“Pediatric Aero-Digestive Disorders in the New Century”

A Valley-Mount Sinai Kravis Children's Hospital educational symposium.

Valley Health System

Mount Sinai

CHILDREN’S HEALTH

Management of Gastroesophageal Reflux

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Medicine

Holtz Children's Hospital

UM/JACKSON MEMORIAL MEDICAL CENTER

Miracles made daily.

Faculty Disclosure

- There are no commercial products or services being discussed
- No financial disclosures
- No unlabeled use of a product is being discussed
- Advisory Board/Consultant for ABBVIE, IQVIA, Ironwood Grant/Research Support for QOL Medical

The Valley Hospital
Valley Health System

Objectives

Understand the Definition and Epidemiology of Pediatric Gastroesophageal Reflux Disease (GERD)

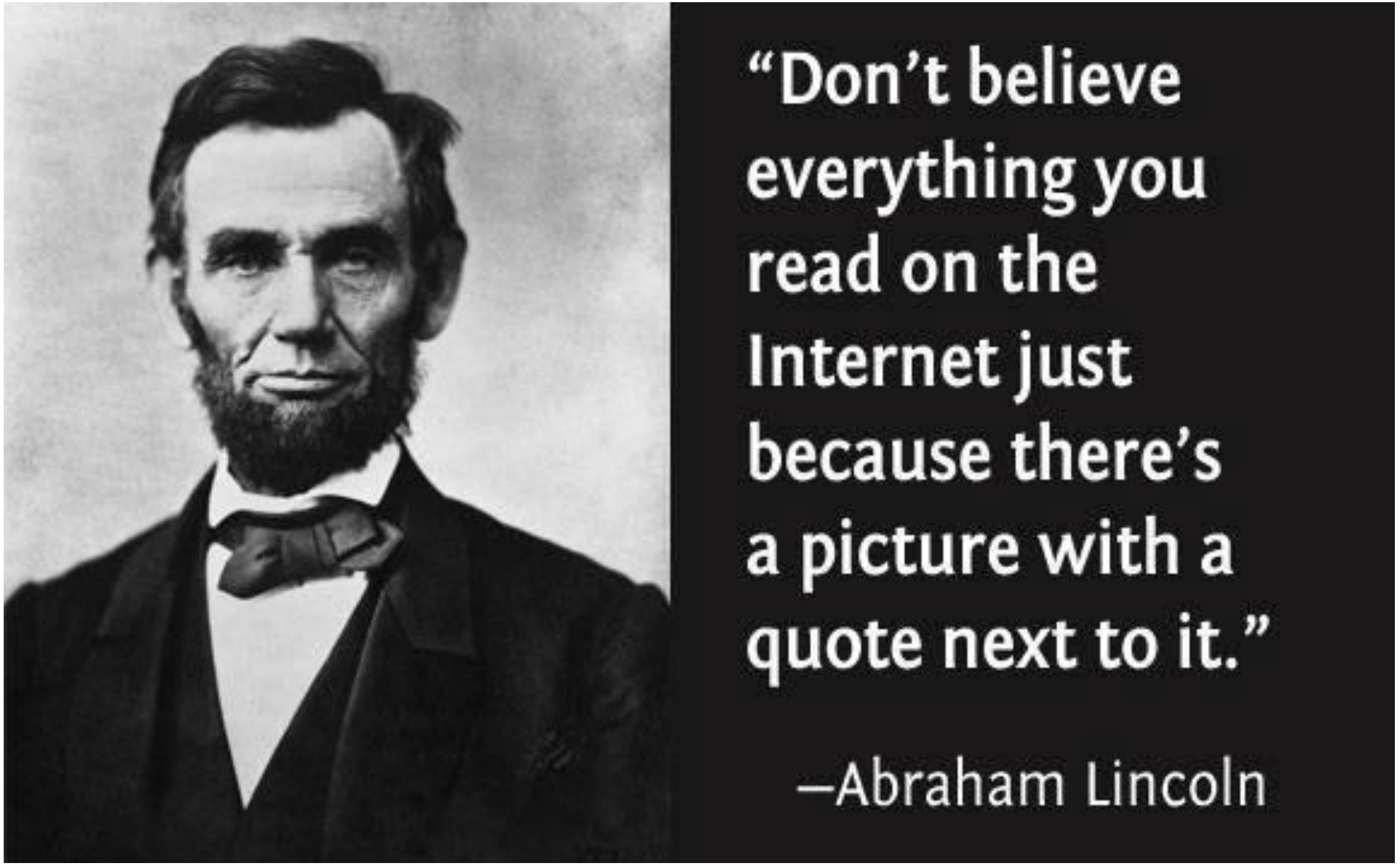
- Define the criteria for diagnosing GERD in children.
- Review the complexity and clinical application of the definition.
- Explore the prevalence and epidemiological factors.

