



GI DISORDERS IN KIDS WITH NEURODEVELOPMENTAL DISABILITIES

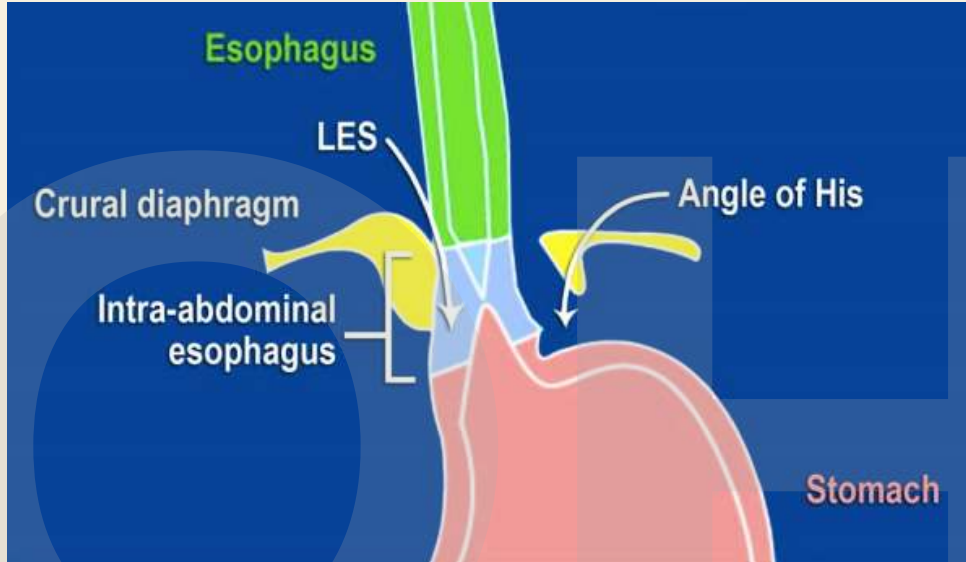
SYLVIA DOAN, MBBS

12/11/2020

OUTLINE

- GERD
- Dysphagia and feeding difficulties
- Constipation
- Complementary Medicine – what's out there?
- Non-traditional sources of patient information

GERD



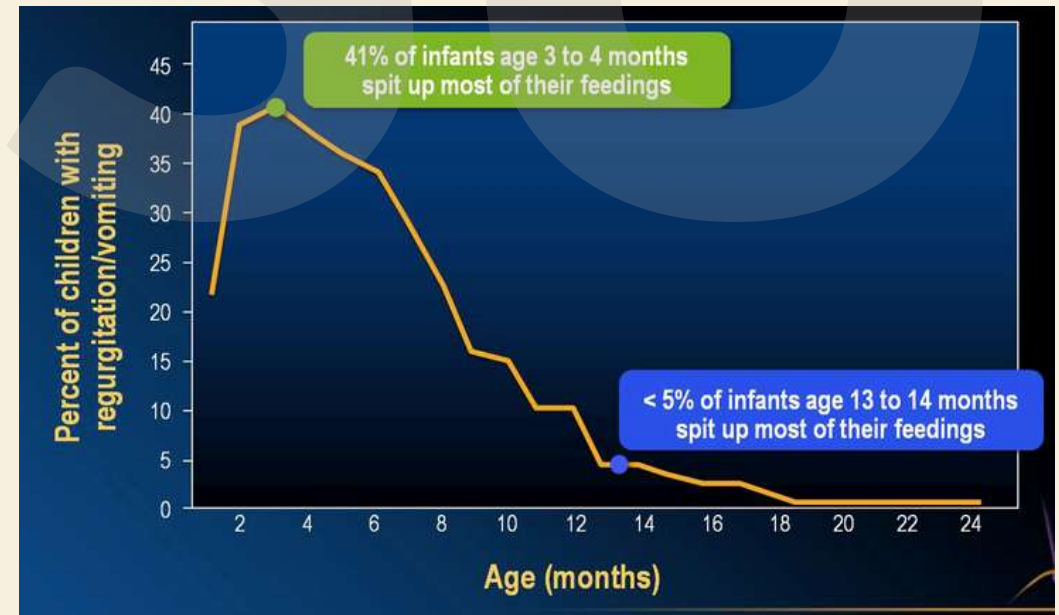
Anti Reflux Barriers

- Lower esophageal sphincter
- Crural diaphragm
- Angle of His

Primary mechanisms of GERD
Transient LES relaxation
Impaired esophageal clearance

Secondary mechanisms of GERD
Intra-abdominal pressure
Decreased gastric compliance
Delayed gastric emptying

Natural History



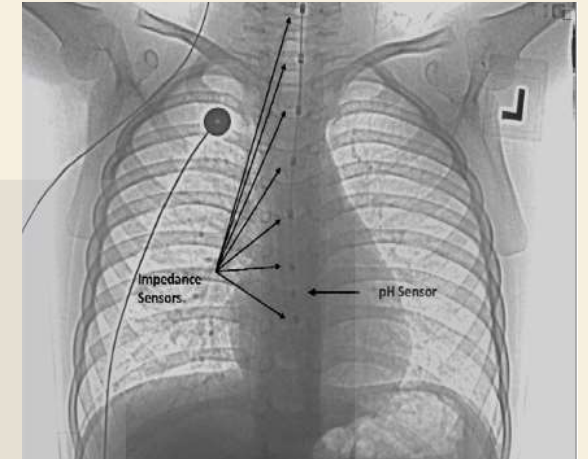
WHO IS AT RISK?

- Esophageal atresia
- Cystic fibrosis
- **Neurological impairment**
- Hiatal hernia
- Obesity
- Family history of GERD

OHSSU

DIAGNOSTIC STUDIES – SUGGESTED USES

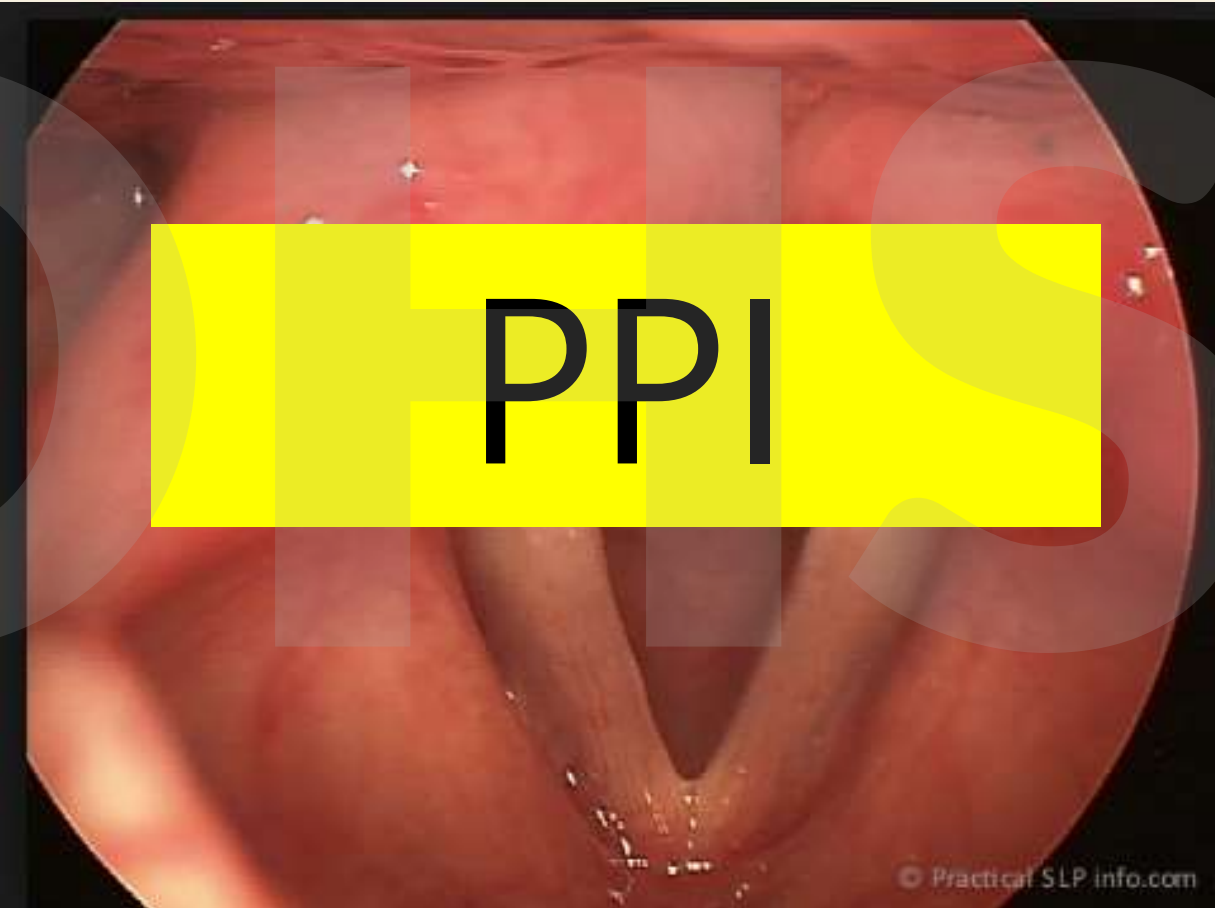
- Barium contrast studies
 - Exclude anatomic abnormalities
- EGD
 - Assessment of alternative diagnoses eg EoE or GERD complications
- pH-impedance study
 - Correlate persistent, troublesome sx with acid and non-acid reflux events
 - Clarify role of acid and non acid reflux in etiology of esophagitis
 - Determine efficacy of acid suppression therapy
 - Differentiate non-erosive reflux disease, hypersensitive esophagus and functional heartburn in patients with normal EGD



