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# Altered Nutritional Function: Nutritional Support in the Pediatric Population

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# Altered Nutritional Function

Nutritional Support in the Pediatric Population

By Gretchen Clavey

# When it comes to feeding a newborn…

…the big decisions most parents make usually involve a choice between the breast and bottle or between pumped breastmilk and commercial formula.

Feeding by mouth, with full use of the digestive system, is the universally expected norm.

# However…



There are numerous reasons a child may have altered digestive function. Many times this may require short or long-term alternative feeding methods.

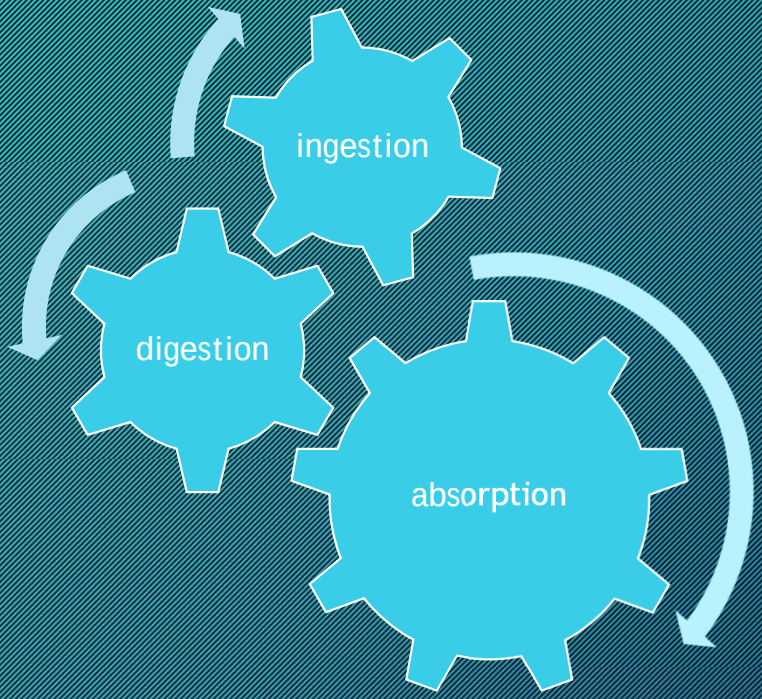
The goal of this presentation is to introduce common variations in the way children's nutritional needs are met.

For many in the pediatric population, these options provide a vital, life-saving method for receiving nutrition.

