

# To Blend or Not to Blend

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# 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

# Oley Consumers

Variable	Pediatric Group (Age <18 years) (n=125)	Adult Group (Age ≥18 years) (n=91)	P-value
Number who have used BTF (%)	112 (89.6%)	60 (65.9%)	<0.0001
Male (%)	74 (59.2%)	39 (42.9%)	0.018
Age (years) (mean ± Standard Deviation)	5.4 ± 3.5	51.7 ± 19.5	<0.001
Work status			
-Work Full time		14 (15.4%)	
-Work part time		13 (14.3%)	
-Do not work		64 (70.3%)	
Duration of tube feeding			0.004
-Less than 1 month	0	0	
-1 to 6 months	3 (2.4%)	11 (12.1%)	
-6 months to 1 year	3 (2.4%)	4 (4.4%)	
-1 year to 5 years	76 (60.8%)	37 (40.7%)	
- Greater than 5 years	43 (34.4%)	39 (42.9%)	



# 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

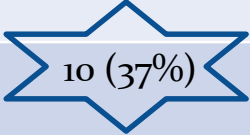
*Hurt R, Edakkanambeth Varayil J, Epp L, et al. Blenderized Tube Feeding Use in Adult Home Enteral Nutrition Patients: A Cross-Sectional Study . Nutr Clin Pract 0884533615600423, first published on July 6, 2015 as doi:10.1177/0884533615600423*

# Why?

	Number of Patients (%)
<b>It is more natural</b>	13 (43%)
<b>I like eating what my family eats</b>	10 (33%)
<b>It makes me feel “normal”</b>	9 (30%)
<b>I can tolerate it better</b>	9 (30%)
<b>I don't like the ingredients of commercial formulas</b>	9 (30%)
<b>I have food allergies</b>	2 (6%)
<b>Other reasons</b>	6 (2%)



# Why not?

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

# 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.

Pentiuk S, O'Flaherty T, Santoro K, Willging P, Kaul A. Pureed by gastrostomy tube diet improves gagging and retching in children with fundoplication. *JPEN J Parenter Enteral Nutr.* May 2011;35(3):375-379.

[Samela K](#), [Mokha J](#), [Emerick K](#), Davidovics ZH. Transition to a Tube Feeding Formula With Real Food Ingredients in Pediatric Patients With Intestinal Failure. *Nutr Clin Pract.* 2016 Aug 4. pii: 0884533616661011.

# 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

Sullivan MM, Sorreda-Esquerro P, Santos EE, et al. Bacterial contamination of blenderized whole food and commercial enteral tube feedings in the Philippines. *J Hosp Infect.* Dec 2001;49(4):268-273

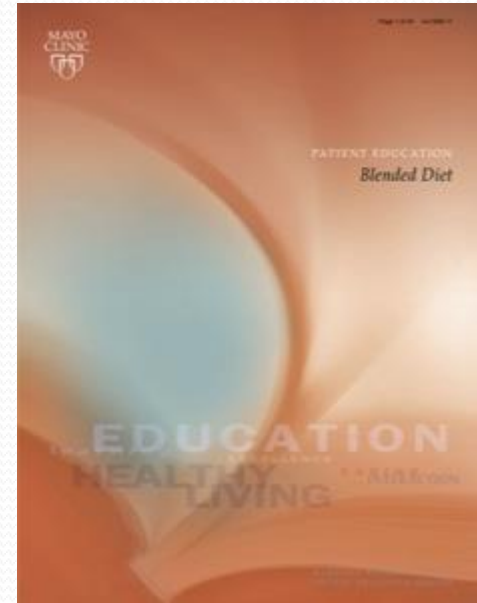
Waila C, Van Hoorn M, Edlbeck A, et al. The Registered Dietitian Nutritionist's guide to homemade tube feeding. *J Acad Nutr Diet.* 2016; Mar