Familiarize with the Clinical Manifestations of Pediatric GERD

- Identify the common clinical symptoms and signs of GERD in children of different ages.

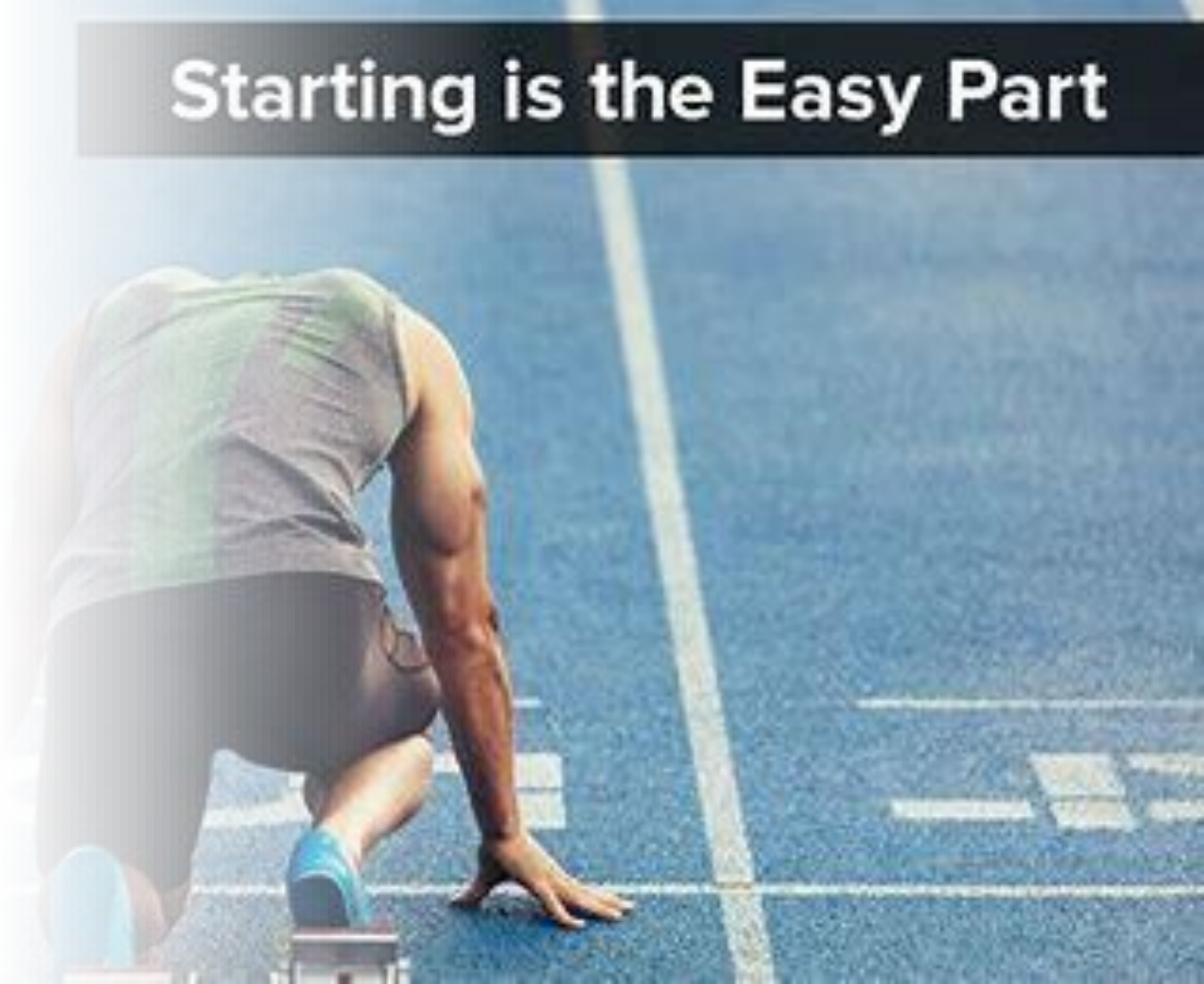
Comprehend the Diagnostic Approach to Pediatric GERD.

- Describe recommendations and the role of diagnostic testing for evaluating GERD and its differential diagnosis in children.