Gastroesophageal reflux burden, even in children that aspirate, does not increase pediatric hospitalization

Daniel R. Duncan, MD¹, Janine Amirault, BA¹, Nikki Johnston, PhD², Paul Mitchell, MA³, Kara Larson, MS⁴, and Rachel L. Rosen, MD¹

- 116 pediatric patients underwent both pH-MII and modified barium swallow studies
- no significant relationship between reflux burden and total number of admissions or number of admission nights even after adjusting for aspiration status



PPI



The Edematous and Erythematous Airway Does Not Denote Pathologic Gastroesophageal Reflux

Rachel Rosen, MD, MPH¹, Paul D. Mitchell, MS², Janine Amirault, BS¹, Manali Amin, MD³, Karen Watters, MD⁴, and Reza Rahbar, MD⁴

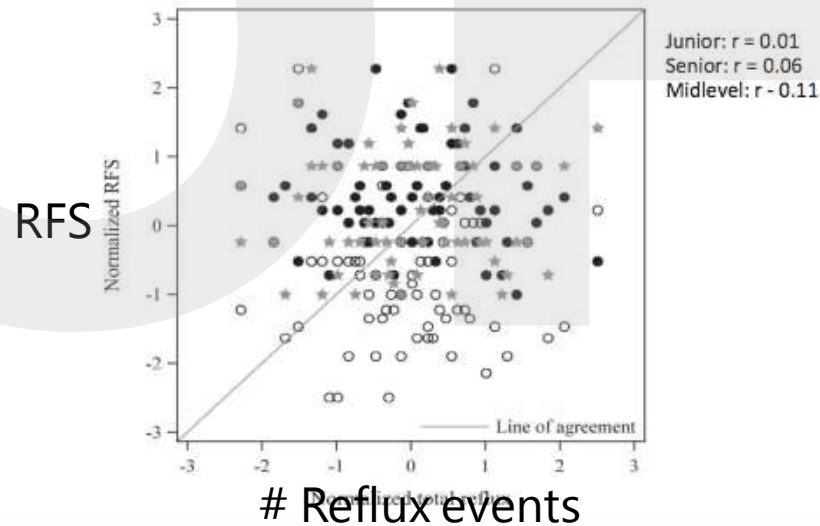


Figure 2. Lack of correlation between RFS and total number of reflux events (open circle: junior otolaryngologist; solid circle: midlevel otolaryngologist; star: senior otolaryngologist).

Lack of relationship between RFS and total # of reflux events

- No correlation between airway findings and pathologic reflux
- Airway findings should not be used to diagnose pathologic reflux

LIPID LADEN MACROPHAGES

Lipid-Laden Macrophage Index Is Not an Indicator of Gastroesophageal Reflux-Related Respiratory Disease in Children

Rachel Rosen, MD, MPH^a, Julia Fritz, BA^a, Ariela Nurko^a, Dawn Simon, MD^b, Samuel Nurko, MD, MPH^a

- Inconsistent relationship between amount of gastroesophageal reflux and lipid laden macrophage index (LLMI)
- No relationship between full column reflux by pH-MII and LLMI

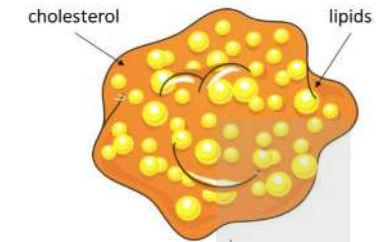
Lipid-laden macrophages in bronchoalveolar lavage fluid as a marker for pulmonary aspiration

S Knauer-Fischer¹, F Ratjen

"Normal" macrophage



Lipid-laden "foamy" macrophage



Lipid laden macrophages present in pulmonary disease where there was no clinical evidence of aspiration

S. Knauer-Fischer et al. Lipid-laden macrophages in bronchoalveolar lavage fluid as a marker for pulmonary

GERD IN CHILDREN WITH CEREBRAL PALSY

- CNS dysfunction likely the main cause of reflux
 - neuromuscular incoordination → impaired antireflux function of the LES mechanism + impaired esophageal motility

Other proposed mechanisms;

- hiatus hernia
- prolonged supine position
- increased intraabdominal pressure secondary to spasticity, scoliosis or seizures

VOMITING ≠ GERD

- Emetic reflex
- Rumination syndrome
- Retching

OHHSU

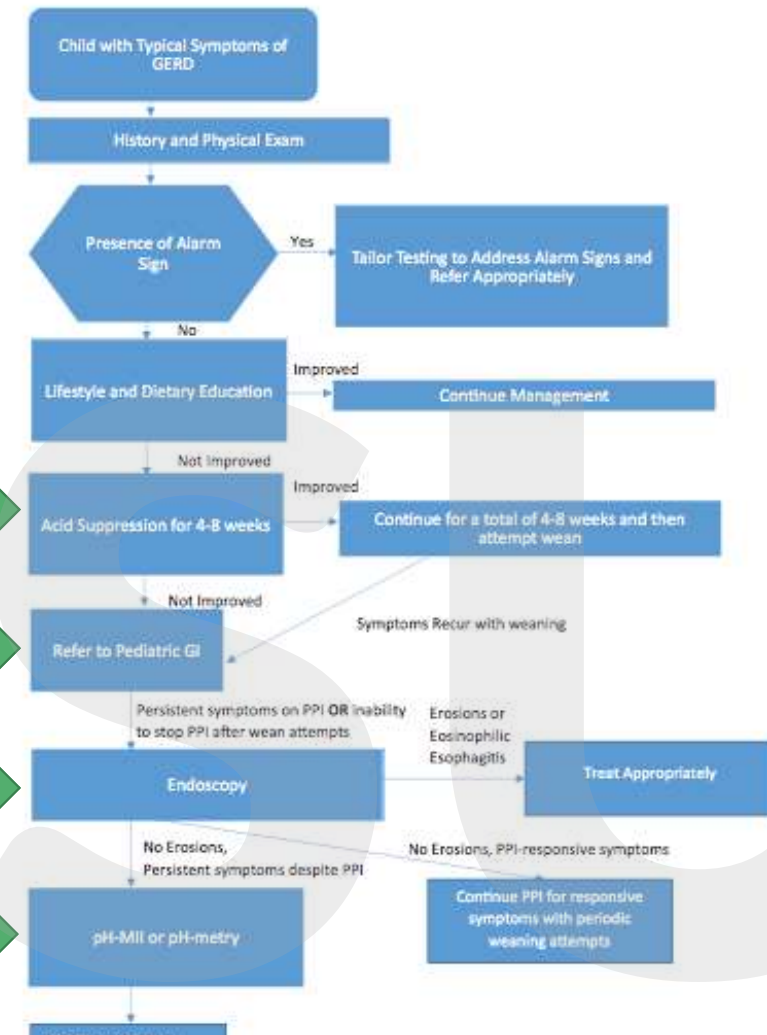
APPROACH & MANAGEMENT

Acid suppression 4-8 weeks, then wean

Refer to GI

Endoscopy

pH impedance testing



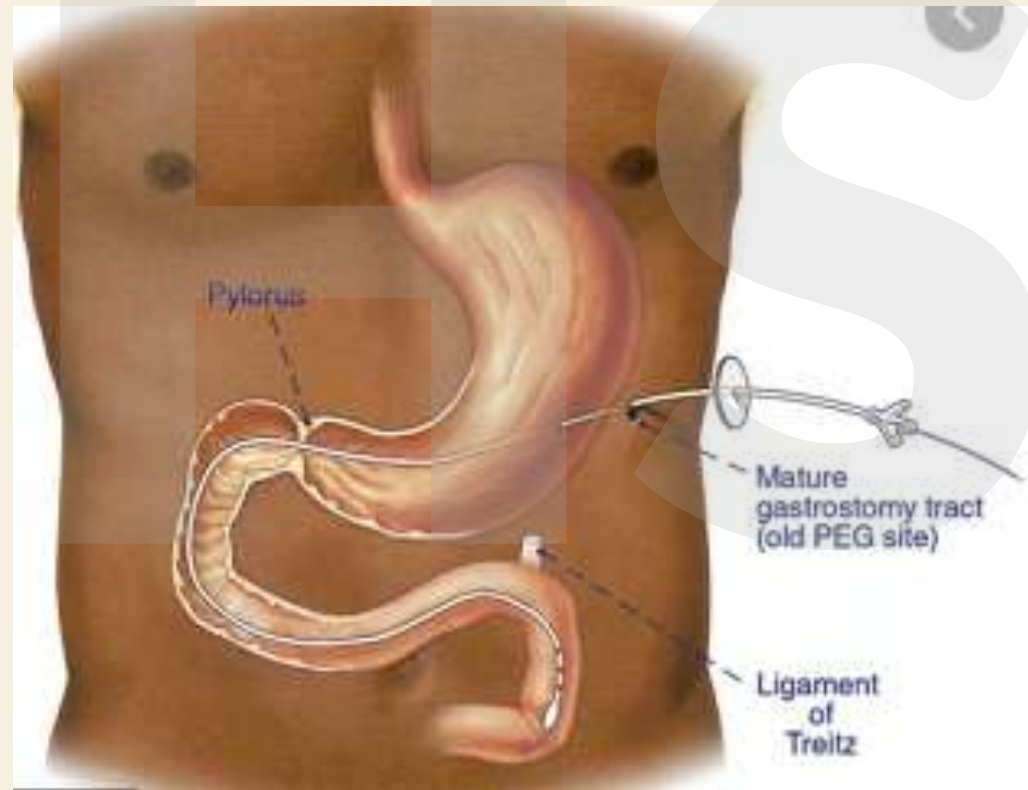
But what about kids with severe GERD and aspiration risk?