# 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





# 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
- 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>



# 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)

INGREDIENT	AMOUNT
Starch – well-cooked oatmeal, rice, pasta or potato	½ cup
Yogurt, reduced fat (2%)	¼ cup
Milk, 1%	¾ cup (6 oz)
Oil, canola	2 teaspoons
Fruit – canned, fresh or frozen apple, banana, peaches, mandarin oranges	½ cup
Vegetable – canned, fresh or frozen well cooked broccoli, carrots, green beans or cauliflower	½ cup
Meat – cooked tender chicken, turkey, beef, fish or smooth, soft tofu	½ cup

**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








INGREDIENTS	Total Volume to send:
Cooked oatmeal	1 cup
Egg, cooked	1 each
Melon	½ cup
Whole milk	4 fl oz
Canola oil	1 teaspoon
Cooked brown rice	½ cup
Cooked green beans	½ cup
Canned peaches (drained)	½ cup
Yogurt (reduced fat 2%)	6oz
Whole milk	4 fl oz
Pureed carrots	½ cup
Tofu	½ cup
Avocado	4 tablespoons




# Family Meals

## MyPlate Daily Checklist

Write down the foods you ate today and track your daily MyPlate, MyWins!

Food group targets for a 1,400 calorie* pattern are:	Write your food choices for each food group	Did you reach your target?	
 <b>Fruits</b> <b>1 1/2 cups</b> 1 cup of fruits counts as <ul style="list-style-type: none"> <li>• 1 cup raw or cooked fruit; or</li> <li>• 1/2 cup dried fruit; or</li> <li>• 1 cup 100% fruit juice.</li> </ul>	_____ _____ _____	<input type="checkbox"/> Y <input type="checkbox"/> N	 <b>Limit</b> <b>Limit:</b> <ul style="list-style-type: none"> <li>• Sodium to <b>1,500 milligrams</b> a day.</li> <li>• Saturated fat to <b>16 grams</b> a day.</li> <li>• Added sugars to <b>35 grams</b> a day.</li> </ul> <input type="checkbox"/> Y <input type="checkbox"/> N   <b>Activity</b> <b>Be active your way:</b> <ul style="list-style-type: none"> <li>• Children 2 to 5 years old should play actively every day.</li> </ul> <input type="checkbox"/> Y <input type="checkbox"/> N
 <b>Vegetables</b> <b>1 1/2 cups</b> 1 cup vegetables counts as <ul style="list-style-type: none"> <li>• 1 cup raw or cooked vegetables; or</li> <li>• 2 cups leafy salad greens; or</li> <li>• 1 cup 100% vegetable juice.</li> </ul>	_____ _____ _____	<input type="checkbox"/> Y <input type="checkbox"/> N	
 <b>Grains</b> <b>5 ounce equivalents</b> 1 ounce of grains counts as <ul style="list-style-type: none"> <li>• 1 slice bread; or</li> <li>• 1 ounce ready-to-eat cereal; or</li> <li>• 1/2 cup cooked rice, pasta, or cereal.</li> </ul>	_____ _____ _____	<input type="checkbox"/> Y <input type="checkbox"/> N	
 <b>Protein</b> <b>4 ounce equivalents</b> 1 ounce of protein counts as <ul style="list-style-type: none"> <li>• 1 ounce lean meat, poultry, or seafood; or</li> <li>• 1 egg; or</li> <li>• 1 Tbsp peanut butter; or</li> <li>• 1/4 cup cooked beans or peas; or</li> <li>• 1/2 ounce nuts or seeds.</li> </ul>	_____ _____ _____	<input type="checkbox"/> Y <input type="checkbox"/> N	
 <b>Dairy</b> <b>2 1/2 cups</b> 1 cup of dairy counts as <ul style="list-style-type: none"> <li>• 1 cup milk; or</li> <li>• 1 cup yogurt; or</li> <li>• 1 cup fortified soy beverage; or</li> <li>• 1 1/2 ounces natural cheese or 2 ounces processed cheese.</li> </ul>	_____ _____ _____	<input type="checkbox"/> Y <input type="checkbox"/> N	

\*This 1,400 calorie pattern is only an estimate of your needs. Monitor your body weight and adjust your calories if needed.


