents)
- 65.9% of adult patients used BTF
- 56% of total daily intake
- 67% used homemade blends
- 51 (85%) reported no weight loss when on BTF vs 31 (32%) reporting no weight loss with commercial enteral formulas.
- Results: using commercial EN formula was more likely to lead to weight loss than using BTF ($P < .0001$).


HEN DEMOGRAPHICS SURVEY

- Online survey linked on Oley Foundation and Feeding Tube Awareness Foundation online.
- Coram and Pediatric Home Services also helped administer the surveys.
- 1519 surveys completed
  - 1062 <18 years old
    - 23.6% reported use of BTF
  - 457 ≥18 years old
    - 14.9% reported use of BTF

Abstract presented at ASPEN Nutrition Science and Practice Conference January 2018
https://www.nutritioncare.org/uploadedFiles/Documents/ASPN%202018/ASPN18_Abstracts/WEDNESDAY%20POSTERS%202018.pdf
TAKE AWAY

- Many patients are blending and this should be part of every nutrition assessment for an enterally fed patient.
- Clinicians refusing to help create recipes may lead to patient harm.
- “you have brought the joy of cooking back into my life”
- “I really like it, it makes me feel more normal.”
- “much more energy with blenderized feedings & regular bowel movements”
- “Feel the best I have in 10 years”

THE APPEAL

- People want ingredients they understand
- Personalized nutrition: avoid corn syrup, milk products, allergens
- Family nurturing
- Family preference
  - Vegan
  - Organic
  - Non-GMO
  - Seasonal foods
CLINICAL BENEFITS

- Food Allergies
- Improve reflux, bowel regularity, bowel adaptation, gut microbiota
- Building patient rapport
  - Nutrition professional discuss as appropriate

BENEFITS

Improve reflux, bowel regularity, bowel adaptation
- 33 children were given BTF
  - 52% had reduction in gagging
  - 73% had decrease in overall symptoms
  - No child had worsening symptoms
  - 57% increased oral intake
Ten children with a mean small bowel length of 48.3 cm were trialed on formula with real food ingredients
  - 9 children tolerated the transition off elemental formula and had improvement in stooling.
Diarrhea improved
- 18 infants randomized to BTF vs semi-elemental formula
- Diarrhea and weight gain better on BTF
BENEFITS CONTINUED

BTF pilot
- 9 patients were given BTF
- GI symptoms similar to when on commercial formula
- No infection or food borne illness
- Those with normal BMI gained weight

Microbiota
- Examined microbiota of 178 elderly
- Healthy, diverse diet promotes a more diverse gut microbiota
- Concluded that use of a single formula could contribute to long-term ill-health in the elderly

CLINICAL HESITATION

- Limited peer reviewed publications
- Microbial contamination
- Variability of nutritional composition
- Increase in clinician’s time
- Potential increase in cost/lose reimbursement
- Possible tube clogging, tube wears out more quickly
- May be more difficult to travel
- Facility or hospital may not support it
SUGGESTED CRITERIA

- Talk to your primary care provider
- Mature stoma
- 14 French or greater tube
  - Smaller French sizes may work with some commercial formulas and thinner home blends.
- Determine a system for monitoring
- Adequate equipment available
- Nutrition professional available

HOSPITAL BTF

- Determine safety of BTF (blood sugar control, fluid status, medical status).
  - Not allowed for any critically-ill patient in an intensive care unit.
  - Prefer not to start in hospital
- Use home program
- Food Service to prepare using room service menu/pureed menu
- Have a commercial blenderized formula on hand if patient/caregiver can’t administer feeding due to nursing time constraints.
POST PYLORIC FEEDING

- Prefer to use a commercial product due to hang time of food.
- Some patients may tolerate small amounts of bolus feeding post pylorically
- More experience/research needed

TOOLS NEEDED
TOOLS

- Blender study
  - Blenders tested: Oster Blender, Cuisinart food processor, Magic Bullet, Mega Kitchen-Ninja System and Vitamix.
  - Vitamix seems to blend better than all of the devices, for thicker recipes, with the exception of the Mega Kitchen-Ninja System.
  - Increased blending time helped with less powerful blender
  - Blendtec worked as well as Vitamix

- O ring syringes
  - Don't get sticky
  - Easier to push

- Straight bolus extension sets

- Nutrition team

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LETS GET STARTED

- The manufacturers of feeding pumps have specifically stated that their pumps are NOT to be used with anything but commercial formula = use a pump with food at your own risk

- Gravity bags (large bore)

- Syringe (open vs with plunger)

- Hang time of food is 2 hours
  - Per USDA “Perishable food should not be left out more than 2 hours at room temperature—1 hour when the temperature is above 90 °F (32.2 °C).”