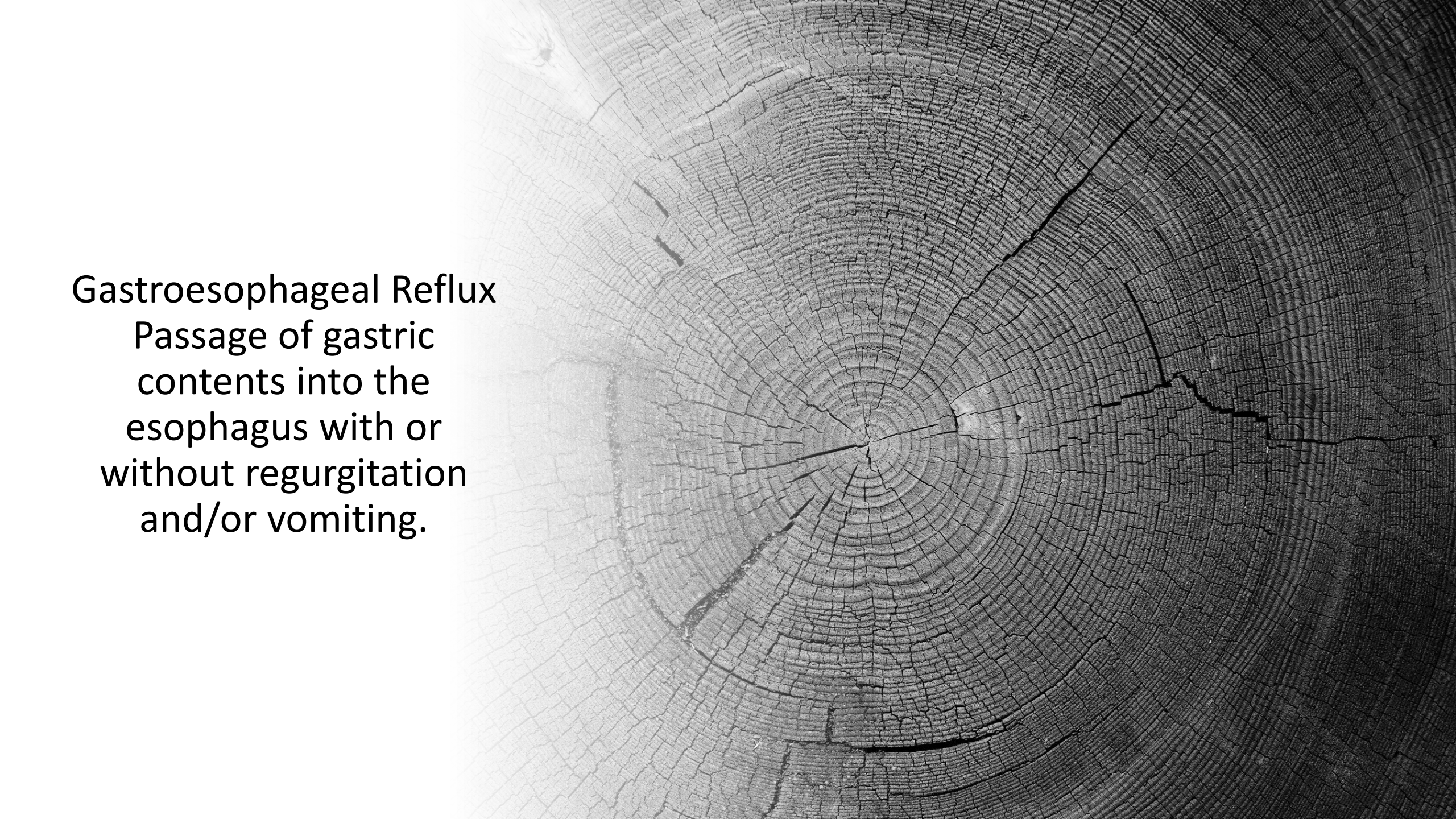

“Don’t believe everything you read on the Internet just because there’s a picture with a quote next to it.”
—Abraham Lincoln

Facts or Fad

Defining Gastroesophageal Reflux (GER) and Disease (GERD)



Gastroesophageal Reflux
Passage of gastric contents into the esophagus with or without regurgitation and/or vomiting.