**Track your MyPlate, MyWins**  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Center for Nutrition Policy and Promotion  
 January 2016  
 USDA is an equal opportunity provider and employer.

# 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

# 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™

- 1.2kcal/mL
- \$4.17 for 330kcal
- 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<sup>®</sup>

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

## Pros

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

## Cons

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



# Liquid Hope<sup>®</sup>

- 1.2kcal/mL
- \$7.99 per 440kcal
- 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<sup>®</sup> (new formulation)

- 1.06kcal/mL
- \$4.00 for 265kcal
- 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<sup>®</sup> (new formulation)

- 1 kcal/mL
- \$3.13 for 250kcal
- 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<sup>®</sup> (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

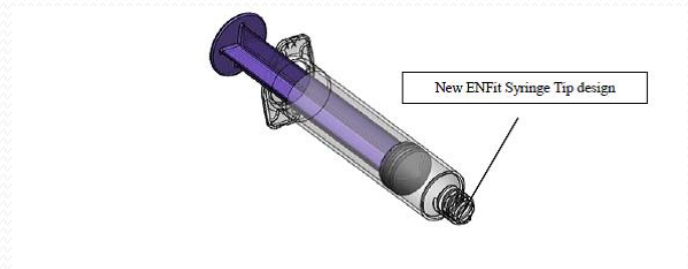
- Alcohol
- Caffeine
- Smoothies
- Favorite foods
- Seasonal foods
- Hydration



## Unite. Connect. Deliver.

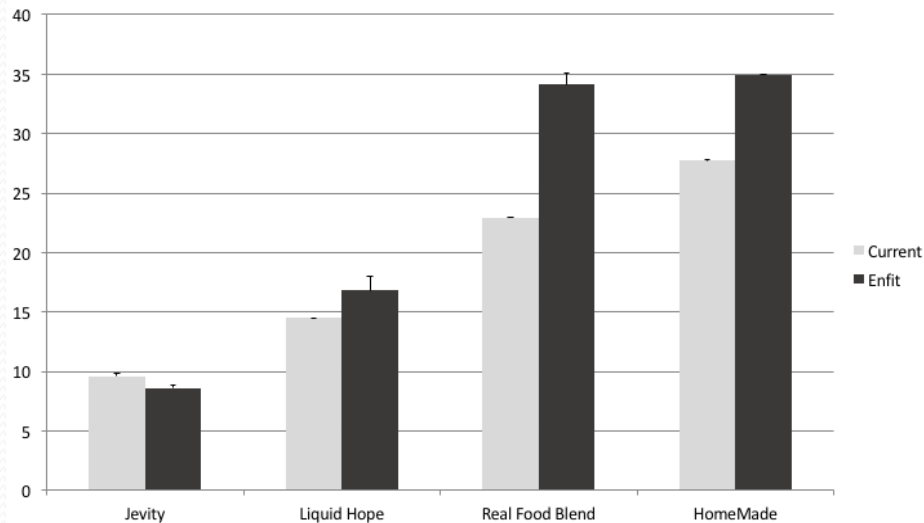
The Global Enteral Device Supplier Association (GEDSA) was formed to help introduce international standards in medical device tubing connectors, which will enhance patient safety. Our connections will facilitate a stronger flow of communication to raise awareness and encourage adoption.