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United States Department of Agriculture Food Safety and Inspection Service,
ITS JUST FOOD AND WATER

RECIPE DEVELOPMENT

- Exchanges
- Standard recipe
- Plate method (family meal)
RECIPE IDEA 500 KCAL (EXCHANGES)

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch - well-cooked oatmeal, rice, pasta or potato</td>
<td>¼ cup</td>
</tr>
<tr>
<td>Yogurt, reduced fat (2%)</td>
<td>¼ cup</td>
</tr>
<tr>
<td>Milk, 1%</td>
<td>¼ cup (6 oz)</td>
</tr>
<tr>
<td>Oil, flaxseed, canola, soybean, walnut</td>
<td>2 teaspoons</td>
</tr>
<tr>
<td>Fruit - canned, fresh or frozen apple, banana, peaches, mandarin oranges</td>
<td>½ cup</td>
</tr>
<tr>
<td>Vegetable - canned, fresh or frozen well cooked broccoli, carrots, green beans or cauliflower</td>
<td>½ cup</td>
</tr>
<tr>
<td>Meat - cooked tender chicken, turkey, beef, fish or smooth soft tofu</td>
<td>½ cup</td>
</tr>
</tbody>
</table>

PROCEDURE: Put all items in a blender and mix well. This fits into a Magic Bullet. Refrigerate if not used immediately.

STANDARD RECIPE 1000 KCAL

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooked oatmeal</td>
<td>1 cup</td>
</tr>
<tr>
<td>Egg, cooked</td>
<td>1 each</td>
</tr>
<tr>
<td>Melon</td>
<td>½ cup</td>
</tr>
<tr>
<td>Whole milk</td>
<td>8 fluid ounces</td>
</tr>
<tr>
<td>Olive oil</td>
<td>1 teaspoon</td>
</tr>
<tr>
<td>Cooked brown rice</td>
<td>½ cup</td>
</tr>
<tr>
<td>Cooked green beans</td>
<td>½ cup</td>
</tr>
<tr>
<td>Canned peaches (drained)</td>
<td>½ cup</td>
</tr>
<tr>
<td>Yogurt (reduced fat 2%)</td>
<td>6 oz</td>
</tr>
<tr>
<td>Cooked carrots</td>
<td>½ cup</td>
</tr>
<tr>
<td>Tofu-cubed</td>
<td>½ cup</td>
</tr>
<tr>
<td>Avocado</td>
<td>4 tablespoons</td>
</tr>
</tbody>
</table>
**FAMILY MEALS**

*MyPlate Daily Checklist*

<table>
<thead>
<tr>
<th>Grouping</th>
<th>Example Portion Sizes</th>
<th>10% Servings (Food Groups)</th>
<th>5 Servings (Food Groups)</th>
<th>2 1/2 Servings (Food Groups)</th>
<th>1 1/2 Servings (Food Groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 large</td>
<td>1 cup of mixed veggies or 1 cup of pasta, 1 1/2 cups of dairy, or 2 cups of fruit</td>
<td>2 servings</td>
<td>6 servings</td>
<td>10 servings</td>
<td>12 servings</td>
</tr>
<tr>
<td>1/2 large</td>
<td>1/2 cup of mixed veggies or 1/2 cup of pasta, 1 cup of dairy, or 1 cup of fruit</td>
<td>1 serving</td>
<td>3 servings</td>
<td>5 servings</td>
<td>6 servings</td>
</tr>
</tbody>
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</thead>
<tbody>
<tr>
<td>4 ounces</td>
<td>1 oz whole milk, 1 cup of cooked beans, 1 cup of cooked grains, or 1 cup of fruit</td>
<td>1 serving</td>
<td>3 servings</td>
<td>5 servings</td>
<td>6 servings</td>
</tr>
<tr>
<td>2 1/2 ounces</td>
<td>1/2 cup fresh fruit, 1/2 cup of cooked veggies, or 1 1/2 oz of lean meat, poultry, or fish</td>
<td>1/2 serving</td>
<td>2 servings</td>
<td>3 servings</td>
<td>4 servings</td>
</tr>
<tr>
<td>1 ounce</td>
<td>1/2 cup of cooked grains, 1/2 cup of cooked beans, or 1/2 cup of fruit</td>
<td>1/2 serving</td>
<td>1 serving</td>
<td>1 serving</td>
<td>1 serving</td>
</tr>
</tbody>
</table>

Be active every day.


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**SERVING EXAMPLES—BLENDED WELL**

- **Fruit**: 1 cup watermelon, 1/2 cup prunes, 1 cup pear juice.
- **Vegetable**: 2 cups chopped kale, 1 cup cooked green beans, 1 cup tomato juice.
- **Protein**: 1 oz cooked chicken, 1 hard boiled egg, 1/4 cup pinto beans.
- **Grain**: 1 piece of whole wheat toast, 1/2 cup cooked brown rice, 1/4 cup grape nuts.
- **Fat**: (5 grams/serving)-1 teaspoon olive oil, 1/2 tablespoon butter, 10 olives.
- **Dairy**: 1 cup whole milk, 1 cup soy milk, 1 cup kefir.
CONSUMER RECIPE SHORTCOMINGS

- Too many fruits/vegetables
- Too much protein
- Low in salt and potassium
- Forget the carbohydrate
- Too much water
- Not enough water

MONITORING

- Same as other enterally fed patients
  - We don’t do routine lab monitoring
  - Usually don’t give multivitamin routinely
  - Supplement only as needed

A.S.P.E.N. Enteral Nutrition Practice Recommendations
https://www.ismp.org/tools/articles/ASPEN.pdf
The following information is being provided for a learning experience and not to promote any one product over another.