You Can See It…

Regurgitation

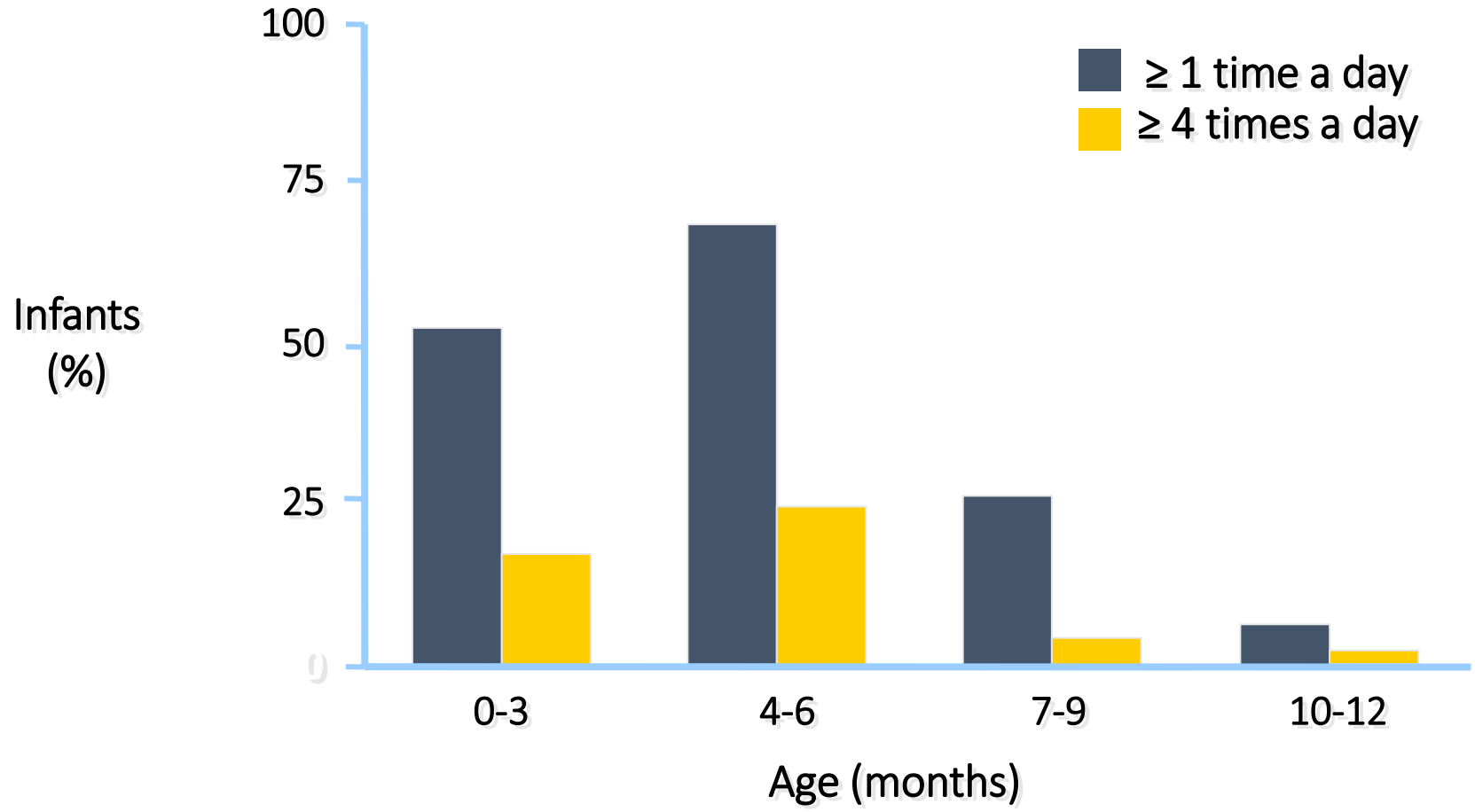
4 months- 67%
7 months- 14%
12 months- 5%

› Arch Pediatr Adolesc Med. 1997 Jun;151(6):569-72. doi: 10.1001/archpedi.1997.02170430035007.

Prevalence of symptoms of gastroesophageal reflux during infancy. A pediatric practice-based survey. Pediatric Practice Research Group

