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Blenderized Feeding Options – The Sky's the Limit

Lisa Epp

The use of blenderized tube feeding (BTF) continues to increase in popularity, among people of all ages, in the United States and across the globe. BTF is the process in which foods and liquids are blended together and given via an enteral feeding tube. This may be in place of, or in addition to/combination with, commercially available enteral formulas. Commercial enteral formulas (CEF) have precise amounts of micronutrients and macronutrients and are prepared in a sterile fashion; unlike BTF, which is usually prepared at home in the family kitchen.

INTRODUCTION

Home enteral nutrition (HEN) is when tube feeding is given in the home setting. A publication by Mundi, et al. reported that more than 400,000 people (189,036 pediatric & 248,846 adult patients) are receiving HEN in the United States as of 2013.[1] This is a significant increase from previously reported numbers in 1992, when an estimated 152,000 people were on HEN.[2] In recent decades, the standard process for HEN was for a clinician to prescribe a CEF in the hospital and the patient would continue its use at home.

In the last 10 years consumer demand for "natural" and organic foods has increased, and the HEN population is no exception. One study suggests that as many as 55.5% of adult HEN users use BTF in varying amounts, and 90% expressed the desire to use BTF if given adequate information.[3] Yet another survey of 216 adult and pediatric Oley Foundation members indicated it could be as high as 90% in some populations, especially among children.[4] The Oley Foundation is a non-profit organization that supports people at home on parenteral nutrition and/or enteral nutrition (oley.org). Adults who responded to the Oley survey indicated 65.9% use BTF.[4] In a survey of 433 parents of tube fed children, 49.5% indicated they used BTF for their child.[5] However, a concerning finding of this survey was that only 50% of respondents used a nutrition professional to help create recipes.[5] Given that only 50% of parents are getting assistance from a nutrition professional, clinicians have a responsibility to identify those who are utilizing BTF in order to provide support and ensure HEN patients are meeting their nutrition needs.

A recent study of 212 head and neck cancer patients demonstrated that many are using BTF

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Table 1. 500 calorie exchange recipe (approximately 500 calories and 25 grams protein)

Ingredient	Amount
Starch (examples: cooked oatmeal, cream of wheat, brown rice, sweet potato)	½ cup
Kefir, whole milk plain (or whole milk yogurt)	¼ cup
Milk, 1% (or fortified milk alternative)	¾ cup
Oil (examples: olive, canola, flaxseed or walnut)	2 teaspoons
Fruit (examples: canned, fresh or frozen apple, banana, peaches, mandarin oranges)	½ cup
Vegetable (examples: canned, fresh or frozen cooked broccoli, carrots, green beans or cauliflower)	½ cup
Meat (examples: moist cooked chicken, turkey, beef, fish or smooth soft tofu)	½ cup

even when it is not prescribed.[6] In this cohort, 112 received CEF, 69 patients voluntarily switched to BTF with unknown ingredients and 31 were prescribed BTF due to lack of health insurance coverage. The results showed that those using BTF did not receive adequate nutrition support and had a decrease in fat free mass. One could argue that since patients changed to BTF on their own, they did not have the clinical support or guidance needed to create nutritionally complete recipes with adequate calories. This is a prime example of why clinicians must be open to the use of BTF.

In the previously mentioned surveys, common reasons given for using BTF were:

1. "It's more natural"
2. "I can tolerate it better"
3. "I like to eat what my family is eating"

Additionally, patients may prefer whole foods, organic, non-GMO, allergen free ingredients. Another reason for using BTF is CEF intolerance, such as reflux, constipation, diarrhea or fullness. Finally, some patients just do not have insurance coverage or adequate funds for commercial enteral formulas. BTF has the potential for allowing each patient's nutrition needs to be met with individualized medicine.