NERD

Reflux Hypersensitivity

Functional Heartburn

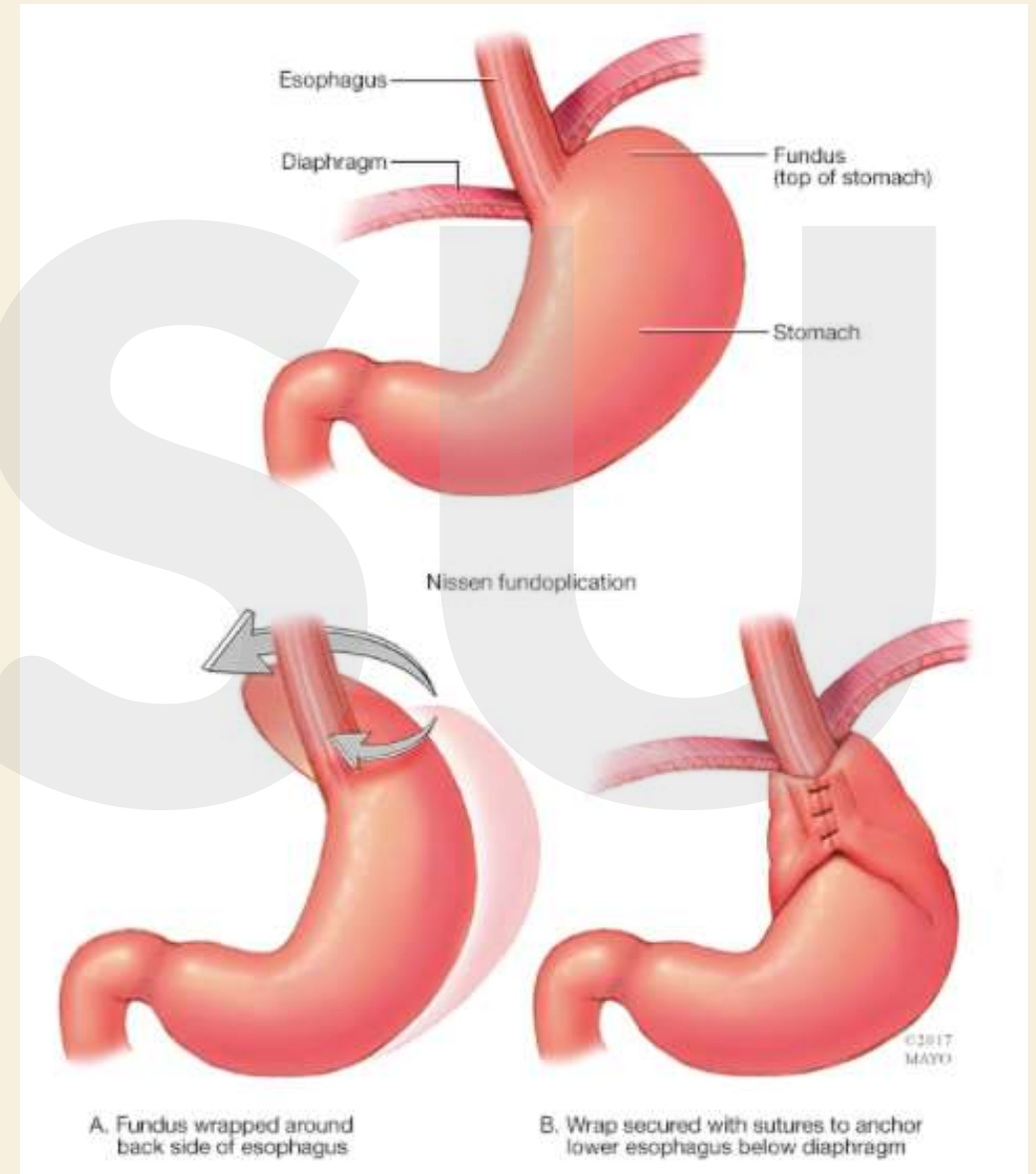
POST PYLORIC FEEDS



FUNDOPLICATION

Fundoplication decreases reflux by

- increasing LES baseline pressure
- decreasing the # of transient LES relaxations
- increasing the length of the intra-abdominal esophagus
- accentuating the angle of His
- reducing a hiatal hernia if present



Article

Impact of Fundoplication Versus Gastrojejunal Feeding Tubes on Mortality and in Preventing Aspiration Pneumonia in Young Children With Neurologic Impairment Who Have Gastroesophageal Reflux Disease

Rajendu Srivastava, Earl C. Downey, Molly O'Gorman, Peter Feola, Matthew Samore, Richard Holubkov, Michael Mundorff, Brent C. James, Peter Rosenbaum, Paul C. Young and Jonathan M. Dean

Pediatrics January 2009, 123 (1) 338-345; DOI: <https://doi-org.liboff.ohsu.edu/10.1542/peds.2007-1740>

- 366 children with neurologic impairment and GERD (43 had first GJ tube and 323 underwent first fundoplication)
- Average follow-up 3.4 years
- **No difference in time to next hospitalization for aspiration pneumonia or mortality** by initial intervention choice

Article

Do Antireflux Operations Decrease the Rate of Reflux-Related Hospitalizations in Children?

Adam B. Goldin, Robert Sawin, Kristy D. Seidel and David R. Flum

Pediatrics December 2006, 118 (6) 2326-2333; DOI: <https://doi-org.liboff.ohsu.edu/10.1542/peds.2006-2212>

- 1142 pediatric pts who underwent anti-reflux surgery – Calculated # of hospitalizations for and rates of reflux-related events per patient- year before and after an anti-reflux procedure
- 3 groups based on age at first antireflux procedure (<1 year, 1-3 years, or 4-19 years)

Conclusions:

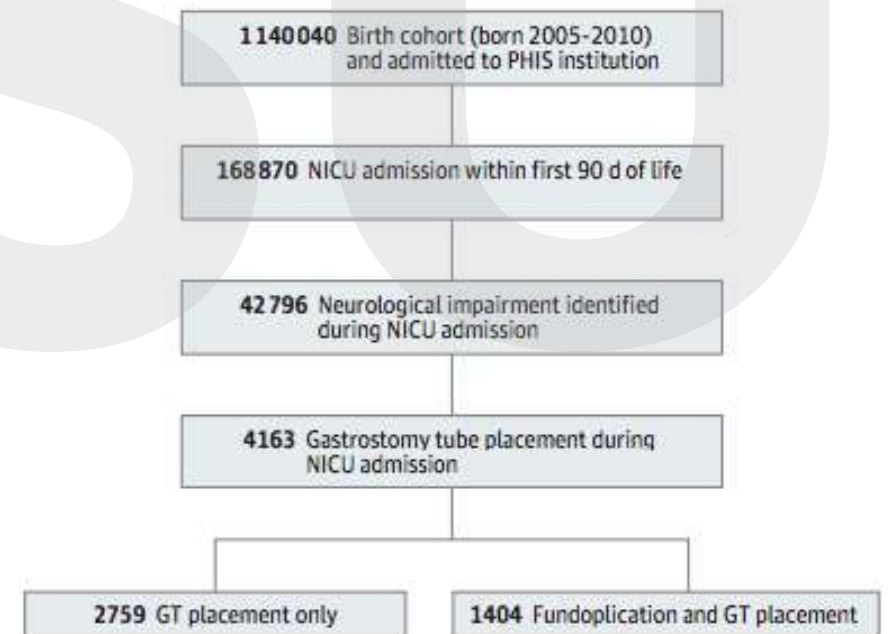
- Rate of reflux-related events was lower after an anti-reflux operation for children <4yo
- Older children hospitalized at equal rates before and after an anti-reflux procedure
- Older children with developmental delay were hospitalized at greater rates after an anti-reflux procedure

Effectiveness of Fundoplication at the Time of Gastrostomy in Infants With Neurological Impairment

Douglas C. Barnhart, MD, MSPH; Matthew Hall, PhD; Sanjay Mahant, MD, FRCPC, MSc; Adam B. Goldin, MD, MPH; Jay G. Berry, MD, MPH; Roger G. Faix, MD; J. Michael Dean, MD; Rajendu Srivastava, MD, FRCPC, MPH

- 4163 infants with neurological impairment in NICU underwent GT placement alone or with fundoplication.
- No difference in 2 groups for reflux-related hospitalization 1 year following surgery

Figure 1. Cohort of Infants With Neurological Impairment Who Underwent Gastrostomy Tube (GT) Placement



FUNDOPLICATION RISKS/COMPLICATIONS

- Dumping syndrome
- Gasbloat syndrome
- Retching
- Early satiety
- Dysphagia
- Worsening aspiration risk from esophageal stasis
- Wrap slipping/unwrapping resulting in the need for reoperation

GJ RISKS/COMPLICATIONS

- Clogging
- Dislodgement
- Balloon rupture, breakage of tube
- Peristomal leakage
- Intussusception
- Perforation

J FEEDS NOT A MAGICAL FIX FOR REFLUX!