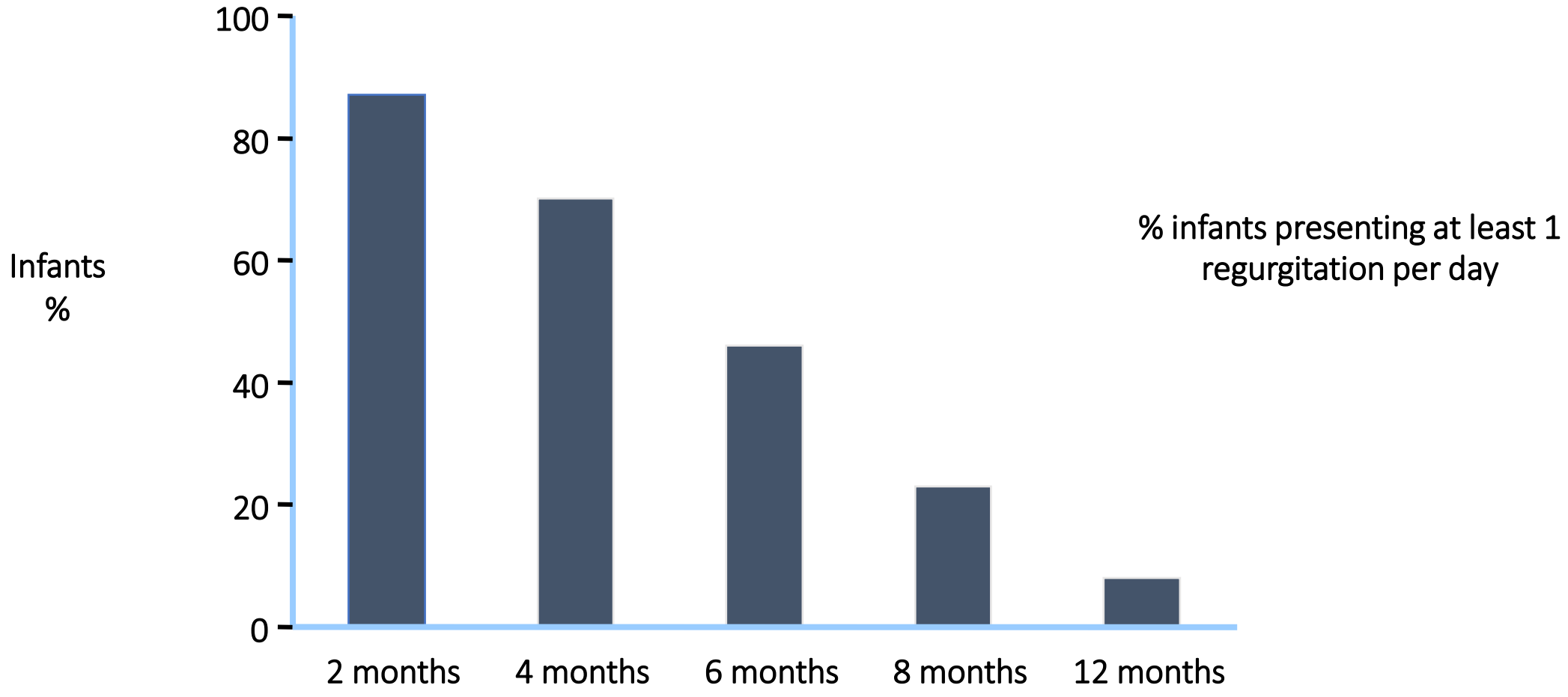
S P Nelson [1], E H Chen, G M Syniar, K K Christoffel

