Blended tube feeding

Addressing the controversies, research and clinical application

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1

Disclosures

- This presentation has been developed for an educational purpose and represents independent evaluations and opinions of the authors and contributors independently from the operating company sponsoring the present symposium.
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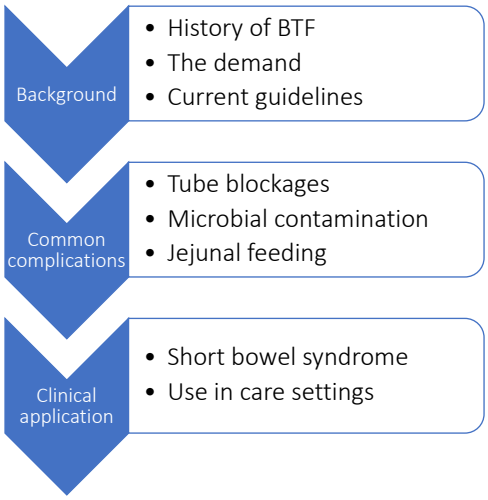
2

Outline



3

Background

4

What is Blended Tube Feeding (BTF)?

- Any food or fluid, excluding formula, expressed breast milk (EBM) or water, given via an Enteral Nutrition (EN) tube
- No clear definition – most studies use >20% of Estimated Energy Requirements (EER) via BTF

Continuum

Durnan S, Kennedy A, Kennedy A, Stanley R, Donohoe S, Thomas S & Constable S, Practice Toolkit: The Use of Blended Diet with Enteral Feeding Tubes 2021, British Dietetic Association

5

History of BTF

- Feeding tubes developed 16-18th Century
- Homemade meals (or BTF)
  - Mashed potato, beef broth, eggs and milk, even whisky (!) given
- Commercial EN introduced in mid 1900's
  - Cost effective
  - Widely available and time efficient
  - Safer (re: microbial contamination)
- 2010 onward – Re-increased interest in homemade meals (BTF)
  - Varied reasons

Chernoff R, 2006, An overview of tube feeding: from ancient times to the future, Nutr Clin Pract 21(4): 408-410
Harkness L, 2002, History of Enteral Feeding 1960s-1970s, J Am Diet Assoc 102(3): 399-404

6

The demand

Families choose to swap for many reasons:

- Concern re: ingredients
- Poor feed tolerance and perceived improvement post BTF's
- Perceived improvement to overall health
- Desire for nurturing feeding interactions and social inclusion
- Desire for more 'natural' feeding options
- Etc etc etc.

Support, guidance and regular monitoring are key!

Trollip, A., Lindeback, R. and Banerjee, K., 2020. Parental perspectives on blenderized tube feeds for children requiring supplemental nutrition. *Nutrition in Clinical Practice*, *35*(3), pp.471-478.

7

The demand

Increasingly recommended by HCP's due to research about:

- Reduced regurgitation and vomiting
- Increased gastric emptying
- Increased bacterial diversity
- Reduced abdominal pain/discomfort
- Improved feed volume tolerance

Much research is still emerging and based on clinician experience.

Chandrasekar N, et al, 2022, Blenderised tube feeds vs. commercial formula: which is better for gastrostomy-fed children?, *Nutrients,* 14(15): 3139
Gallagher K, et al, 2018, Blenderized enteral nutrition diet (BLEND) study, *JPEN,* 00:1-15

8

Guidelines

- **Australia and New Zealand**

AuSPEN 2022 Blended Tube Feeding in Enteral Feeding: Consensus Statement

- **Europe**

ESPGHAN 2023 The Use of Blended Diets in Children with Enteral Feeding Tubes: A Joint Position Paper

- **United Kingdom**

BDA 2021 Practice Toolkit: The Use of Blended Diet with Enteral Feeding Tubes

BDA 2019 Policy Statement: The Use of Blended Diet with Enteral Feeding Tubes

- **North America**

ASPEN 2023 Blenderized tube feeding: practice recommendations from the American Society for Parenteral and Enteral Nutrition