Photo credit: Clavey, 2013

# The work of the digestive system…

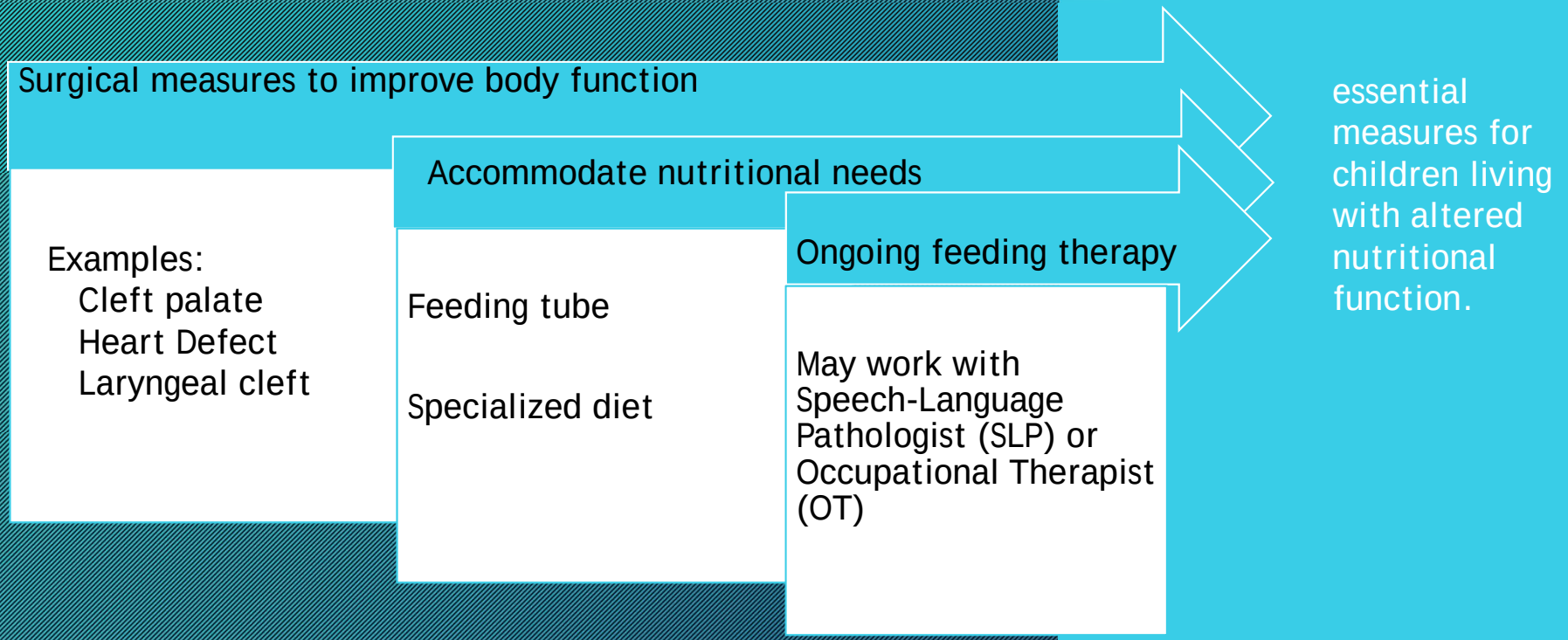





- Parts of a complex process
- Coordination of the processes may encounter obstacles
- May require therapeutic intervention

# Interdisciplinary interventions



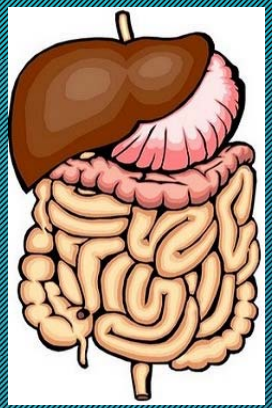


# Nutritional Delivery Options



## Enteral Nutrition

- ✓ Nutrients enter and are processed via digestive system.
- ✓ May bypass some part of the GI tract