Prevalence of Regurgitation in Healthy Chicago Infants



Nelson SP et al. Arch Pediatr Adolesc Med 1997; 151:569

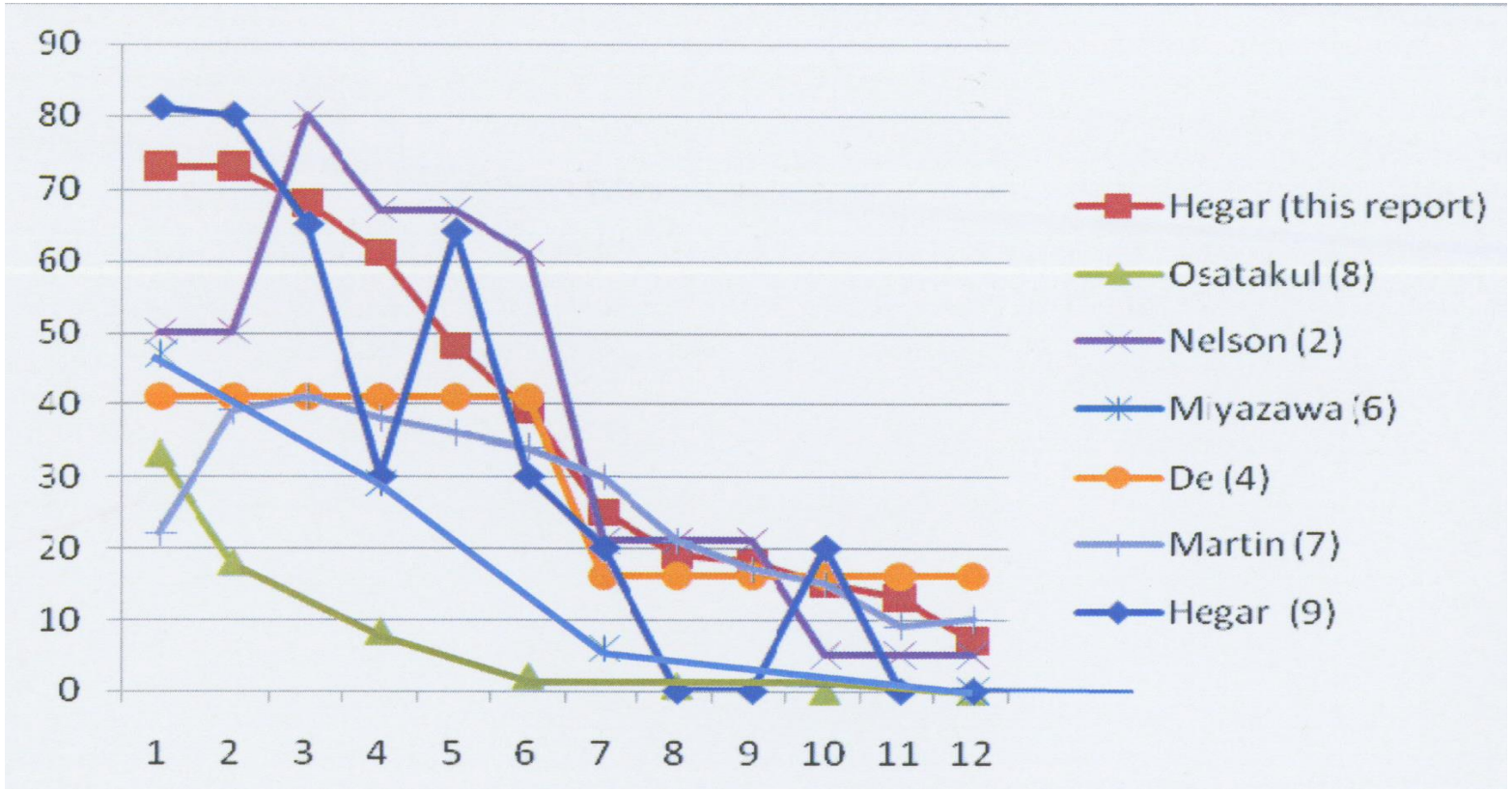
Prevalence of Regurgitation in Healthy Thai Infants



Osatakul S et al. J Pediatr Gastroenterol Nutr 2002; 34:63

Natural Evolution of Regurgitation in Infants

% infants



Age (months)

Acta Pædiatrica 2009;98,1189–1193

Pediatrics. 1998 Dec;102(6):E67. doi: 10.1542/peds.102.6.e67.

One-year follow-up of symptoms of gastroesophageal reflux during infancy. Pediatric Practice Research Group

S P Nelson [1], E H Chen, G M Syniar, K K Christoffel

You Can Reassure Parents

At 1-year follow-up, no parents described spitting up as a problem.

180 ml

5 kg

3 liters

80 kg

Equivalent amounts consumed in 10 minutes

Esophagus: short, limited capacity

Poorly accommodating stomach

Gravity + excessive relative volume ⟹ regurgitation

Not So Easy

GERD when the reflux leads to troublesome symptoms and/or complications, such as esophagitis or stricturing.

Presence of symptoms attributable to reflux events that are bothersome to the patient

Bothers Whom?

Infants Are Non-Verbal

Normal Infants Have Symptoms

Daily regurgitation (40%),

Crying >1 hour/day (17%)

Arching (10%)

Daily hiccups (36%)

Clinical Trial › Clin Pediatr (Phila). 1996 Dec;35(12):607-14. doi: 10.1177/000992289603501201.