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



# Force data

- ENFit
  - Our testing showed increase in PSI needed



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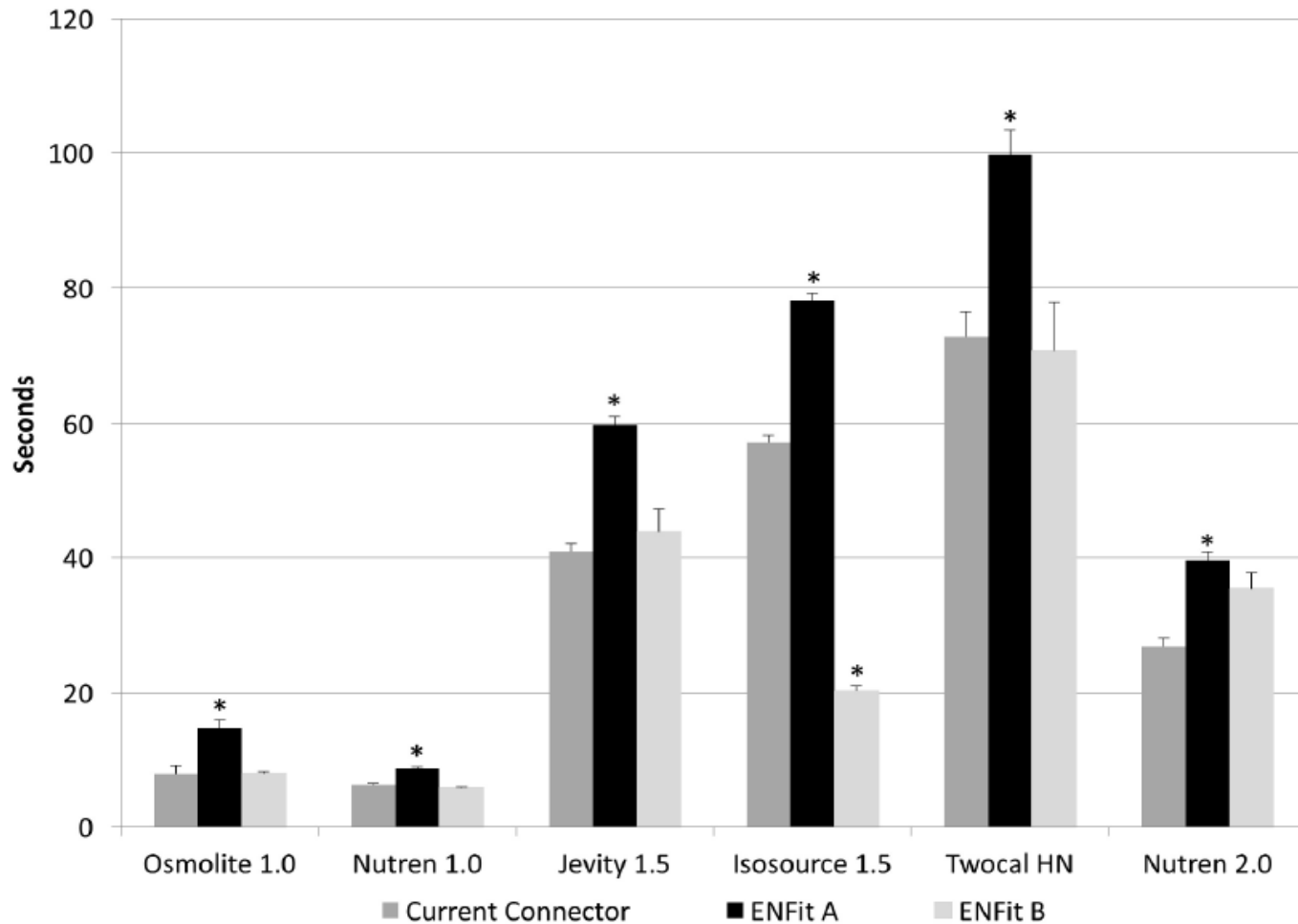
Mundi MS, Epp L, Hurt RT. Increased Force Required With Proposed Standardized Enteral Feed Connector in Blenderized Tube Feeding. *Nutr Clin Pract*, 0884533616639126, first published on April 18, 2016





# Flow with ENFit

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



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

253x190mm (300 x 300 DPI)

# 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

# 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

- Hurt R, Edakkanambeth Varayil J, Epp L, et al. Blenderized Tube Feeding Use in Adult Home Enteral Nutrition Patients: A Cross-Sectional Study. *Nutr Clin Pract* 2015 Dec;30(6):824-9. doi: 10.1177/0884533615591602
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