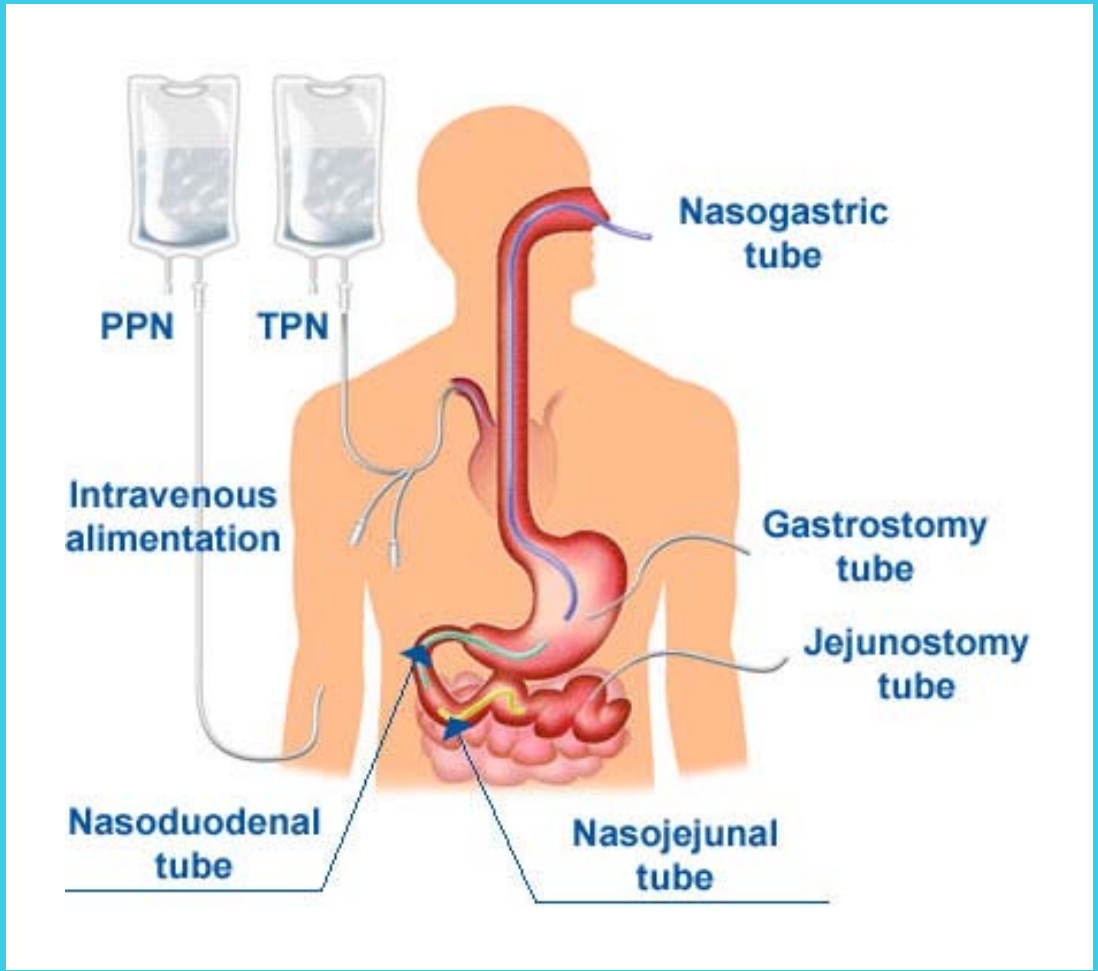




## Parenteral Nutrition

- ✓ Broken down nutrients enter blood stream directly through a large catheter or port.
- ✓ Proteins, fats, water, mineral, glucose and vitamins = "total" nutrition
- ✓ Called TPN or Total Parental Nutrition

There are critical differences between enterally delivered nutrition compared to intravenous, parenteral nutrition.




https://spareyourtummy.wordpress.com/others/total-parenteral-nutrition/

# Reasons a child may need a feeding tube



According to the Feeding Tube Awareness Foundation (2018), several broad categories of at-risk populations exist. Children may have:

- Swallowing Disorders
- Motility Disorders
- Eosinophilic Disorders
- Chromosome & Genetic Disorders
- Mitochondrial Disorders

# Feeding & swallowing disorders



Children at high risk for a swallowing disorder may include those with:

- A neurological disorder
- Brain injury or stroke
- Preterm birth, especially <34 weeks
- Uncoordinated swallow
- Difficulty swallowing (dysphagia)
- Craniofacial anomalies
- Fatigue due to medical conditions such as a heart defect

Generally, there are a number of conditions that may affect a newborn's ability to swallow. These children may need tube feeding temporarily or long-term

https://www.feedingtubeawareness.org/tube-feeding-basics/tests-conditions/swallowing-disorders/