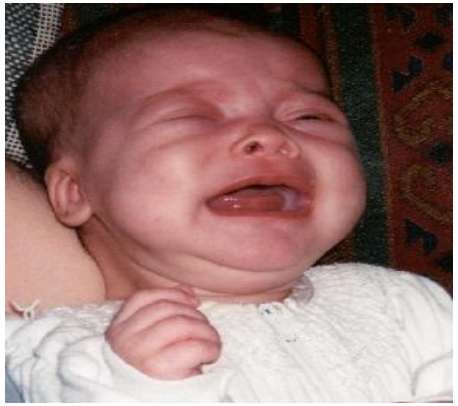
Reflux symptoms in 100 normal infants: diagnostic validity of the infant gastroesophageal reflux questionnaire

S R Orenstein [1], T M Shalaby, J F Cohn

Total Minutes of Crying/Day in Normal infants

Age (mo)	1-3	4-6	7-9	10-12
Crying time (min)	121 +/- 105	59 +/-67	72 +/-101	54+/-79

GERD
or
Normal
or
Other



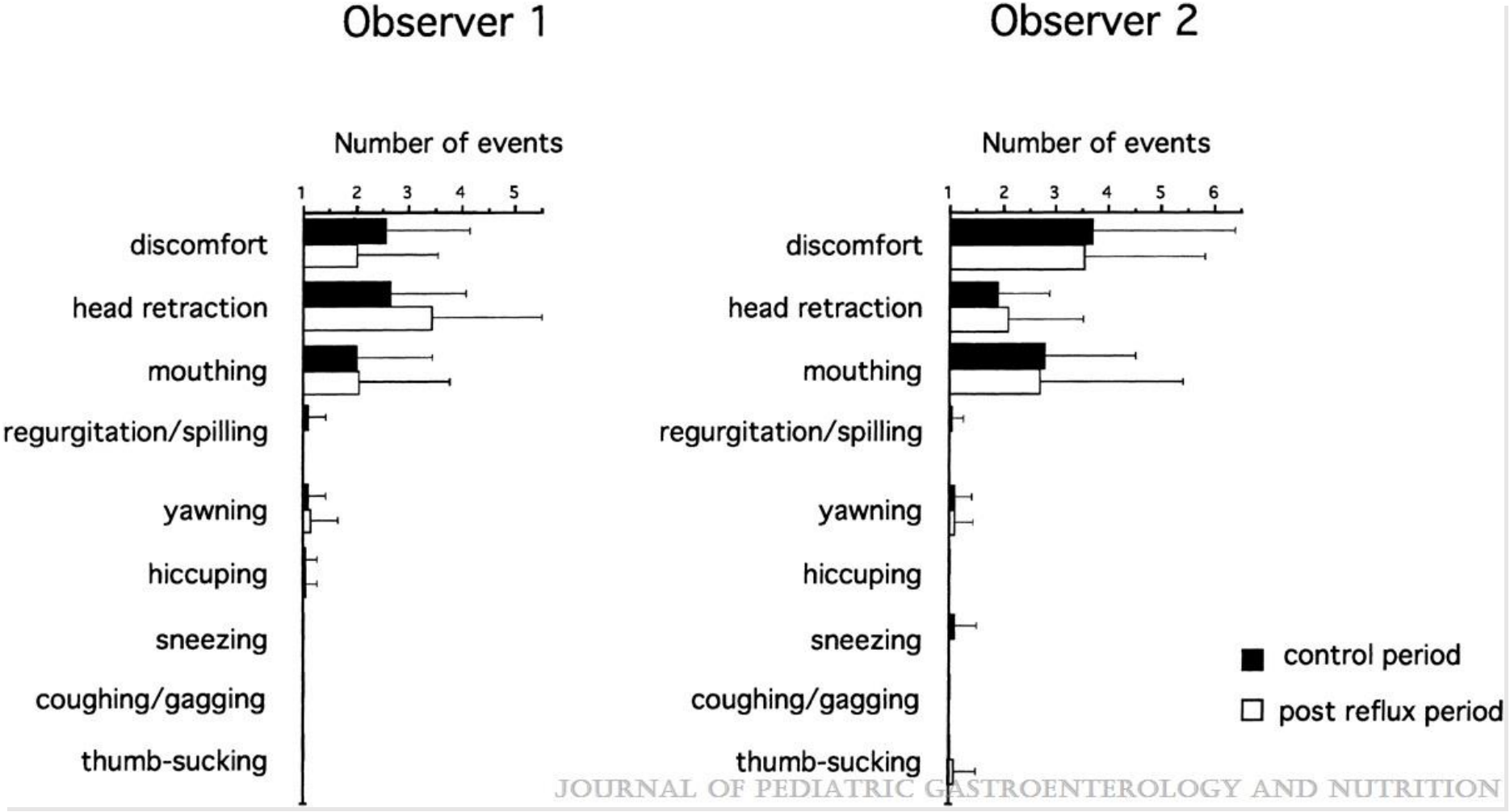
Clinical symptoms, histology and pH study show poor correlation in infants.