- Rosen et al - pH/impedence showed reflux still present during feeding (but less than previous)
- Same amount of aspiration and reflux-related hospitalizations (before and after initiation of J feeds)
- Stone et al - retrospective study in children with NI and GER with GT feeds underwent fundoplication vs GJ (1178 vs 163)
 - Similar rates of reflux-related hospitalizations in both within first year
 - FTT, repeat of initial intervention, crossover intervention more common in GJ group

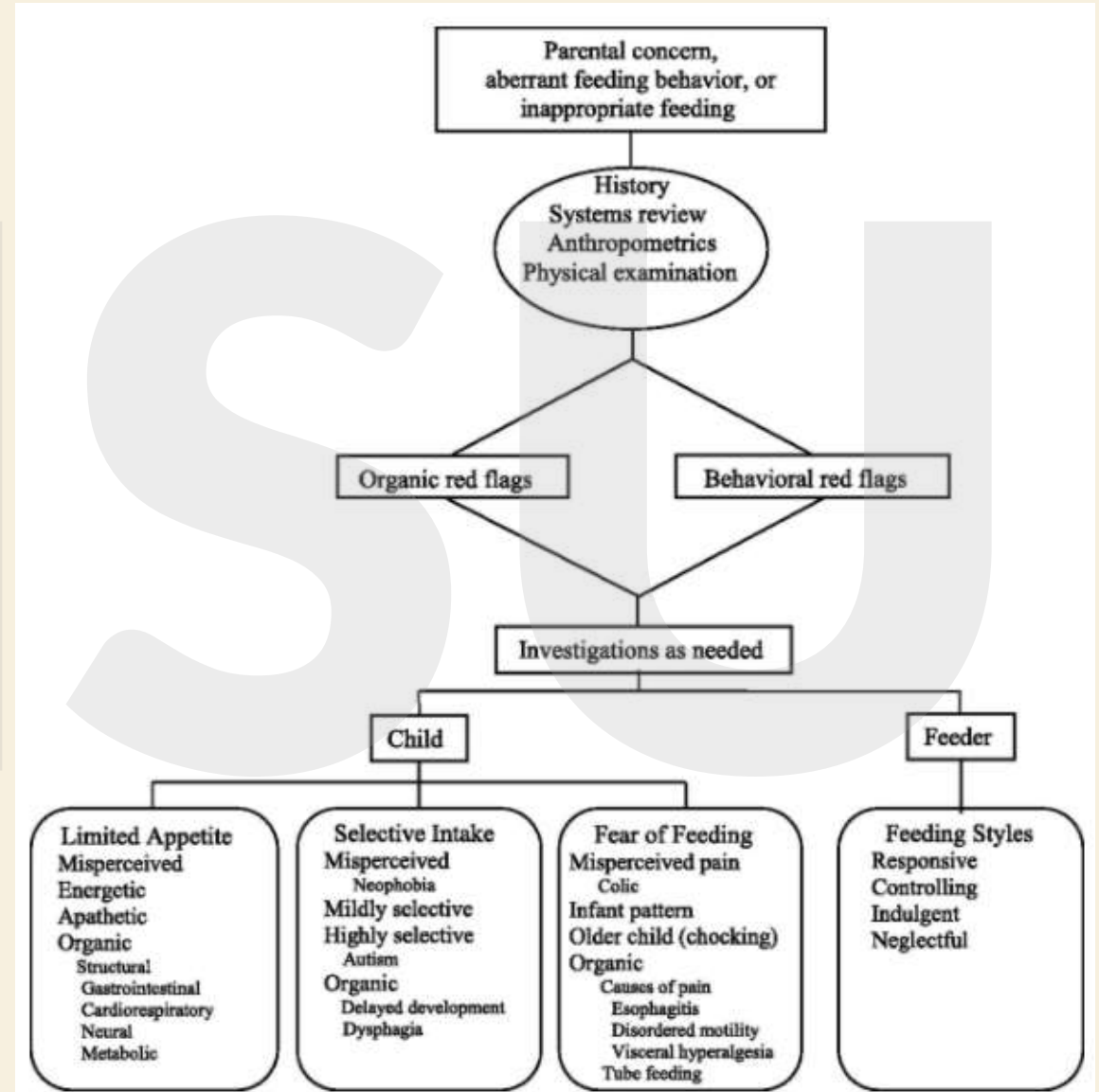
Rosen et al. Incidence of gastroesophageal reflux during transpyloric feeds. JPGN 2011

Stone B et al. Effectiveness of Fundoplication or Gastrojejunal Feeding in Children With Neurologic Impairment. Hosp Pediatr 2017

FEEDING DIFFICULTIES

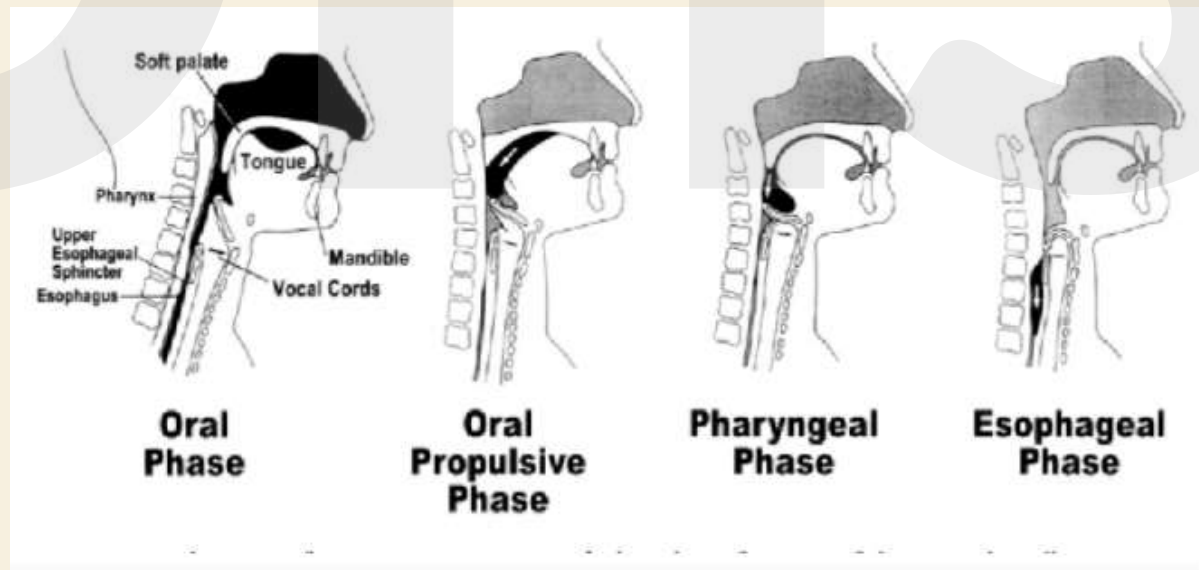
Approach

- Consider medical etiology as well as behavioral perspectives
- Consider the impact of parenting and feeding styles
- Identify red flags



EVALUATION

- Identify dysphagia or aspiration
 - Choking, gagging, color changes with feeds? With secretions?
 - Identify which phase of deglutition (oral, pharyngeal, or esophageal) is disorganized
- speech therapy or oral motor specialist can help



EVALUATION

- Medical reasons for poor feeding
 - GI – vomiting? Diarrhea? Atopic history?
 - Eosinophilic esophagitis may present in children as a feeding difficulty or food refusal
 - Underlying genetic condition – dysmorphic? Meeting milestones?
 - Cardiac – murmur? Fatigue with feeds?
- If multiple specialties needed eg airway and lung concerns, consider aerodigestive referral

FEEDING DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS ARE ASSOCIATED WITH EOSINOPHILIC ESOPHAGITIS

- 45,286 children with ASD and 226,430 matched controls
- EoE more in ASD vs controls
- Feeding disorders a/w EoE in both children with ASD and controls
- Feeding disorders had a higher odds ratio for EoE compared with other atopic conditions, among both children with ASD and controls
- Compared with controls with a feeding disorder, children with ASD and a feeding disorder had no difference in the rate of diagnosed EoE

PEDIATRICS[®]

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Review Article

Gastrointestinal Symptoms in Autism Spectrum Disorder: A Meta-analysis

Barbara O. McElhanon, Courtney McCracken, Saul Karpen and William G. Sharp

Pediatrics May 2014, 133 (5) 872-883; DOI: <https://doi.org/10.1542/peds.2013-3995>

- Higher rates of diarrhea, constipation and abdominal pain compared to neurotypical children

- Children with ASD may present with difficult behaviors
- Unable to verbalize or localize pain

Possible presentations of GI pain:

- Abnormal posturing, self injury, aggression, vocal tics, regression, sleep disturbance, PICA
-
- Not all seemingly GI problems turn out to be a GI etiology

- Most common disorders are functional disorders
- Autism Treatment Network GI Signs and symptoms Inventory (ATN-GISSI-17)
 - May be helpful instead of ROME-IV

CHRONIC ABDOMINAL PAIN

- Intermittent or constant pain >1-2 months
- Functional or something more serious?
 - Rule out alarm symptoms
 - Involuntary **weight loss**
 - Deceleration of linear growth
 - Gastrointestinal **blood loss** (visible or occult)
 - Significant vomiting
 - Chronic severe **diarrhea**
 - Persistent right upper or right lower quadrant pain
 - Unexplained fever
 - Family history of inflammatory bowel disease
 - Abnormal or unexplained physical findings
 - **Nocturnal awakening** with any symptom