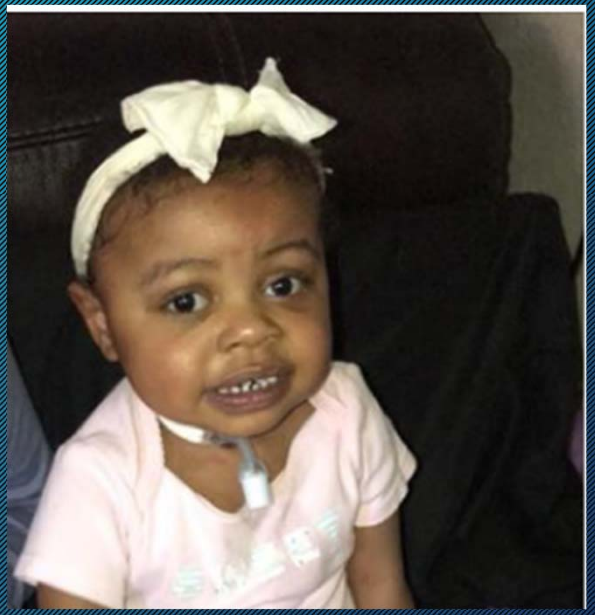


Photo credit, Shannon Starks, 2018, used with permission

# Feeding & swallowing disorders



- 5-10% of the pediatric population has some form of a serious feeding disorder at some point.

- 80% of children with developmental disabilities have a feeding disorder which may include problems with oral-motor or oral-sensory dysfunction.

Photo credit: Clavey, 2013

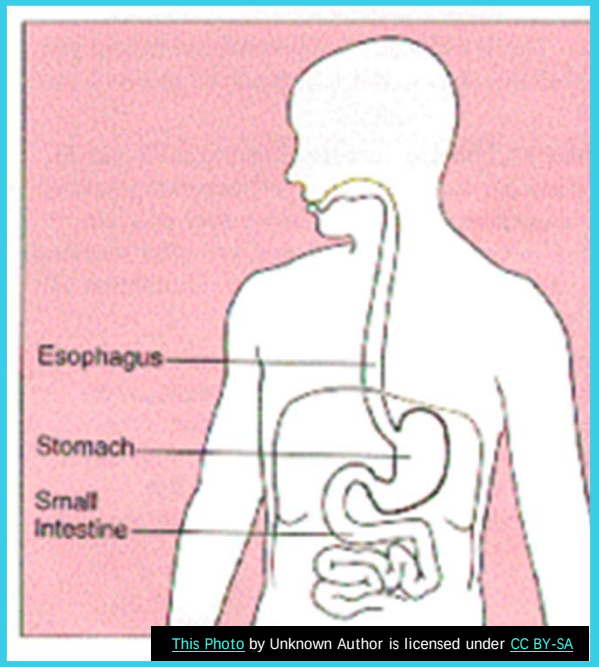
www.chw.org/medical-care/gastroenterology-liver-and-nutrition-program/conditions/oral-motor-and-oral-sensory-problems

# Motility Disorders



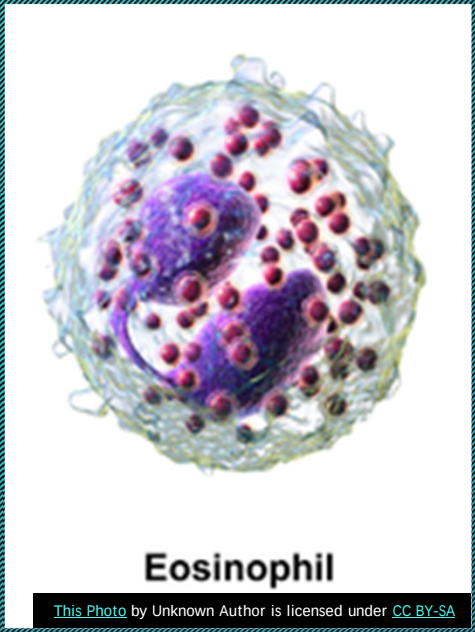
- A motility disorder can affect the movement of food through the digestive system.
- One or several aspects of the digestive system may be affected.
- Tube-feeding enables us to deliver food to the system in a way that may bypass the part with diminished or non-existent functionality

https://www.feedingtubeawareness.org/tube-feeding-basics/tests-conditions/motility-disorders/



# Eosinophilic Disorders








- Characterized by the overproduction of a normal white blood cell (the eosinophil) in one or all parts of the digestive system. This occurs in response to an ingested or inhaled allergen.
- Eosinophils release toxins that may lead to chronic inflammation & tissue damage
- Special diets, such as a hypoallergenic formula, may be utilized with or without a feeding tube.
- For more information on Eosinophilic Disorders: https://curedfoundation.org/
- https://www.feedingtubeawareness.org/tube-feeding-basics/tests-conditions/eosinophilic-disorders/

# Chromosome & Genetic Disorders



- Alterations in the genetic code before conception may result in medical conditions that affect the digestive system

- The Feeding Tube Awareness Foundation has a list of 398 genetic conditions that may affect a child's ability to swallow or eat orally.