Despite a patient's desire to use BTF, some health care professionals hesitate to support its use. A survey of registered dietitians showed that the use of BTF is largely patient/family driven, but 28% of registered dietitians surveyed felt they needed more information about using BTF in clinical practice.[7] Some clinical hesitations may include increased clinician time, potential for increased microbial contamination,[8-9] increase in tube clogging and variability in nutrition composition.

Table 2. 1000 Calorie Recipe (approximately 1000 calories and 50 grams protein)

Ingredient	Amount
Cooked oatmeal	1 cup
Egg, cooked	1 each
Melon	½ cup
Whole milk	8 fluid oz
Walnut oil	1 teaspoon
Cooked brown rice	½ cup
Cooked spinach	½ cup
Frozen peaches	½ cup
Yogurt (reduced fat 2%)	¾ cup
Cooked carrots	½ cup
Tofu	½ cup
Avocado	4 tablespoons

At this time there is a small body of evidence that indicates that BTF may help with EN intolerance such as reflux, volume intolerance and bowel issues. With the reemergence of BTF, additional research is underway and this body is evidence is growing. In a study of 33 children, 52% of those given BTF had a reduction in gagging, 73% had a decrease in overall GI symptoms, and 57% had an increase in oral intake; no child had worsening symptoms.[10] In another study, 10 children with short bowel syndrome were given formula with real food ingredients; 9 experienced an improvement

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Table 3. 1600 Calorie Recipe
(approximately 1600 calories and 65 grams protein)

Ingredient	Amount
Cooked oatmeal	½ cup
Blackberries	½ cup
Yogurt (reduced fat 2%)	¾ cup
Canola, sunflower oil	2 tablespoons
Unsweetened soy milk	16 fluid ounces
Cooked white rice	1 cup
Banana	1 banana
Cooked green beans	¾ cup
Cooked potato without skin	½ cup
Cooked kale	1 cup
Tofu	½ cup
Pinto beans	¾ cup

in their stool habits and were able to wean off elemental formula.[11] In a third study,18 infants with diarrhea were randomized to BTF vs. semi-elemental formula, and those on BTF experienced improvement in diarrhea and weight gain compared to those on semi-elemental formula.[12] Lastly, a recent publication showed that children who were given BTF had decreased vomiting along with an increase in the bacterial diversity of their stool.[13] These studies were all done in the pediatric population; however one study in adult patients included a group of 178 elderly individuals, 5 of which were on enteral feeding via percutaneous endoscopic gastrostomy (PEG).[14] Those with a diverse diet had the healthiest gut microbiome, while those on a single formula had increased frailty.

The remainder of this article is intended as a guide for clinicians wanting to help their patients utilize BTF if desired.

Considerations before starting BTF:

- Does your patient have a 14 French or greater size feeding tube?
  - Smaller tubes may work with thinner blends
- Is the stoma mature in case the tube does become clogged?

Table 4. Low Volume Calorie Boosters
(approximately 100 calories per serving listed)

Ingredient	Amount
Butter	1 tablespoon
Coconut cream	2 tablespoons
Kefir, whole milk plain	5 fluid oz
Whole milk Ricotta cheese	4 tablespoons
Mango	1 cup sliced
Dried cherries	3 tablespoons
Prune juice	4 fluid oz
Tomato paste	½ cup
Grape nuts	¼ cup
Nut butter (peanut, almond)	1 tablespoon
Sunflower seed kernels	2 tablespoons
Pantry Staples that can be used for Extra Calories	
Honey	1.5 tablespoons
Maple syrup	2 tablespoons
Sugar, brown sugar	6 teaspoons
Agave nectar	1.5 tablespoons
Cooking oil	1 tablespoon
Ranch dressing	1.5 tablespoons
Evaporated milk	3 fluid oz

  - A tube in a mature stoma can be changed more easily if needed
  - Some patients may benefit from BTF at initial tube placement and should be considered on a case by case basis.
- Can your patient tolerate bolus feeding since food can only be held safely at room temperature for 2 hours?[15]
  - More information is needed on the use of BTF in post pyloric feeding tubes

Tools needed:

- Commercial grade blender such as Vitamix® (vitamix.com), Blendtec® (blendtec.com) or Ninja® (ninjakitchen.com)
- O ring syringes (Figure 1)

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- Large bore gravity bags (Figure 2)
  - Feeding pumps may not work well due to decrease in accuracy and motor failure
- Straight bolus extension set for low profile tubes (Figure 3)
- Bolee bag with bolink (Figure 4)
- Nutrition professional involved
- Plan for monitoring and evaluation

There are a variety of ways to develop BTF recipes; including using food exchanges, standard recipes or the plate method with family meals. Table 1 shows a 500 calorie recipe that is easy to double, triple or quadruple as needed to meet estimated calorie needs with balanced macronutrients. Using food exchanges makes it easy to choose foods that are available in the home to create a variety of recipes. Tables 2 and 3 provide sample standard recipes for approximately 1000 and 1600 calories. Lastly, reviewing the MyPlate Daily Checklist (choosemyplate.gov)[16] is a great way to determine the number of servings of each food needed in the blend at a given calorie level.

Many children and adults use BTF due to enteral formula intolerance. Therefore, these patients may not be able to tolerate large volumes of feeding at one time. Table 4 gives examples of nutrient dense foods in each food group that may help decrease overall volume intake while still providing adequate calories. Table 5 provides options to "exchange" foods to increase the variety

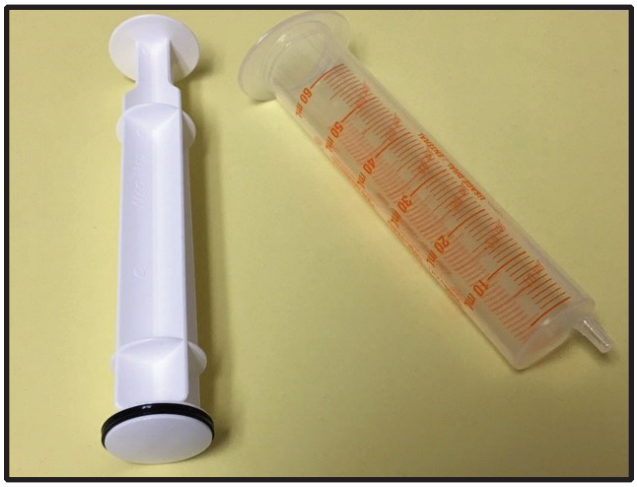

Figure 1. O Ring Syringe

Figure 2. Large Bore Gravity Bag

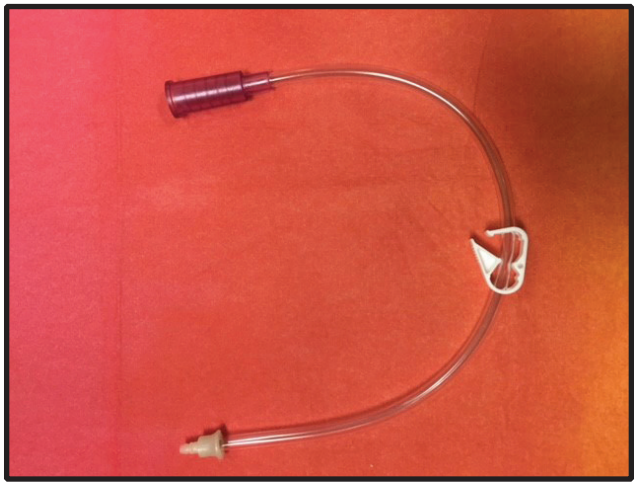

Figure 3. Straight Bolus Extension set for Low Profile Tube

Figure 4. Bolee Bag with Bolink

Table 5. Meal Planning (these foods can be used interchangeably in recipes)

Food Group	Sample Servings of Similar Nutrient Content
Grain Servings	• ½ cup cooked oatmeal, cream of wheat • ½ cup brown or white rice • 1 slice whole wheat toast • ½ cup cooked pasta
Protein Servings	• 1/4 cup cooked garbanzo beans (or canned) • 1 cooked egg • 1 tablespoon peanut butter • 1/4 cup tofu • ¼ cup evaporated skim milk • ½ cup hummus
Fruit Servings	• 1 cup pear juice • 1 cup cubed mangos • ½ cup dried cherries • 1 cup fresh or canned fruit
Vegetables Servings	**Starchy vegetables** • 1 cup cooked cubed sweet potatoes, butternut squash, peas, beans (lima, kidney, butter, pinto), corn
	Leafy vegetables • 2 cups fresh spinach, kale, turnip greens • 1 cup vegetable juice • 1 cup cooked carrots, green beans, cauliflower or non-starchy vegetable.
Dairy/Dairy Alternative Servings	• 1 cup unsweetened calcium fortified soy milk • 1 cup unsweetened Ripple (pea milk) • 1 cup yogurt • ½ cup ricotta cheese • 1 cup milk
Fat/Oil foods (most children or adults need 3-7 teaspoons daily)	• Butter • Avocado • Oil (coconut, flaxseed, olive, or vegetable) • Nuts (peanuts, walnuts, almonds) • Nut butter (peanut, almond, sunflower seed, pepitas [baby pumpkin seeds])

of the blenderized meals.

Some patients may use commercial food-based enteral formulas for some or all of their nutrition intake. See Table 6 for a variety of available products. These products may make it easier to travel or be away from home since they are shelf stable and do not require preparation, or refrigeration until opened.

It is important to note that BTF is approximately 70-75% fluid. Therefore, extra fluid will likely be needed to meet hydration needs. Fluid can either be mixed into the recipes or given as boluses between feedings. It is also important to review micronutrient profiles of the recipes as homemade blends tend to be low in sodium, and salt may need to be added in some cases. A multivitamin/mineral, calcium, vitamin D or iron supplement may be needed, but should not be necessary if the recipes contain a wide variety of foods. Routine multivitamin/mineral use is not usually indicated if a variety of foods are used. Monitoring patients as they transition onto BTF is essential, and when they are tolerating goal feedings these patients should be followed in the same fashion as any other HEN patient. Labs should only be done when relevant to the clinical situation and are typically not routinely monitored.

Table 6. Commercial Food-Based Enteral Formulas

Abbott (enteralfeeding.pediasure.com)
• Pediasure Harvest™
Functional Formularies® (functionalformularies.com)
• Liquid Hope®
• Nourish®
Kate Farms® (katefarms.com)
• Core Essentials Standard 1.0 (vanilla or chocolate)
• Kate Farms® Core Essentials
• Peptide Plus 1.5 Plain
Nestle (nestlehealthscience.us)
• Compleat®
• Compleat® Pediatric
• Compleat® Pediatric Reduced Calorie
• Compleat® Organic Blends (plant based and chicken garden blend – both pediatric & adult)
Real Food Blends™ (realfoodblends.com)
• Orange Chicken, Carrots & Brown Rice
• Apples & Oats
• Salmon, Oats & Squash
• Beef, Potatoes & Spinach
• Quinoa, Kale & Hemp
Trovita Health Science (trovitahealth.com)
• Ultrient™ (coming soon)

SUMMARY

Blenderized tube feeding use has increased over the recent years, and will more than likely continue to increase in popularity as more studies are published. While patients are interested in using BTF for a variety of reasons, clinicians remain hesitant to support its use. We have a clinical responsibility to include assessment of BTF use in all HEN patients in order to provide guidance for appropriate recipe development and monitoring. This article is meant to increase awareness of the widespread use of BTF and to help empower clinicians to aid patients in its use. ■

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17. You can find more information about the food groups and recommended portion sizes online at the U.S. Department of Agriculture's website www.choosemyplate.gov. Accessed 2/19/18.