**Information taken from company websites.

### COMMERCIAL PRODUCTS

1. Real Food Blends™
2. Liquid Hope® and Nourish®
3. Compleat®, Compleat® Pediatric, Compleat ® Pediatric Reduced Calorie, Compleat ® Organic Blends
4. Kate Farms® Komplete, Core Essentials, Peptide Plus 1.5
5. Ulrient™ (coming soon)
COMMERCIAL BLENDED PRODUCTS

Pros
- Precise macronutrients and micronutrients
- Convenient
- More consistent viscosity

Cons
- Limited peer reviewed publications
- Possible decreased pump accuracy
- Insurance coverage (B4149, B4153)
- Supplier availability

REAL FOOD BLENDS™

- ~1.2kcal/mL
- Retail $4.16 for 330 calories

Pros
- Variety of meals available
- For kids and adults
- No additives, 100% real food

Cons
- Made for bolus feeding, add water to gravity feed
- 2 hour hang time
- Not a “complete” nutrition product
NOURISH®/LIQUID HOPE®
- Adult 1.27kcal/mL, pediatric 1.3kcal/mL
- Retail $7.99 per 400/450 calories
- Organic, non-GMO, gluten, dairy, corn and soy free

Pros
- 12-hour hang time
- Nutritionally complete
- Specific product for pediatric patients
- Compatible with pumps

Cons
- No fruit

COMPLEAT® AND COMPLEAT® PEDIATRIC
- 1-1.06kcal/mL
- Retail $4.00 for 265 calories/$3.13 for 250 calories
- Ingredients from real foods

Pros
- 12 hour hang time
- DME availability
- Compleat® Available in closed system
- ≥8 FR feeding tube for gravity or pump administration. No dilution is required. (nasal tubes)
- Compatible with pumps

Cons
- Food ingredients (not blended whole foods)
- Consistency is thinner
**COMPLEAT® ORGANIC BLENDS**

- Adult 1.27 kcal/mL, pediatric 1.2 kcal/mL
- Cost unknown
- Organic, non-GMO, gluten, dairy, corn and soy free

**Pros**
- Nutritionally complete
- Compatible with pumps
- Plant based and meat options
- 12-hour hang time

**Cons**
- 12 french or larger tube needed
- Difficult to use with gravity

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**KATE FARMS® PRODUCTS**

- **Pros**
  - Compatible with pumps
  - 12 hour hang time
  - Nutritionally complete
  - Non-GMO, gluten, dairy, corn and soy free

- **Cons**
  - Food ingredients (not blended whole foods)
  - Consistency is thinner
KATE FARMS®

- **Komplete**
  - Real food ingredients
  - Meant for oral intake
  - Retail $3.58 for 290-310 calories
- **Core Essentials**
  - Real food ingredients
  - Retail $3.45 for 325 calories
  - Standard B4150 HCPCS code approved
- **Peptide Plus 1.5**
  - Hydrolyzed pea protein
  - MCT from coconut oil
  - Retail $9.00 for 500 calories

IN BETWEEN

- Alcohol
- Caffeine
- Smoothies
- Favorite foods
- Seasonal foods
- Hydration
FLOW WITH ENFIT-INITIAL STUDY (WITH PROTOTYPES)

- Six sample enteral feeds were chosen
- Significant variability between the two ENFit connectors tested
- 500 mL of fiber containing 1.5kcal/mL formula will take 2.3 and 2.7 times longer respectively when gravity feeding through the proposed small bore connector in larger than 20 french tube.
  - From 15 minutes to 34.5-40.5 minutes


A COMPARISON OF GRAVITY FLOW RATES-UPDATED 2017

- We obtained all ENFit and comparative legacy tubes of variable sizes
- Gravity enteral feeding was simulated using a variety of formulas
- No difference with low profile, 18 and 20 french tubes
- 14 and 24 french tube had a slower flow rate with ENFit

FORCE DATA

- ENFit
  - Our initial testing showed increase in PSI needed with prototype, especially with thicker blends.
  - Additional testing on a variety of tubes has shown limited difference between ENFit and Legacy tubes.

CONCLUSION

- Blended formula appears to be used in many HEN patients.
- Can meet nutrition needs with the help of a registered dietitian.
- For patients who syringe feeding, there seems to be minimal difference between ENFit (small bore connector) and Legacy tubes.
- Patients should be followed closely during the transition from legacy to small bore connectors to make sure full volume of feedings are able to be given. Especially if gravity feeding.
REFERENCES