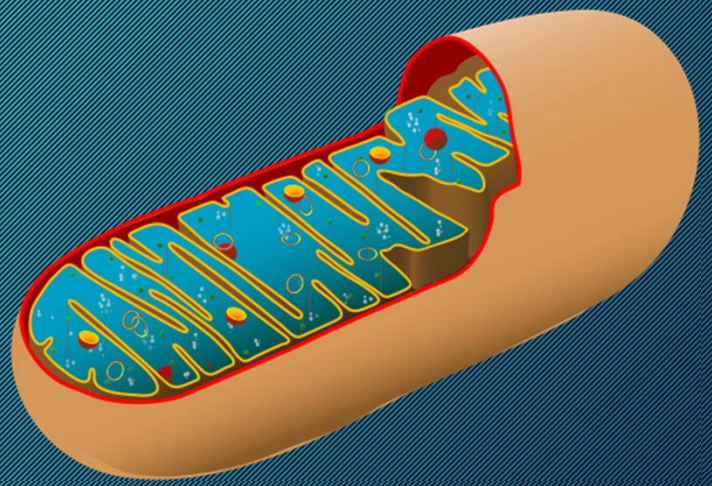
FEEDING TUBE AWARENESS FOUNDATION

https://www.feedingtubeawareness.org/tube-feeding-basics/tests-conditions/chromosome-disorders/

# Mitochondrial Disorders



- A disorder affecting the mitochondria, which are responsible for energy production in the cell
- Disease may present with digestive problems, such as dysmotility, that require tube feeding





https://www.feedingtubeawareness.org/mitochondrial-disease/

# Non-Surgical Feeding Tubes



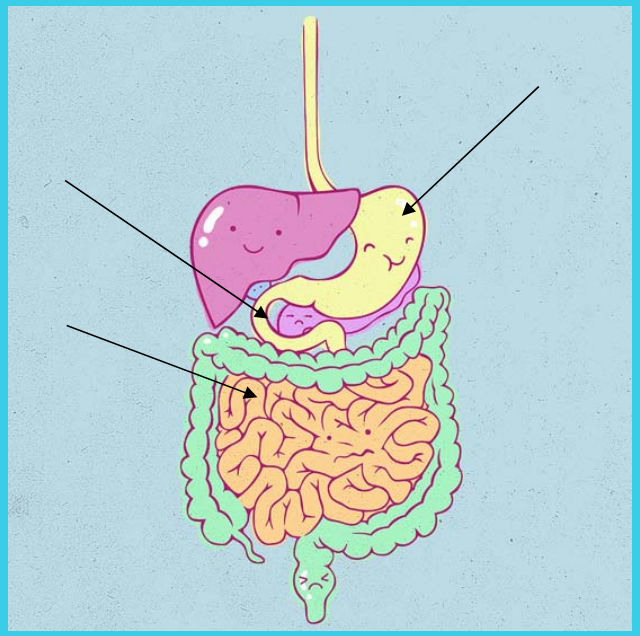
- Oral-Gastric (OG) Tube
- Naso-Gastric (NG) Tube
- Naso-Duodenal (ND) Tube
- Naso-Jejunal (NJ) Tube

Photo credit: Clavey, 2013

# Non-Surgical Feeding Tubes



- Tube inserted through nose or mouth then through the nasopharynx and esophagus
- Depending on where feeds are tolerated, ends in:
  - Stomach,
  - Duodenum, or
  - Jejunum
- Short term use, 1-6 months
- Placement verified by radiology