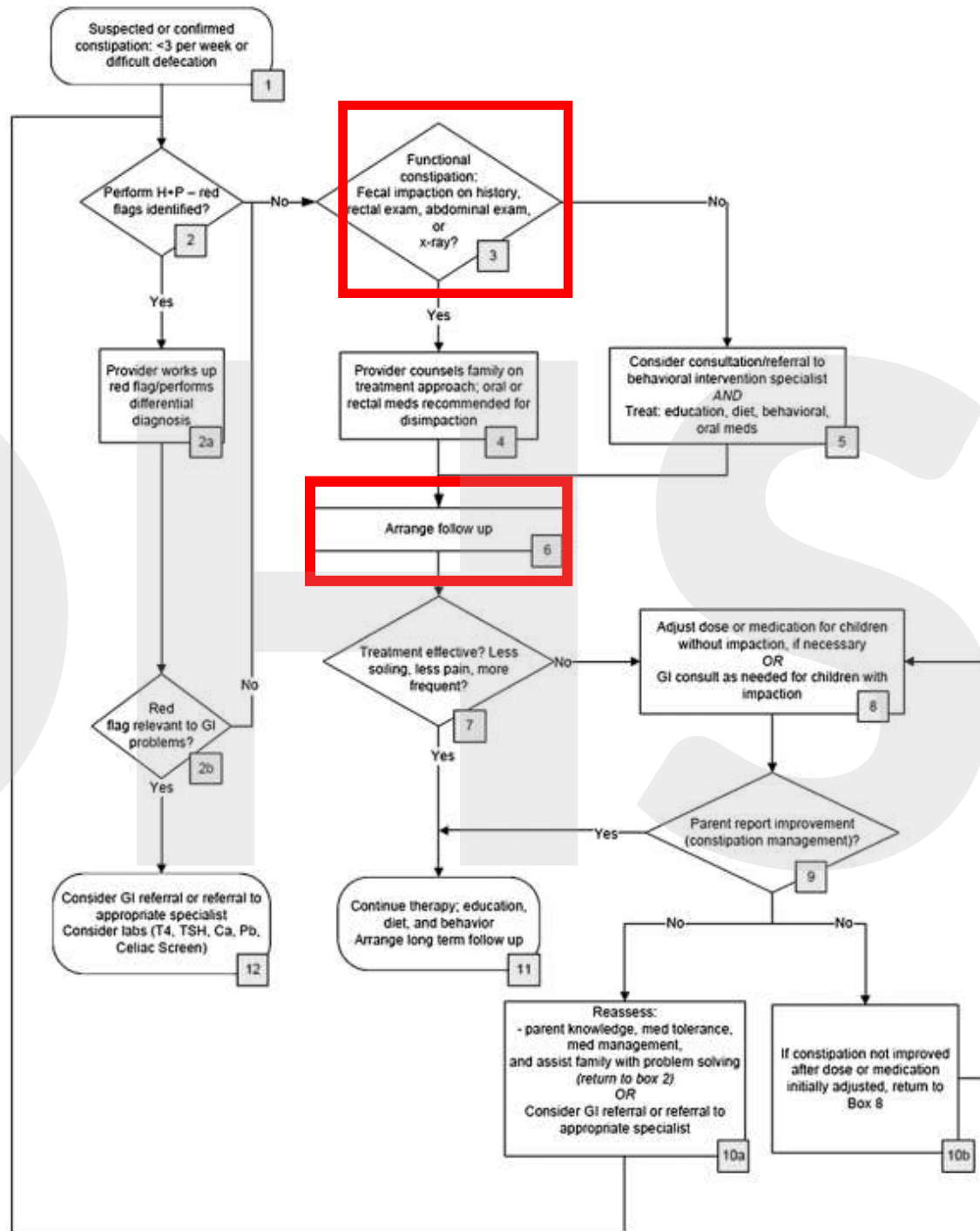
Screening labs for IBD?
CBC, CMP, CRP, ESR

Screening labs for celiac?
Total IgA level, TTG IgA

Screening labs for nutritional deficiencies?
Vitamin D, iron studies

CONSTIPATION

- Fecal retention secondary to difficulty with sensory stimuli, sensory processing, motor problems
- Selective eating – processed foods and lack of fiber
- Medications eg anticholinergics, opiates
- Behavioral – toilet phobia, school bathroom avoidance
- Anatomic eg Consider Hirschsprung if history of delayed stool passage after birth
- Metabolic and gastrointestinal eg electrolyte abnormalities, thyroid problems, gluten enteropathy



MANAGEMENT

- Behavior modifications
 - Toilet time after meals – sit down for 5-10 minutes
 - Positive reinforcement – praise, stickers, preferred activities

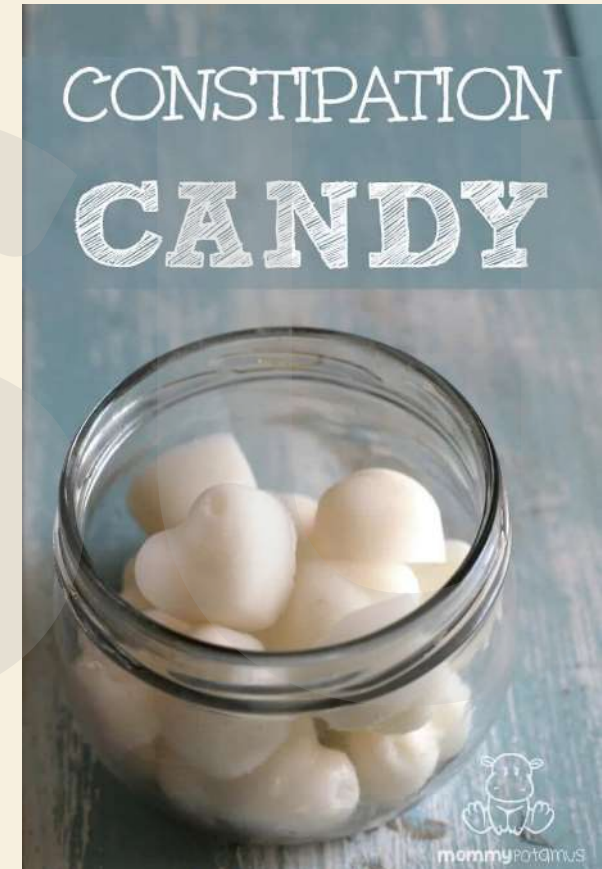
TABLE 8 Medications for Use in Treatment of Constipation in Children

Medication	Dosage	Comments
Lactulose (70% solution)	1–3 mL/kg per d in divided doses	Well tolerated
Sorbitol (70% solution)	1–3 mL/kg per d in divided doses	Similar to lactulose but less expensive
Magnesium hydroxide (400 mg/5 mL, 800 mg/5 mL, or tablets)	3 mL/kg per d	Monitor for Mg toxicity, hypophosphatemia, hypocalcemia
Magnesium citrate (liquid, 16.17% Mg)	<6 y of age: 1–3 mL/kg per d; 6–12 y of age: 100–150 mL/d in single or divided doses; >12 y of age: 150–300 mL/d in single or divided doses	Monitor for Mg toxicity, hypophosphatemia, hypocalcemia
PEG 3350	1–1.5 g/kg per d for 3 d; maintenance: 1 g/kg per d (usual dose 17 g/d)	Palatable (can be dissolved in most fluids); not approved for use in infants
Phosphate enemas	<2 y of age: to be avoided; ≥2 y of age: 6 mL/kg up to 135 mL	May be psychologically traumatic; may damage rectal wall; may cause abdominal distention or vomiting; tetany with hyperphosphatemia/hypocalcemia; avoid if renal disease is present
PEG electrolyte solution	For disimpaction: 25 mL/kg per h (maximum: 1000 mL/h) via nasogastric tube until clear; maintenance: 10 mL/kg per d	Taste is an issue; may cause nausea, bloating, cramps, vomiting
Mineral oil	<1 y of age: not recommended; >1 y of age: maintenance 1–3 mL/kg per d	Safe alternatives are available; should be used only if other agents fail; lipid pneumonia if aspirated; leakage of stool; concern about impairing absorption of fat-soluble vitamins has not been substantiated clinically
Senna (syrup, 8.8 mg sennosides per 5 mL)	2–6 y of age: 2.5 mL/d; >12 y of age: 5–15 mL/d	May cause permanent nerve or muscle damage, hepatitis, melanosis coli
Bisacodyl suppository (10 mg)		May irritate rectal mucosa
Bisacodyl tablets (5 mg)		Abdominal pain, diarrhea, hypokalemia
Glycerin suppositories		Minimal adverse effects except for stress caused from insertion



GETTING CREATIVE

- Miralax – kids with autism may refuse to take it or unable to titrate it to get a good effect
- Tips and tricks:
 - Mix miralax to chocolate milk, Gatorade, juice
 - Mix magnesium citrate or lactulose with soda
 - Offer multiple chocolate ex-lax throughout the day over a few days



MAINTENANCE BOWEL REGIMEN

- Stool softer – Goal is soft mushy stools, like soft serve ice cream or oatmeal
- Stimulant – increase as much as child will tolerate
- Follow up sooner than later

MIRALAX SAFETY

The New York Times

Scrutiny for Laxatives as a Childhood Remedy

By Catherine Saint Louis

Jan. 5, 2015



100



**Parents Against Miralax
Restoralax Movicol (PEG 3350)**

🔒 Private group · 42.4K members

**** Any recommendation to use or continued use Miralax (PEG 3350) will result in removal and block. If you are here, you are ready to try to stop using it. DO NOT POST THAT YOU ARE USING IT OR SUGGEST SOMEONE USE IT. See Less**

MIRALAX SAFETY

Polyethylene Glycol 3350 (PEG 3350) Frequently Asked Questions

NASPGHAN Neurogastroenterology and Motility Committee
January 2015

1. What is PEG 3350?

Polyethylene glycol (PEG) is a water-soluble, inactive ingredient of which only a very small amount is absorbed in the gut or gastrointestinal tract, the rest moves through the body. PEG is non-toxic and has no effect on the body. It is used in many products including medications such as ointments and pills to allow them to be more easily dissolved in water. PEG can also be found in common household products such as certain brands of skin creams and tooth paste. PEG 3350 is the most commonly used form of PEG in the United States and Canada for the treatment of constipation and is the focus of discussion in this FAQ. Commonly used brand names of PEG 3350 available in the United States and Canada are MiraLax, GlycoLax, Lax-A-Day and RestoraLAX.