9

Guidelines: A Comparison

Operational Safety Parameters

	AuSPEN	ESPGHAN	BDA	ASPEN
Tube size	>14 Fr (caution if smaller)	14 Fr preferred (notes smaller Fr used in practice)	>12 Fr (thinner blends if smaller)	>14 Fr preferred, care if smaller
Tube type	Gastrostomy only (no jejunal feeding)	Gastrostomy preferred, however acknowledges NG use, extreme caution for jejunal feeding	Gastrostomy/ nasogastric tube only (caution jejunal feeding)	Gastrostomy preferred, but NG's and jejunal tubes can be considered (likely commercial BTF)
Continuous feeding	Not recommended, hang time <2hrs	Not recommended, hang time <2hrs	Not recommended, hang time <2hrs	Can be considered, but may limit feeds to commercial BTF's due to hang time of <2hrs
Age	>12 months, not before 6 months	≥6 months (+ formula/EBM until 1 year)	≥6 months (+ formula/EBM until 1 year)	≥6 months (+ formula/EBM until 1 year)

10

Guidelines: A Comparison

Patient Safety Parameters

	AuSPEN	ESPGHAN	BDA	ASPEN
Sole source nutrition	Agree provided a dietitian is involved	Agree provided a dietitian is involved	Agree, recommend vit D supps	Team must be able to analyse the nutritional profile
Medically unstable children	Caution and clinical judgement	Consultation with local hospitals required	Challenges noted with same	Can be used in hemodynamically stable ICU patients
Malnutrition/ poor growth	Caution and clinical judgement	No comment on commencement, may increase risk of development	No comment on commencement, note increased energy provision needed on BTF's	May increase risk – needs RD involvement
Children with clinical complexity	Caution and clinical judgement	Individual consideration, contraindicated for children with reduced gastric function + those who don't tolerate BTF	Individual consideration	Individual consideration, but largely supported

11

Dietitians Association

2018 EN Manual (adults)

- BTF's not usually recommended
- Note downsides (time, tube blockage/breakdown, nutritional adequacy and bacterial contamination)
- Focus on food safety, delivery technique and disadvantages

2023 Patient information on enteral feeding

- Note growing interest in BTF (homemade, commercial puree or commercial BTF)
- Notes downsides (bacterial contamination, tube blockage and time)
- Dietitians should be involved to assist in appropriate food selection

Enteral nutrition manual for adults in health care facilities, June 2018, Nutrition Support Interest Group, Dietitians Australia
DA 2023 Patient information on enteral feeding - https://dietitiansaustralia.org.au/health-advice/enteral-nutrition, accessed 14 Jan 2024

12

ESPEN

Guideline on Home Enteral Nutrition (HEN) with some reference to use of BTF

Recommendation 47

- Standard commercial formula enteral tube feeds can be used, unless there is a specific justification for a blended tube feed (strong consensus – 92% agreement)
- If BTF is used, it should be administered via a large PEG tube (14Fr)

Recommendation 48

- As home-made blenderised admixtures are less effective than EN formula or commercially produced 'whole food' solutions, they should not be utilised in patients on HEN (majority consensus – 63% agreement)

Recommendation 49

- As home-made blenderised admixtures are less safe than EN formula or commercially produced 'whole food' solutions, they should not be utilised in patients on HEN (majority consensus – 76% agreement)

Bischoff, Stephan C., et al. "ESPEN guideline on home enteral nutrition." *Clinical nutrition* 39.1 (2020): 5-22.