# Surgically Placed Feeding Tubes



May use laparoscopic or endoscopic method for placement

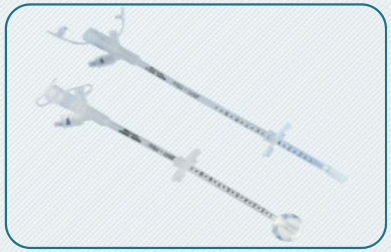
- Gastronomy Tube (G-Tube)
  - Sometimes also called “PEG tube’
  - There are various types of G-Tubes, one of which is PEG tube
- Gastronomy-Jejunal Tube (GJ-Tube)
- Jejunal Tube (J-Tube)

# Gastronomy Tube (G-Tube)



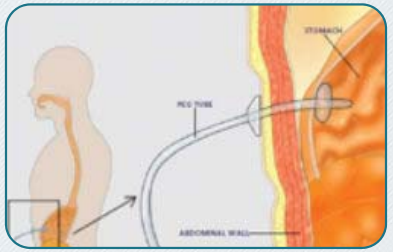
Low profile "button" (A)

- * Held in place by a balloon
- * Different brands:
  - "Mini-One" or
  - "MIC-Key" (1)



Long G-Tube (B)

- * Secured by inner balloon and outer flange or bolster
- * no clamp, bend to occlude (2)
-



PEG tube (C)

- * Placed endoscopically
- * no balloon in inside, held by an internal disc or bumper (3)

- Images 1 & 2: https://www.appliedmedical.net/enteral/
- Image 3: https://gi.md/patient-information/procedures/peg-pej

# Gastro-Jejunal and Jejunal Tube



- Tube may be part of a G-tube with an extension that leaves the stomach and ends in the jejunum (GJ-Tube);
- J-Tube may also be inserted through abdomen directly into jejunum.
- Nutrition infused by pump, typically at slower rate than G-Tube

https://www.appliedmedical.net/enteral/

# Tube-Fed Nutrition Options



- Breastmilk
- High Calorie Fortifiers
- Hypoallergenic commercial formulas
- Regular commercial formulas
- Blended (pureed) table food

# Breastmilk

- Highly nutritious option for tube-fed babies.
- Lactation support essential to help mothers maintain milk supply during extended pumping.


https://www.medela.com/breastfeeding/mums-journey/breast-milk-composition

# Human Milk Fortifiers



- Utilized for premature and/or low birthweight babies who receive breastmilk
- Added to meet a higher need for protein and minerals for growth
- Also supplies additional electrolytes, calories and vitamins



https://abbottstore.com/similac-human-milk-fortifier-powder-0-9-g-packet-case-of-150-54598.html
https://www.enfamil.com/products/enfamil-human-milk-fortifier-powder

# Hypoallergenic Commercial Formulas



- Three main forms reflecting degree of processing to remove potential allergens:
  - Partially hydrolyzed
  - Extensively Hydrolyzed
  - Free-Amino Acid Based

https://www.verywellhealth.com/hypoallergenic-infant-formula-1323942


https://similac.com/baby-formula/similac-alimentum


https://www.neocate.com/

# Regular Commercial Formula



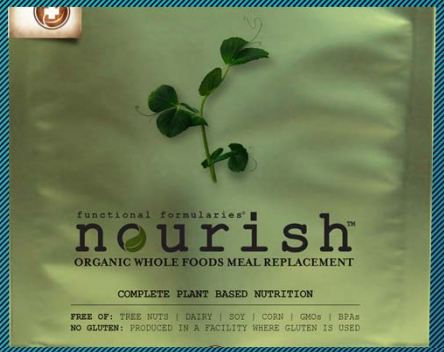
- Formula readily available over the counter
- Variations include:
  - Formulations for different conditions like colic or reflux
  - Formulations using dairy or soy depending on tolerance of the child

Photo credit: Safe Baby Healthy Child; www.safebabyhealthychild.com/formula-wait-try-this-first/

# Blended (Pureed) Whole Foods



- ✓ Commercially prepared
- ✓ Tube-ready meals




www.functionalformularies.com


www.realfoodblends.com/

# Home Blended Meals



Family Meal

Well Blended


Ready to feed!