2. How does PEG 3350 work in the treatment of constipation?

PEG 3350 helps constipation by holding more water in the bowel, making stool softer and easier to pass. The effect of PEG 3350 is not immediate, and may take 24 hours or more to work.

3. Is PEG 3350 approved for use in children?

No. PEG 3350 is currently approved by the U.S. Food and Drug Administration (FDA) for use in adults, for no longer than seven days, and is not approved for use in children. However, a drug that does not have FDA approval for use in children does not mean that the drug is unsafe. It usually means the drug has not been tested by the manufacturer in very large trials of children specifically for FDA approval. This may happen for several reasons such as lack of funding, and ethical issues in performing some type of studies in children. Many commonly used medications are not specifically FDA approved for use in children less than 16 years.

6. Is PEG 3350 safe for use in children long-term?

Several research studies have shown PEG 3350 to be safe in children when used for several weeks to several months. Currently there have been no studies specifically on the use and safety of PEG 3350 in children for longer periods of time. In clinical practice however, it is common for pediatric gastroenterologists to prescribe PEG 3350 for chronic use and there have been no reports of serious, long-term side effects in the medical literature.

7. What have previous research studies found about the safety of PEG 3350?

Studies of PEG 3350 in adults and children have generally shown it to be safe. PEG 3350 has not been associated with electrolyte imbalances or problems in liver or kidney functioning when used in the short-term or at high doses for bowel preparation for colonoscopy. Animal studies using PEG 3350 at higher doses or for longer periods of time have also not reported any significant side effects.

8. Why is the FDA sponsoring a new study on the safety of PEG 3350 and what new information do they hope to find out?

The FDA is interested in investigating the safety of PEG 3350 use in children and for prolonged periods. Although PEG 3350 is a very large molecule which is not absorbed by the gut due to its size, there are concerns that smaller compounds, such as ethylene glycol or diethylene glycol, could be found as impurities in the manufacturing process of PEG 3350 or formed when PEG 3350 is broken down within the body. The FDA is investigating if these smaller compounds are absorbed by the gut and accumulated in the bodies of children taking PEG 3350. Some families have reported concerns to the FDA that some neurologic or behavioral symptoms in children may be related to taking PEG 3350. It is unclear whether these side-effects are due to PEG 3350. This study is the first step towards trying to determine if there is truly a link.



The Journal of Pediatrics

Volume 195, April 2018, Pages 148-153.e1



Original Articles

PEG 3350 Administration Is Not Associated with Sustained Elevation of Glycol Levels

Kent C. Williams MD^{1, 3}  , Lynette K. Rogers PhD^{2, 3}, Ivor Hill MD^{1, 3}, John Barnard MD^{1, 2, 3}, Carlo Di Lorenzo MD^{1, 3}

WAKEFIELD'S LEGACY

- "Autistic enterocolitis"
 - Idea that there is a specific GI pathology associated with ASD
 - Triggered by abnormal immune function or increase gut permeability
 - "Leaky gut" responsible for developmental regression in 12 children after administration of MMR vaccine
 - Retracted
- There is no GI pathology specific to kids with ASDs

CAN MY CHILD EAT GLUTEN AND DAIRY?

Wheat “Consumption” and Hospital Admissions for Schizophrenia During World War II: A Preliminary Report

F. C. DOHAN

The American Journal of Clinical Nutrition, Volume 18, Issue 1, January 1966, Pages 7–10,

<https://doi.org/10.1093/ajcn/18.1.7>

Published: 01 January 1966

Studies do not support a link between ASD and celiac disease, leaky gut, lactose intolerance

Some kids do respond – improved sociability, anxiety, hyperactivity ***
Need nutritional support (food selectivity)



- Casein- and gluten-free diet
 - Anecdotal reports suggest there is a subset of children with ASDs that respond to dietary intervention
 - Parents see differences in behavior after being on diet on a few days to few months.
- Hediger et al – dairy-free diets and alternative diets may place boys with autism at high risk for decreased bone density
 - But this also occurred for kids not on dairy-restricted diets
 - Implicating factors for suboptimal bone development: lack of exercise, GI problems, compromised vitamin d and calcium intake

- Double blind cross over trial of GFCF or typical diet in 15 kids with ASDs
 - No difference in measure of severity of ASD symptoms, communication, social skills or urinary peptide levels after 12 weeks
 - 9 parents wanted to continue diet + reported positive subjective clinical changes while their kid was on the diet
- Overall, no evidence to recommend dietary manipulation as a primary treatment for ASD
- Can be expensive, time consuming and require lots of planning
- Need additional studies to assess risk factors + possible markers to identify kids who may benefit from these diets

SELECTIVE EATING

Man Cannot Live On Rice And Beans Alone (But Many Do)

May 3, 2012 · 1:44 PM ET

SARAH ZIELINSKI



Beans and rice are a popular, healthy, and cheap food option. But how healthy are they?

istockphoto.com

- Kids with ASD get enough calories and protein
- Concern for lack of vitamins and minerals
- Intentional diet restriction/ alternative diet
 - casein-free, gluten-free or soy-free

Diet	Foods restricted
Elimination diets/elemental diet ^{22,23}	Elimination diet (6 foods): milk, egg, wheat, soy, peanuts/tree nuts, fish/shellfish Elemental: all foods except an amino acid–based formula
Fermentable oligo-di-monosaccharides and polyols ^{24,25}	Foods containing fructose (eg, fruit, high-fructose corn syrup), lactose (eg, cow's milk dairy), fructans (eg, wheat, onion, garlic), galactans (eg, legumes), and polyols (eg, sorbitol, cherries, avocados)
Food coloring/food additives avoidance ^{26,27}	Foods that contain food color additives (food dye)
Gluten-free, casein-free ²⁸⁻³⁰	Foods containing gluten (eg, bread, pasta) and casein (eg, cow's milk, yogurt)
Ketogenic diet or modified Atkins diet ^{31,32}	Carbohydrate-rich foods, including sugar
Specific carbohydrate diet ^{29,33,34}	Cereal grains (eg, wheat, oats, rice), processed meats (eg, lunch meats, hot dogs), canned vegetables, canned fruits, most fruit juices, soy beans, chick peas, bean sprouts, mung beans, fava beans, yogurt, milk, processed cheese, tubers (eg, potatoes, yams), curry, onion powder, garlic powder

Figure 1. Possible caregiver-initiated restrictions in autism spectrum disorder (in alphabetical order).

- Hyman et al. 2012 - Study based on 252 records of food diaries of children with ASD
 - Lower than recommended intake of vitamin A, D, K, calcium, fiber, magnesium, phosphorus, potassium from food sources
 - Sufficient intake of iron, B6, B12, folic acid
 - Comparable to typically developing peers
-
- Children with ASD don't consume recommended levels but neither does general pediatric population!

WHY DO THEY HAVE MORE GI CONCERNS?

- Etiology unclear
- Combination of changes in gut microflora, intestinal permeability, inappropriate immune response, activation of metabolic pathways

- Gut microbiome

- Children with ASD at risk for suboptimal breastfeeding – late initiation and shorter duration
- Breastmilk assists in development of GI tract
- Perhaps could lead to atypical colonization of gut microbiome
- Ding et al. Gut microbiota changes in patients with autism spectrum disorder Oct 2020
 - Fecal samples from children with ASD: higher biomass, richness, and biodiversity of gut microbiota

- Immune abnormalities in ASD
 - Changes in immune-related gene expression, skewed cytokine production, altered T-cell function, enhanced immune responses
- Mucosal immune cells make up ~70% of immune cells within body
- Immune abnormalities could possibly affect integrity of mucosal barrier

- MET – receptor that functions in both brain development and GI repair
- Campbell et al 2009 – MET gene associated with both ASD and GI conditions
- Disrupted MET signaling may contribute to increased risk of ASD that includes familial GI dysfunction

COMPLEMENTARY MEDICINE

- Peppermint oil
- Probiotics
- Omega 3 fatty acids
- Melatonin
- Nutritional supplements eg Vitamin B 12



• Essential oils!



- **Oregano** *Origanum onites, Origanum smyrnaeum, Origanum vulgare, Origanum compactum, Origanum hirtum, Thymbra capitata, Thymus capitatus, Coridothymus capitatus, Satureija capitata* - avoid dermal use on children under 2
- **Peppermint** *Mentha x Piperita* - avoid using (all routes) on children under 6
- **Peru Balsam** *Myroxylon balsamum, Myroxylon pereiraw, Myroxylon perufiferum, Myrospermum pereirae, Toluifera pereirae* - avoid topical use on children under 2
- ***Rambiazana** *Helichrysum gymnocephalum* - avoid using on children under 6
- ***Rosemary** *Rosmarinus officinalis* - avoid using on children under 6
- **Saffron** *Crocus sativus* - avoid topical use on children under 2
- ***Sage (Greek), Salvia fruiticosa, Salvia triloba Sage (White)** - avoid using on children under 6
- **Sage (White)** *Salvia apiana* - avoid using on children under 6
- **Sage (Wild Mountain)** *Hemizygia petiolata* - avoid topical use on children under 2
- ***Sanna** *Hedychium spicatum* - avoid using on children under 6
- ***Saro** *Cinnamosma fragrans* - avoid using on children under 6
- **Savory** *Satureia hortensis, Satureia montana* - avoid topical use on children under 2
- **Styrax** *Liquidambar orientalis, Liquidambar styraciflua* - avoid topical use on children under 2
- **Tea Leaf/Black Tea** *Camellia sinensis, Thea sinensis* - avoid topical use on children under 2
- **Tea Tree (lemon-scented)** *Leptospermum petersonii, Leptospermum citratum, Leptospermum liversidgei* - avoid topical use on children under 2
- **Treemoss** *Pseudevernia furfuracea* - avoid topical use on children under 2
- **Tuberose** *Polianthes tuberosa* - avoid topical use on children under 2
- **Turpentine** *Pinus ayacahuite, Pinus caribaea, Pinus contorta, Pinus elliottii, Pinus halepensis, Pinus insularis, Pinus kesiya, Pinus merkusii, Pinus palustris, Pinus pinaster, Pinus radiata, Pinus roxburghii, Pinus tabulaeformis, Pinus teocote, Pinus yunnanensis* - avoid topical use on children under 2
- **Verbena (Lemon)** *Aloysia triphylla, Aloysia citriodora, Lippa citriodora, Lippa triphylla* - avoid topical use on children under 2
- **Ylang-Ylang** *Cananga odorata* - avoid topical use on children under 2

* indicates essential oils that are high in 1,8-cineole and can potentially cause respiration to slow in children. If you are looking for age-appropriate anti-congestion suggestions, read this post: [Anti-Germ and Anti-Congestion blend recipes.](#)

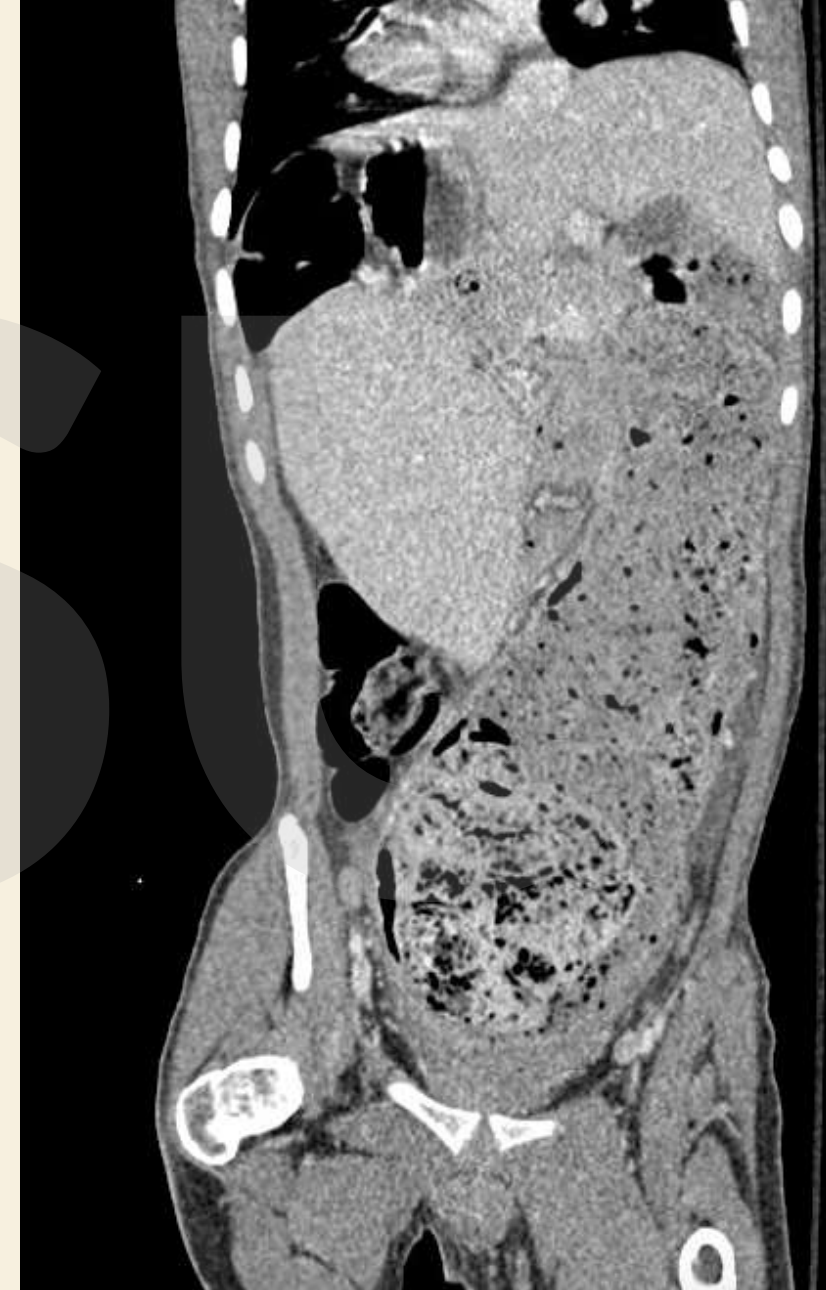


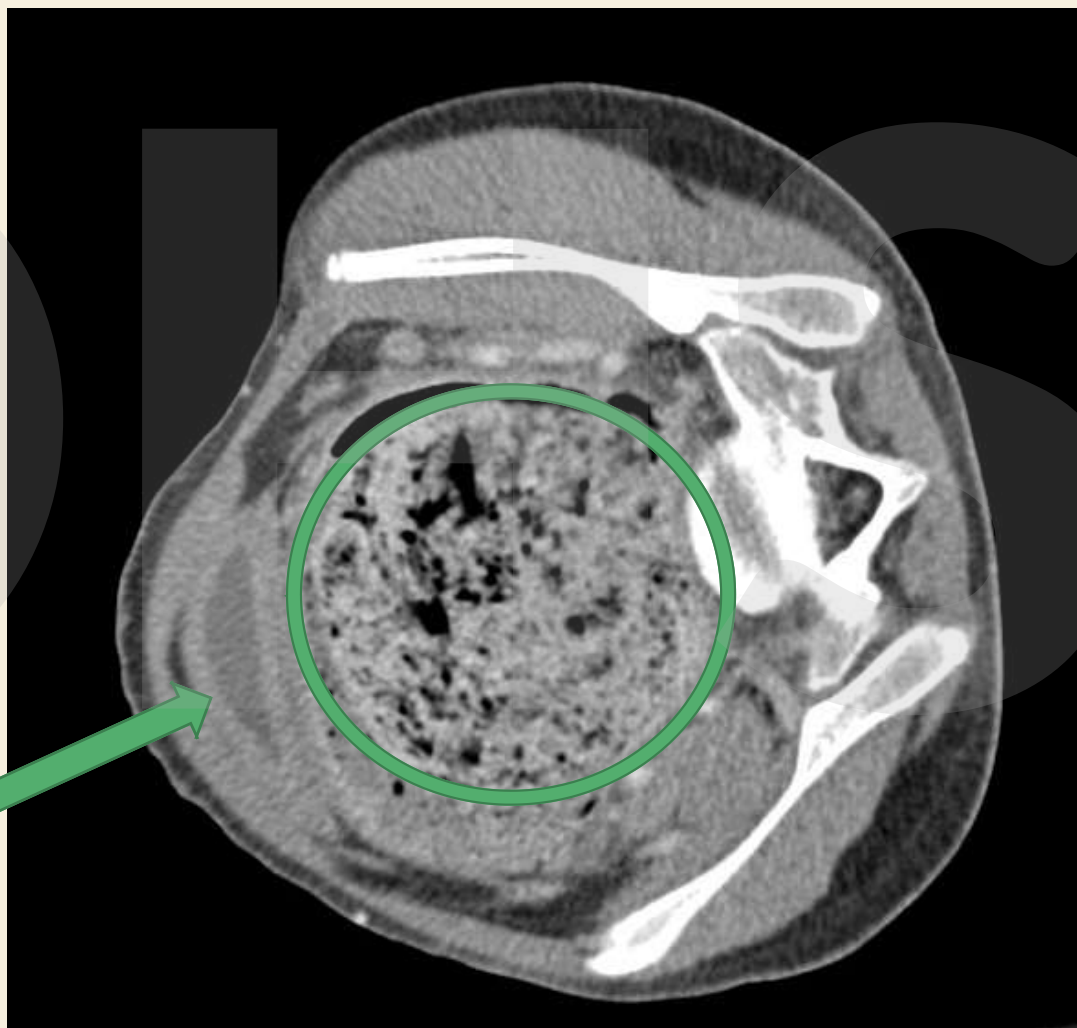
So here, finally, is a list of essential oils with **warnings against on children** according to The Book, [Essential Oil Safety](#) ([click here](#) to download a printable pdf version of this list):