13

Common complications

14

Tube Blockages

- Gastrostomies routinely block due to:
  - Interaction between protein and silicon lining causes breakdown
  - Medication administration
  - Administration method
- Common concern re: BTF's due to:
  - Risk of inadequate blending of food (e.g. fruit skins)
  - Viscosity of blends and force needed to administer, causing blockage or tube splitting
- Mitigation of risk (both BTF and commercial)
  - Education re: tube blockage management
  - Mature stoma to avoid surgical complications of replacement, wound dehiscence or peritonitis
  - Replacement 3-6 monthly

Bischoff S, Austin P, Boeykens K, 2020, ESPEN guideline on home enteral nutrition, *Clinical Nutrition,* 39: 5-22
Durnan S, Kennedy A, Kennedy A, Stanley R, Donohoe S, Thomas S & Constable S, Practice Toolkit: The Use of Blended Diet with Enteral Feeding Tubes 2021, British Dietetic Association

15

Tube Blockages

- 10 years of RCT's
  - No increase in blockages from BTF's
  - Variable tube sizes and time from insertion to BTF commencement
- Lab Study Madden et al. 2019
  - Looked at BTF blockage frequency across 27 administrations
  - No blockages in 14Fr tubes
  - 2 blockages in smaller tubes but cleared with a single water flush (10 and 12 Fr tubes)

Table 1 Recipe and calculated nutritional composition of blended diet and comparison with estimated requirements for hypothetical man

Ingredients and weight			
Whole fat milk (g)	855	Avocado (g)	133
Cooked brown wholegrain rice (g)	570	Water (g)	95
Raw tomatoes (g)	532	Feta cheese, regular not low fat (g)	55
Lettuce (g)	342	Red wine vinegar (g)	8
Chick peas, canned, drained (g)	312		

Madden, A.M., Baines, S., Bothwell, S., Chen, E., Goh, S., Jerome, L., Sommariva-Nagle, C. and Szychta, M., 2019. A laboratory-based evaluation of tube blocking and microbial risks associated with one blended enteral feed recipe. *Journal of Human Nutrition and Dietetics*, *32*(5), pp.667-675.

16

Tube Blockages – Practical Considerations

- Tube type (including size)
- Feed viscosity
- Preparation and storage
- Ancillaries
- Blender
- Water flushes
- Medication management

17

Tube Blockages – Practical Considerations

Tube Type

- Gastrostomy with mature stoma (>8-12 weeks post insertion)
- Balloon retained gastrostomy device preferable
- 14Fr preferrable, use smaller tubes with caution

Viscosity

- Modify based on gastrostomy size
- Pouring cream consistency for 12Fr or lower
- Education on IDDSI levels 1-3
- Viscosity linked to nutritional composition

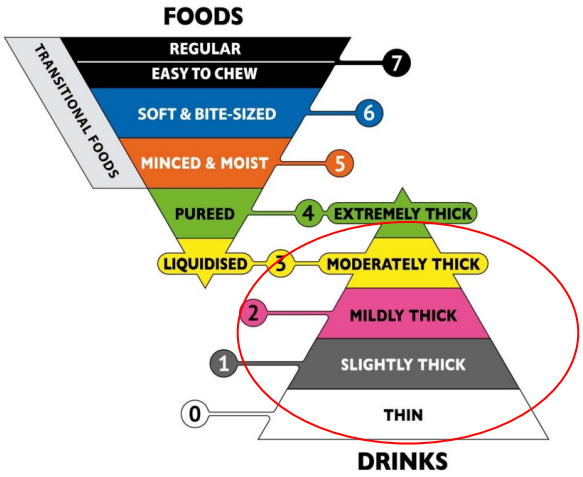
Preparation and Storage

- Consider 1mm metal sieve if using pips, seeds, grains, tough meats etc.
- Pre-grind nuts and seeds
- Viscosity increases over time

Brown S, 2014, Blended food for enteral feeding via a gastrostomy, *Nursing Children and Young People,* 26(9): 16-20

18

IDDSI Framework



Available at: iddsi.org/framework

Köglmeier, Jutta, et al. "The use of blended diets in children with enteral feeding tubes: a joint position paper of the ESPGHAN committees of allied health professionals and nutrition." *Journal of Pediatric Gastroenterology and Nutrition* 76.1 (2023): 109-117.