Photo credit: Shannon Starks, 2018; used with permission

# Children's hospitals are getting involved in research about blended diet:



Here are 2 reports included at the conference for North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN):

**Conclusion**: "The pureed diet by GT is an alternative diet that is well received by families of patients. The pureed diet can improve the gagging / retching, oral tolerance, weight velocities, and stooling habits. Adverse effects of the pureed diet are limited" (Children's Hospital of Michigan/Wayne Medical School, 2014)

**Conclusion**: "Pediatric patients who are dependent on G-tube feedings may benefit from BTF for improvement in stool consistency, vomiting, and G-Tube intolerance. Full BTF may result in better outcomes than combination foods. Frequent monitoring of anthropometric measurements is warranted to promote age appropriate growth" (Children's Hospital of Orange County, 2015)

# The “Language” of Tube-Feeding



- **Stoma**
  Surgically placed opening through abdominal wall for feeding-tube
- **French (Fr)**
  Diameter of the feeding tube lumen; blenderized food is best with a 14 Fr
- **Bolus Feed**
  Using a syringe to feed a meal over a relatively short period of time
- **Continuous Feed**
  Using a feeding pump to infuse the meal at a tolerable rate
- **Flush**
  Administering a small amount of water through a feeding-tube after a meal to clear remaining food or formula
- **Attachment**
  A longer tube that is connected to the stationary feeding-tube to allow meal to be administered.

# The “Language” of Tube Feeding



- (Gastric) Residual
  Amount of liquid left in the stomach after enteral feeding. Typically checked a before beginning the next feed.
- Venting
  Opening the attachment clamp with a syringe attached to allow air in the stomach to escape.
- Hypergranulation tissue
  Can also be called “overgranulation” tissue. Unwanted red tissue that may emerge from the stoma. May cause discomfort and need to be treated with topical silver nitrate.
- EnFit System
  Industry-wide changes in the feeding-tube attachment connections. Change is intended to eliminate the possibility of accidentally placing enteral nutrition into intravenous TPN catheter.
- AMT Bridle-Pro
  Securement device for naso-gastric feeding tubes. Loops around vomer bone in nasal cavity. Alternative to taping tubes to face

# Top Patient Resources



- The Oley Foundation:
- "Striving to enrich the lives of those living with home intravenous nutrition and tube feeding through education, advocacy, and networking."
- https://oley.org/

- Feeding Tube Awareness Foundation
- Resource for parents of tube-fed kids. Partners with clinical organizations, makers of tube related products and clinicians to raise awareness & assist families who supply enteral nutrition for their children.
- https://www.feedingtubeawareness.org/

- Real Food For Real People

Online community run by parents of medically complex children. Provides a forum and dynamic resource for parents helping each other navigate life with a child needing enteral nutrition.

- www.foodfortubies.org

- Blendarized RN

Online community and video channel to support parents blending food for their children. Started by registered nurse and mother of a complex, tube-fed child.

https://youtu.be/3o1Fju_ZZak

Altered digestive function puts children at risk for nutritional deficits that can have lifelong impact on cognition, growth and development.

Whether there is a need for short or long-term nutritional support, there are a variety of options available.

# Beyond survival… thriving is the goal!

# Citations



Children's Hospital of Michagan/Wayne Medical School. (2014). *Tolerance of Pureed Diet by Gastrostomy Tube in Pediatric Patients.* North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN).

Children's Hospital of Wisconsin. (2018). *Children's Hospital of Wisconsin*. Retrieved from GI, Liver and Nutrition Program: www.chw.org/medical-care/gastroenterology-liver-and-nutrition-program/conditions/oral-motor-and-oral-sensory-problems

Children's Hospital of Orange County. (2015). *Short-term Outcomes Using Blenderized Tube Feedings Among Gastrostomy-Tube Dependent Children*. North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN).