To Blend or Not to Blend

Lisa Epp, RDN, LD, CNSC
Disclosures

- Abbott consultant-- I have a commercial relationship with Abbott Nutrition as a speaker and will not include any practice recommendations and will address only evidence based science in my presentation
Objectives

- Evaluate who is using blenderized tube feeding (BTF).
- Define criteria that should be met prior to starting BTF.
- Be able to list tools needed to make and administer BTF.
- Construct sample recipes for BTF.
- Discuss differences between the premade whole food formulas.
Who is blending?
Oley Foundation Survey

- N = 216
  - 125 pediatrics (< 18 years old)
  - 91 adults

**Pediatrics**
- 89.6% of pediatric patients used BTF
- 71% of total daily intake

**Adults**
- 65.9% of adult patients used BTF
- 56% of total daily intake

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pediatric Group (Age &lt;18 years) (n=125)</th>
<th>Adult Group (Age ≥18 years) (n=91)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number who have used BTF (%)</td>
<td>112 (89.6%)</td>
<td>60 (65.9%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Male (%)</td>
<td>74 (59.2%)</td>
<td>39 (42.9%)</td>
<td>0.018</td>
</tr>
<tr>
<td>Age (years) (mean ± Standard Deviation)</td>
<td>5.4 ± 3.5</td>
<td>51.7 ± 19.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Work status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Work Full time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Work part time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Do not work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of tube feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Less than 1 month</td>
<td>0</td>
<td>0</td>
<td>0.004</td>
</tr>
<tr>
<td>- 1 to 6 months</td>
<td>3 (2.4%)</td>
<td>11 (12.1%)</td>
<td></td>
</tr>
<tr>
<td>- 6 months to 1 year</td>
<td>3 (2.4%)</td>
<td>4 (4.4%)</td>
<td></td>
</tr>
<tr>
<td>- 1 year to 5 years</td>
<td>76 (60.8%)</td>
<td>37 (40.7%)</td>
<td></td>
</tr>
<tr>
<td>- Greater than 5 years</td>
<td>43 (34.4%)</td>
<td>39 (42.9%)</td>
<td></td>
</tr>
</tbody>
</table>
Mayo patients blending

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

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number of Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is more natural</td>
<td>13 (43%)</td>
</tr>
<tr>
<td>I like eating what my family eats</td>
<td>10 (33%)</td>
</tr>
<tr>
<td>It makes me feel “normal”</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><strong>I was not aware of blenderized tube feeding</strong></td>
<td><strong>10 (37%)</strong></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>
Take away

- Many patients are blending and this should be part of every nutrition assessment for an enterally fed patient.

- “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
- Avoid corn syrup
- Avoid milk products
- Family preference
  - Vegan
  - Organic
  - Non-GMO
  - Seasonal foods
Clinical 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
  - 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 and had improvement in stooling.


Clinical Benefits

- Food Allergies
- Building patient rapport
  - Nutrition professional discuss as appropriate
Clinical Hesitation

- Microbial contamination
  - Philippines, 78.8-87.8 degrees F
- Variability of nutritional composition
- Increase in clinician’s time
- Lack of evidence
- 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

Criteria

- Talk to your primary care provider
- Mature stoma
- 14 french or greater tube (pre-pyloric preferred)
- Determine a system for monitoring
- Adequate equipment available
- Nutrition professional available
Tools needed

- Syringes
  - O ring works best
- Blender (commercial preferred)
- Air tight storage containers / labeling
- Food Safety Guidelines
- Professional resources
Let’s 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
- One pump manufacturer currently working on a pump that can be used for blended food.
- Gravity bags (not common)
- Syringe (open vs with plunger)
- Hang time of food is 2 hours
Its Just Food and Water
Recipe development

- Exchanges
- Standard recipe
- Plate method
  - [http://www.choosemyplate.gov/supertracker-tools/daily-food-plans.html](http://www.choosemyplate.gov/supertracker-tools/daily-food-plans.html)
Oncology patients

- Great way to help meet American Institute for Cancer Research recommendations for:
  - Eating a plant based diet
  - Eating more of a variety of fruits, vegetables, whole grains, legumes
  - Avoiding sugary drinks

- AND further recommendations:
  - Limit intake of added sugars
  - Limited evidence but may add other spices (curcumin, aloe vera juice, green tea)
# 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>½ cup</td>
</tr>
<tr>
<td>Yogurt, reduced fat (2%)</td>
<td>¼ cup</td>
</tr>
<tr>
<td>Milk, 1%</td>
<td>¾ cup (6 oz)</td>
</tr>
<tr>
<td>Oil, canola</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>Total Volume to send:</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>4 fl oz</td>
</tr>
<tr>
<td>Canola 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>Whole milk</td>
<td>4 fl oz</td>
</tr>
<tr>
<td>Pureed carrots</td>
<td>½ cup</td>
</tr>
<tr>
<td>Tofu</td>
<td>½ cup</td>
</tr>
<tr>
<td>Avocado</td>
<td>4 tablespoons</td>
</tr>
</tbody>
</table>
## Family Meals

![MyPlate Daily Checklist](https://www.choosemyplate.gov/MyPlate-Daily-Checklist)

This image shows a MyPlate Daily Checklist, which is used to write down the foods you ate today and track your daily MyPlate, MyWins!

### Food Group Targets for a 1,400 Calorie Pattern

<table>
<thead>
<tr>
<th>Group</th>
<th>Target</th>
<th>Food Choices</th>
<th>Did You Reach Your Target?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruits</td>
<td>1 1/2 cups</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>1 cup of fruits counts as:</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>- 1 cup raw or cooked fruit; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup dried fruit; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 cup 100% fruit juice.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>1 1/2 cups</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>1 cup vegetables as:</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>- 1 cup raw or cooked vegetables; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 2 cups leafy salad greens; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 cup 100% vegetable juice.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grains</td>
<td>5 ounce equivalents</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>1 ounce of grains counts as:</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>- 1 slice bread; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 ounce ready-to-eat cereal or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/2 cup cooked rice, pasta, or cereal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>4 ounce equivalents</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>1 ounce of protein counts as:</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>- 1 ounce lean meat, poultry, or seafood;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 egg; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 Tbsp peanut butter; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/4 cup cooked beans or peas; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/2 ounce nuts or seeds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy</td>
<td>2 1/2 cups</td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td></td>
<td>1 cup of dairy counts as:</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>- 1 cup milk; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 cup yogurt; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1 cup fortified soy beverage; or</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 1/2 ounces natural cheese or 2 ounces</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>processed cheese.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Limit

- Sodium to 1,500 milligrams a day.
- Saturated fat to 16 grams a day.
- Added sugars to 35 grams a day.

### Activity

- Be active your way:
  - Children 2 to 5 years old should play actively every day.

### MyWins

Track your MyPlate, MyWins

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https://www.choosemyplate.gov/MyPlate-Daily-Checklist  accessed 9/29/16
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 do not give vitamin/mineral supplementation as a general rule.
  - Only if recipe meets less than 100% Reference Daily Intake of vitamins and minerals

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

1. Real Food Blends™
2. Liquid Hope®
3. Nourish®
4. Compleat®
5. Compleat Pediatric®
6. Kate Farms® Komplete, Core Essentials, Peptide
7. Ultrient™ (coming soon)
Real Food Blends™

- 1.2 kcal/mL
- $4.17 for 330 kcal
- Not recommended for smaller tubes (<14 french) or J-tubes
- Animal and vegetarian options
- 4 different meals
Real Food Blends™

- **Pros**
  - Variety of meals available
  - No additives, 100% real food

- **Cons**
  - Made for bolus feeding, add water to gravity feed
  - 2 hour hang time
  - Billing concerns (B4149)
  - Not a complete nutrition product
  - DME availability
  - Fruit juice, no whole fruits
Nourish®

Pros
- 1.13kcal/mL
- $7.99 per 400 calories
- Organic

Cons
- DME availability
- No fruit
- Billing concerns (B4149)