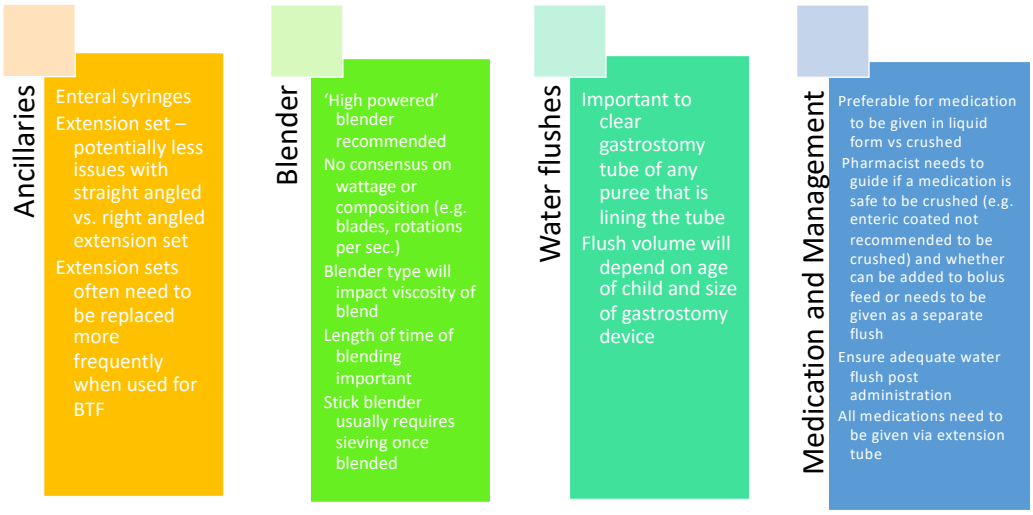
19

Testing viscosity of a homemade blend

- Pre-test before use
  - Draw up 60mL of BTF with EnFit syringe
  - Connect to extension tube (not yet connected to patient's gastrostomy)
  - Push through
  - It should flow through slowly, over 1-2 minutes
  - There should not be force and puree should not stop halfway through tube

20

Tube Blockages – Practical Considerations



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21

Microbial contamination

- Early studies had little differentiation between bacterial sources
- Patient studies show no foodborne gastroenteritis events (Poland, Australia, America)
- Limited comparison to food
- Use with caution for immunocompromised patients (most guidelines)
- Potential beneficial effect of BTF on the gut microbiome
- Following food safety guidelines mitigates microbial risk

Education is key!

Gallagher, Kelsey, et al. "Blenderized enteral nutrition diet study: feasibility, clinical, and microbiome outcomes of providing blenderized feeds through a gastric tube in a medically complex pediatric population." Journal of Parenteral and Enteral Nutrition 42.6 (2018): 1046-1060.
Milton, Debra L., et al. "Accepted safe food-handling procedures minimizes microbial contamination of home-prepared blenderized tube-feeding." Nutrition in clinical practice 35.3 (2020): 479-486.
Galindo, Caroline de Oliveira, et al. "Home-prepared enteral tube feeding: evaluation of microbiological contamination, hygiene, and the profile of the food handler." *Nutrition in Clinical Practice* 36.3 (2021): 704-717.