- **Anise/Aniseed** *Pimpinella anisum* - avoid using (all routes) on children under 5
- **Anise (Star)** *Illicium verum* - avoid using (all routes) on children under 5
- **Basil (lemon)** *Ocimum x citriodorum* - avoid topical use on children under 2
- **Benzoin** *Styrax benzoin, Styrax paralleloneurus and Styrax tonkinensis* - avoid topical use on children under 2
- **Birch (sweet)** *Betula lenta* - avoid using (all routes) on children
- **Black Seed** *Nigella sativa* - avoid topical use on children under 2
- ***Cajuput** *Melaleuca cajuputi, Melaleuca leucadendron* - avoid using on children under 6
- ***Cardamon** *Elettaria cardamomum* - avoid using on children under 6
- **Cassia** *Cinnamomum cassia, Cinnamomum aromaticum* - avoid using on children under 2
- **Chaste Tree** *Vitex agnus castus* - avoid using (all routes) on prepubertal children
- **Clove Bud, Clove Leaf, Clove Stem** *Syzygium aromaticum, Eugenia caryophyllata, Eugenia aromatica* - avoid topical use on children under 2
- ***Cornmint** *Mentha arvensis, Mentha canadensis* - avoid using (all routes) on children under 6
- ***Eucalyptus** *Eucalyptus camaldulensis, Eucalyptus globulus, Eucalyptus maidenii, Eucalyptus plenissima, Eucalyptus kochii, Eucalyptus polybractea, Eucalyptus radiata, Eucalyptus Australiana, Eucalyptus phellandra, Eucalyptus smithii* - avoid using on children under 10
- **Fennel (bitter), Fennel (sweet)** *Foeniculum vulgare* - avoid using (all routes) on children under 5
- ***Galangal (lesser)** *Alpinia officinarum, Languas officinarum* - avoid using on children under 6
- **Garlic** *Allium sativum* - avoid using on children under 2
- **Ginger Lily** *Hedychium coronarium* - avoid topical use on children under 2
- ***Ho Leaf/Ravintsara** *Cinnamomum camphora* (cineole chemotype) - avoid using on children under 6
- **Hyssop** *Hyssopus officinalis* (pinocamphone chemotype) - avoid using (all routes) on children under 2
- ***Laurel Leaf/Bay Laurel** *Laurus nobilis* - avoid topical use on children under 6
- **Lemon Leaf/Lemon Petitgrain** *Citrus x limon, Citrus limonum* - avoid topical use on children under 2
- **Lemongrass** *Cymbopogon flexuosus, Andropogon flexuosus, Cymbopogon citratus, Andropogon citratus* - avoid topical use on children under 2
- ***Marjoram (Spanish)** *Thymus mastichina* - avoid using on children under 6
- **Massoia** *Cryptocarya massoy, Cryptocarya massoia, Massoia aromatica* - avoid using on children under 2
- **May Chang** *Litsea cubeba, Litsea citrata, Laura cubeba* - avoid using on children under 2
- **Melissa/Lemon Balm** *Melissa officinalis* - avoid topical use on children under 2
- ***Myrtle (red)** *Myrtus communis* - avoid using on children under 2
- **Myrtle (aniseed)** *Bacchousia anisata* - avoid using (all routes) on children under 5
- **Myrtle (honey)** *Melaleuca teretifolia* - avoid using on children under 2
- **Myrtle (lemon)/Sweet Verbena** *Bacchousia citriodora* - avoid dermal use on children under 2
- ***Niaouli** (cineole chemotype) *Melaleuca quinquinervia* - avoid using on children under 6
- **Oakmoss** *Evernia prunastri* - avoid dermal use on children under 2
- **Opopanax** *Commiphora guidottii* - avoid dermal use on children under 2

CASE

- 16 year old male with Wolf-Hirschhorn syndrome, cerebral palsy, TOF s/p repair, G tube dependence, presents to ER with 3 weeks of no stool, intermittent fever and possible dental abscess
- Palpable stool mass on exam
- Due to fever, labs and CT abdomen obtained



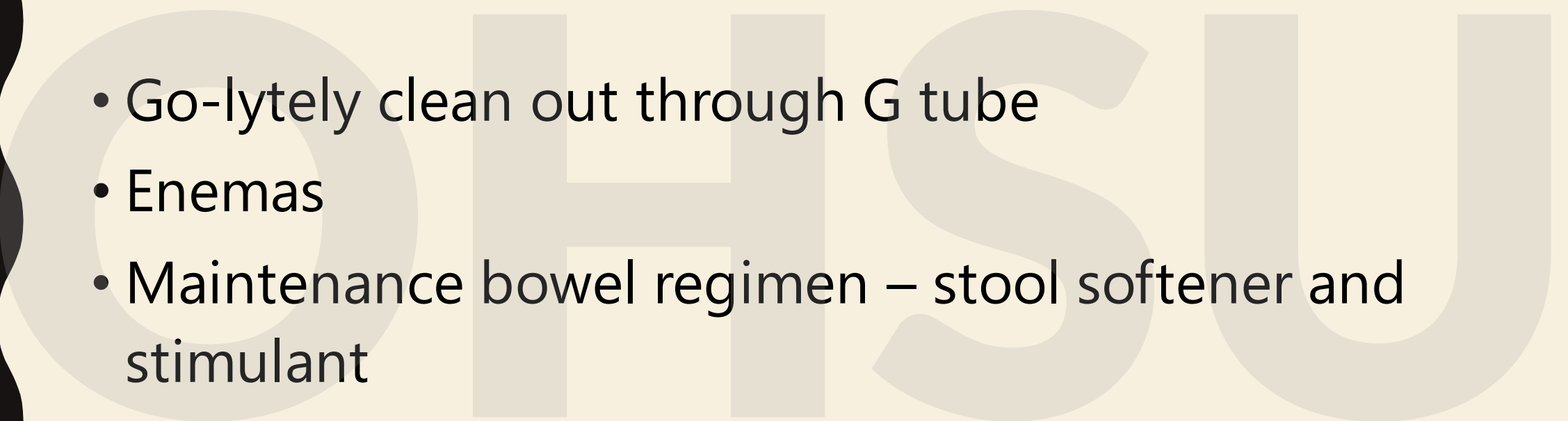


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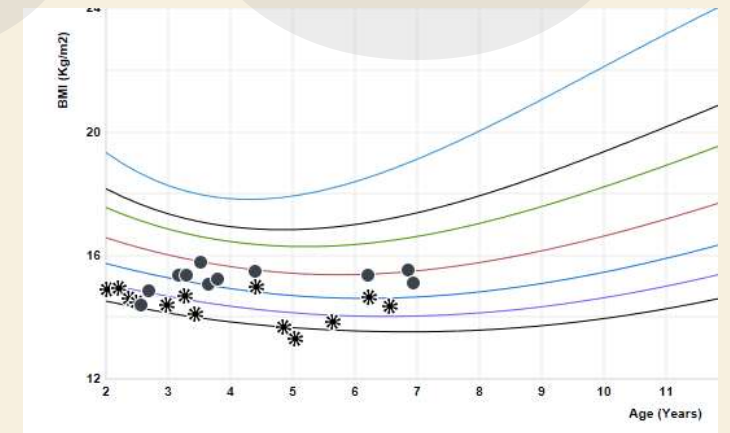
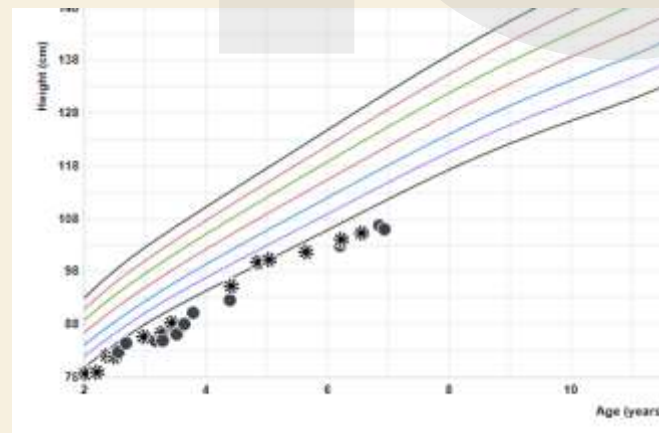
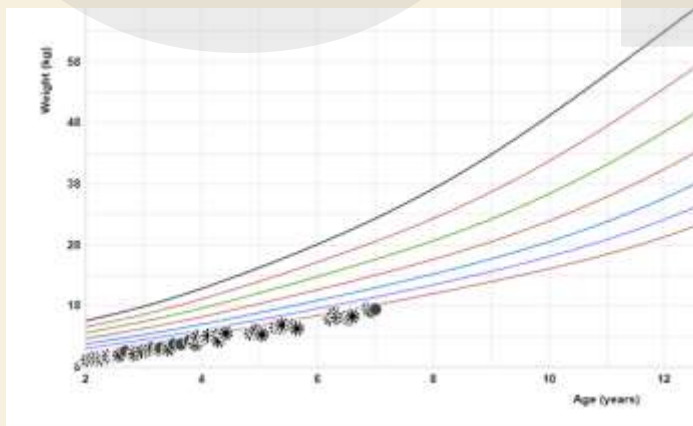
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- Go-lytely clean out through G tube
 - Enemas
 - Maintenance bowel regimen – stool softener and stimulant

CASE

- 14yo non verbal female with autism, seizures, constipation
- Presented to GI clinic visit with abdominal pain (holding stomach) and no stool
- Difficult to examine due to patient cooperation
- Bowel regimen with miralax and senna increased
- Presented to ER for increased seizures
- Abdominal Xray obtained due to infrequent stooling
- Bezoar found! History of PICA revealed..
- Surgical removal

CASE

- 6 year old male with mild intellectual disability, Tourette's, right exotropia, motor dyspraxia, poor weight gain, food selectivity, reflux
- Referred to GI clinic for long standing dysphagia and regurgitation
- Acid suppression with H2 blocker with no improvement in the past





- Eliminated dairy and soy
- Started proton pump inhibitor
- Will need ongoing support from feeding team including dietician given history of poor weight gain and food selectivity

TAKE HOME MESSAGES

- GI disorders are common in children with neurodevelopmental disability
- Children with neurodevelopmental disability may not present with GI symptoms in a classic way, (non verbal, sleep disturbances, behavioral change) therefore warrant thorough evaluation
- Phone a friend – GI, developmental physician, dietician, speech therapist
- Be open to families' needs and desire for complementary treatments
- Understand where families are obtaining information and educate