Pros
- 12-hour ambient room temperature hang time
- Nutritionally complete
- Specific for pediatric patients
- Easier to use with jejunostomy
Liquid Hope ®

- 1.2 kcal/mL
- $7.99 per 440 kcal
- Organic

Pros
- Nutritionally complete
- 12-hour ambient room temperature hang time
- Easier to use with jejunostomy

Cons
- No fruit
- DME availability
- Billing concerns (B4149)
Compleat® (new formulation)

- 1.06 kcal/mL
- $4.00 for 265 kcal
- Ingredients from real foods

**Pros**
- Can run safely on pump
- 8 hour hang time
- DME availability
- Available in closed system
- ≥8 FR feeding tube for gravity or pump administration. No dilution is required. (nasal tubes)

**Cons**
- Food ingredients (not blended whole foods)
- Insurance approval
- Consistency is thinner
Compleat Pediatric® (new formulation)

- 1 kcal/mL
- $3.13 for 250 kcal
- Ingredients from real foods

**Pros**
- Can run safely on pump
- 8 hour hang time
- DME availability

**Cons**
- Some additives
- Insurance approval
- Consistency is thinner
Kate Farms®

- Komplete
  - Real food ingredients
  - Meant for oral intake
  - $3.59 for 290-310 calories
- Core Essentials
  - Real food ingredients
  - $3.88 for 325 calories
  - HCPCS code approved
- Peptide
  - Hydrolyzed pea protein
  - MCT from coconut oil
  - HCPCS pending, currently $10.20 for 500 calories
Kate Farms® (continued)

- **Pros**
  - Can run safely on pump
  - 12 hour hang time
- **Cons**
  - Food ingredients (not blended whole foods)
  - Insurance approval
  - Consistency is thinner
In between

- Alcohol
- Caffeine
- Smoothies
- Favorite foods
- Seasonal foods
- Hydration
ENFit


The Global Enteral Device Supplier Association (GEDSA) was formed to help introduce international standards in medical device tubing connectors, which will enhance patient safety. Our connections will facilitate a stronger flow of communication to raise awareness and encourage adoption.

- Summer 2016 - California mandate took effect
- 2017 - Transition to ISO connectors complete
Force data

- ENFit
- Our testing showed increase in PSI needed

This information is being provided for a learning experience and not to promote any one product over another.

Mundi MS, Epp L, Hurt RT. Increased Force Required With Proposed Standardized Enteral Feed Connector in Blenderized Tube Feeding. *Nutr Clin Pract, 0884533616639126, first published on April 18, 2016*
Flow with ENFit

- Six sample enteral feeds were chosen
- Significant variability between the two ENFit connectors tested
- 500 mL of fiber containing 1.5 kcal/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

Number of seconds required to flow 40ml of various formula comparing 20 Fr legacy with ENFit A and ENFit B connectors.
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

To be published in JPEN 2017. Presented as poster at ASPEN 2017
Other research

• **Blenders**
  - The choice of blender and recipe did make an impact in terms of particle size. Thus, possibly affecting ability to go through ENFit connector.
  - For thicker recipes Vitamix was statistically superior to other blenders.
  - Longer blending time led to decrease in particle size

• **Blenderized safety trial**
  - BTF did not cause weight loss in non-obese patients
  - Larger trials are needed to prove safety

Both presented as posters at ASPEN 2017
Future research

- Now on to RCT!
Conclusion

- Blended formula appears to be used in the majority of Mayo/Oley HEN patients
- Can meet nutrition needs with the help of a registered dietitian.
- Current ENFit design may be problematic for some BTF users
- Future studies are needed
Question 1

Which is not a tool needed to start blenderized tube feeding

- Syringes
- Blender
- All organic food
- Storage containers
Question 2

Which of the following is not criteria for starting blenderized

- 14 french tube or greater
- Talk with your healthcare provider
- Hire a chef
- Have adequate equipment available
Question 3

Which formula has a hang time of 8 hours?

- Real Food Blends
- Homemade formula
- Liquid Hope
- Compleat
References