22

Jejunal Feeding

Limited evidence	• Contraindicated by many position statements • No specific recommendations on use available
Need for continuous feeding	• Food safety risks • Viscosity • Risk of tube blockage or pump occlusion
Query role for commercially prepared/sterile BTFs	• Noted in ASPEN jejunal BTFs could be considered for specific patients • No nutritionally complete commercial BTF's

23

Clinical application of blenderised tube feeding

24

Short bowel syndrome and blended tube feeding

- Short bowel syndrome – critical reduction of gut mass below the minimum needed to absorb nutrients and fluid required for adequate growth and hydration
- SBS – most common cause of intestinal failure (requirement of parenteral nutrition for nutrition and/or fluid)
- Term infants are born with a small bowel length of 250cm +/- 40cm
- Infants with a residual small bowel length of <75cm are at risk of developing short bowel syndrome

Thompson J, Rochling F, Weseman R & Mercer D, 2012, Current management of short bowel syndrome, *Curr Probl Surg,* 49(2):52-115

25

Short bowel syndrome and blended tube feeding

- Increasing demand and use on BTF in patients with SBS, although research limited and not in any current SBS guidelines
- Some evidence to suggest
  - Improved diarrhoea
  - Worsening gas
  - Poor weight gain/or weight loss
- Patients with colonic resection, ostomy, no ICV has more complications from blended tube feeds
- Patients on 100% BTF more likely to have complications vs hybrid regimen

Zong W, Troutt R & Merves J, 2022, Blenderized enteral nutrition in pediatric short gut syndrome: tolerance and clinical outcomes, *Nutr Clin Pract,* 37:913-920

26

BTF and short bowel syndrome - considerations

- Bowel resection vs SBS-IF
- Section of bowel removed
- Presence of stoma
- Risk of NEC
- Non-IgE mediated food allergies
- Bowel anatomy
- Hydration
- Risk of SBO

27

Safe-guarding

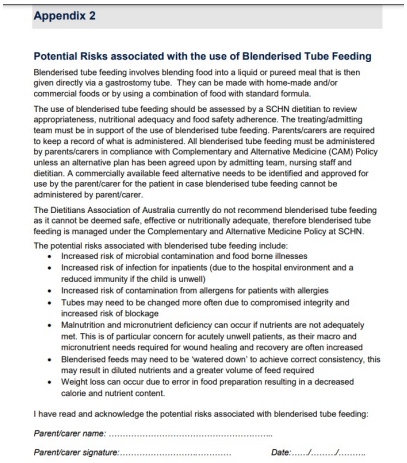
Critical Care:

- **Depends on the unit's/intensivists stance**
- Note increased energy and protein needs
- **Some settings don't allow fibre containing feeds in ICU**
  - AuSPEN notes insufficient evidence for a recommendation re fibre in ICU
- Difficulties **of administration as many critically unwell children need continuous feeds**
- BTF's may mitigate inflammatory risks in critically unwell patients

AuSPEN endorsed Australian and New Zealand Paediatric Critical Care Nutrition Support Guidelines 2023 - https://custom.cvent.com/EF8ADF3646FB4896BCFA8239F12DC577/files/863fd86399ba4c3ab82da757faffa5c1.pdf accessed Jan 15 2024
Epp, Lisa, et al. "Blenderized tube feedings: Practice recommendations from the American Society for Parenteral and Enteral Nutrition." *Nutrition in Clinical Practice* 38.6 (2023): 1190-1219.
Köglmeier, Jutta, et al. "The use of blended diets in children with enteral feeding tubes: a joint position paper of the ESPGHAN committees of allied health professionals and nutrition." *Journal of Pediatric Gastroenterology and Nutrition* 76.1 (2023): 109-117.

28

Safe-guarding in Critical Care



Appendix 2

Potential Risks associated with the use of Blenderised Tube Feeding

Blenderised tube feeding involves blending food into a liquid or pureed meal that is then given directly via a gastrostomy tube. They can be made with home-made and/or commercial foods or by using a combination of food with standard formula.

The use of blenderised tube feeding should be assessed by a SCHN dietitian to review appropriateness, nutritional adequacy and food safety adherence. The treating/admitting team must be in support of the use of blenderised tube feeding. Parents/carers are required to keep a record of what is administered. All blenderised tube feeding must be administered by parents/carers in compliance with Complementary and Alternative Medicine (CAM) Policy unless an alternative plan has been agreed upon by admitting team, nursing staff and dietitian. A commercially available feed alternative needs to be identified and approved for use by the parent/carer for the patient in case blenderised tube feeding cannot be administered by parent/carer.

The Dietitians Association of Australia currently do not recommend blenderised tube feeding as it cannot be deemed safe, effective or nutritionally adequate, therefore blenderised tube feeding is managed under the Complementary and Alternative Medicine Policy at SCHN.

The potential risks associated with blenderised tube feeding include:

- Increased risk of microbial contamination and food borne illnesses
- Increased risk of infection for inpatients (due to the hospital environment and a reduced immunity if the child is unwell)
- Increased risk of contamination from allergens for patients with allergies
- Tubes may need to be changed more often due to compromised integrity and increased risk of blockage
- Malnutrition and micronutrient deficiency can occur if nutrients are not adequately met. This is of particular concern for acutely unwell patients, as their macro and micronutrient needs required for wound healing and recovery are often increased
- Blenderised feeds may need to be 'watered down' to achieve correct consistency, this may result in diluted nutrients and a greater volume of feed required
- Weight loss can occur due to error in food preparation resulting in a decreased calorie and nutrient content.

I have read and acknowledge the potential risks associated with blenderised tube feeding:

Parent/carer name: .....

Parent/carer signature:..... *Date:*...../...../.....

Patient 1 – Mr K

- SMA with unsafe swallow
- Frequent ICU admissions for respiratory decompensation
- Hypos when critically unwell
- Often on ventilation
- Each admission assessed, often goes onto commercial feeds +/- Polyjoule, upgraded to BTF on the ward

Patient 2 – Mr W

- Hypoplastic kidneys
- Frequent UTI's
- ICU admission post ureteric stents
- Agreed pre-op with both the surgeon and intensivist that they were happy for bolus feeds of BTF post – Agreement signed

Complementary and alternative medicine (cam) use at SCHN, https://www.schn.health.nsw.gov.au/_policies/pdf/2012-9015.pdf accessed 17.01.24

29

Safe-guarding

On the wards

- Variable implementation
- Hospital food service limitations
  - Consider alternative options as outlined in the BDA toolkit
  - Query commercial BTF's
- Training of nursing staff/presence of parents for administration
- Allowance of outside food

Epp, L., et al. "Implementing blended tube feeding into the clinical setting." *Support Line* 41.6 (2019): 2-9.
O'Connor, Graeme, Zoltan Hartfiel-Capriles, and Sharan Saduera. "Intermittent bolus versus continuous feeding in children receiving an enteral formula with food derived ingredients: a national multicentre retrospective study." Clinical Nutrition ESPEN 54 (2023): 175-179.

30

Safe-guarding

On the wards

- BDA toolkit options
  - 6 month commercial purees (jars or pouches) mixed with formula or rice cereal as needed
  - Hospital kitchen cooks and provides blended food (e.g. GOSH)
  - Parent/carer brings blends from home – needs medical approval, patient info sticker, expiry and ingredients
  - Foods provided by hospital food service on a puree diet code, and then prepared at the bedside

Epp, L., et al. "Implementing blended tube feeding into the clinical setting." *Support Line* 41.6 (2019): 2-9.
O'Connor, Graeme, Zoltan Hartfiel-Capriles, and Sharan Saduera. "Intermittent bolus versus continuous feeding in children receiving an enteral formula with food derived ingredients: a national multicentre retrospective study." Clinical Nutrition ESPEN 54 (2023): 175-179.

31

Safe-guarding

Schools/daycares

- School and daycare staff can be trained in administration, but will need to agree to this responsibility
- Food safety and storage considerations important ++
- Role of the NDIS dietitian in education/training - scope of practice considerations
- NSW department of Education investigating ways to support families better

32

Summary

- Evidence is evolving
- Use guidelines, toolkits and resources for support
- Know clinical limitations, seek support as needed

Don't discount the patient experience!

33