J Pediatr Gastroenterol Nutr. 2005 Feb;40(2):210-5. doi: 10.1097/00005176-200502000-00024.

Gastroesophageal reflux disease in infants: how much is predictable with questionnaires, pH-metry, endoscopy and histology?

Silvia Salvatore [1], Bruno Hauser, Kris Vandemaele, Raffaele Novario, Yvan Vandenplas

Difficult to Assess Reflux By Observation



Snel A, et al. JPGN 2000;30:18-21

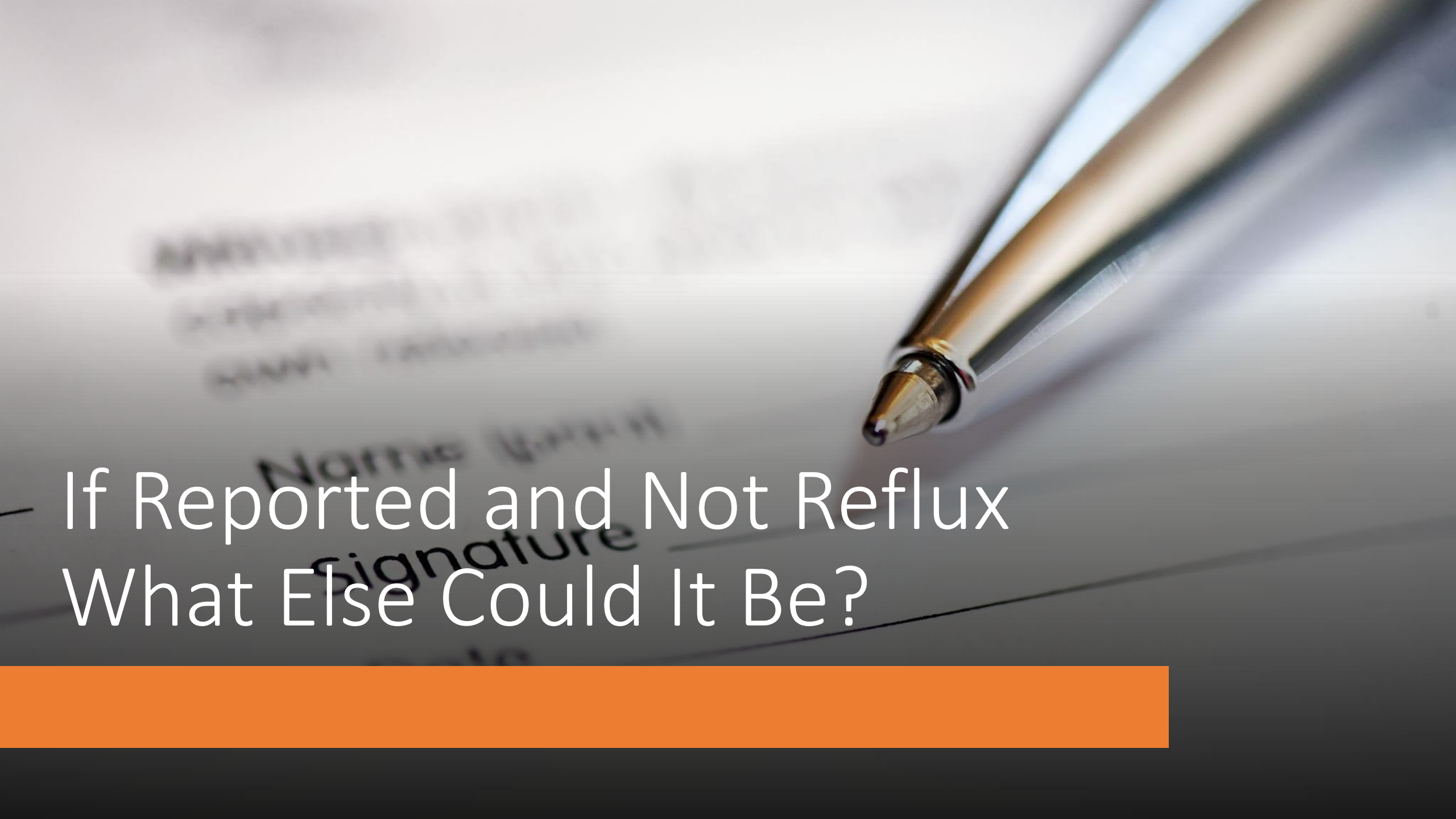
Common Things Are Common

Two Things Can Be True and Unrelated

Association is Not Causation

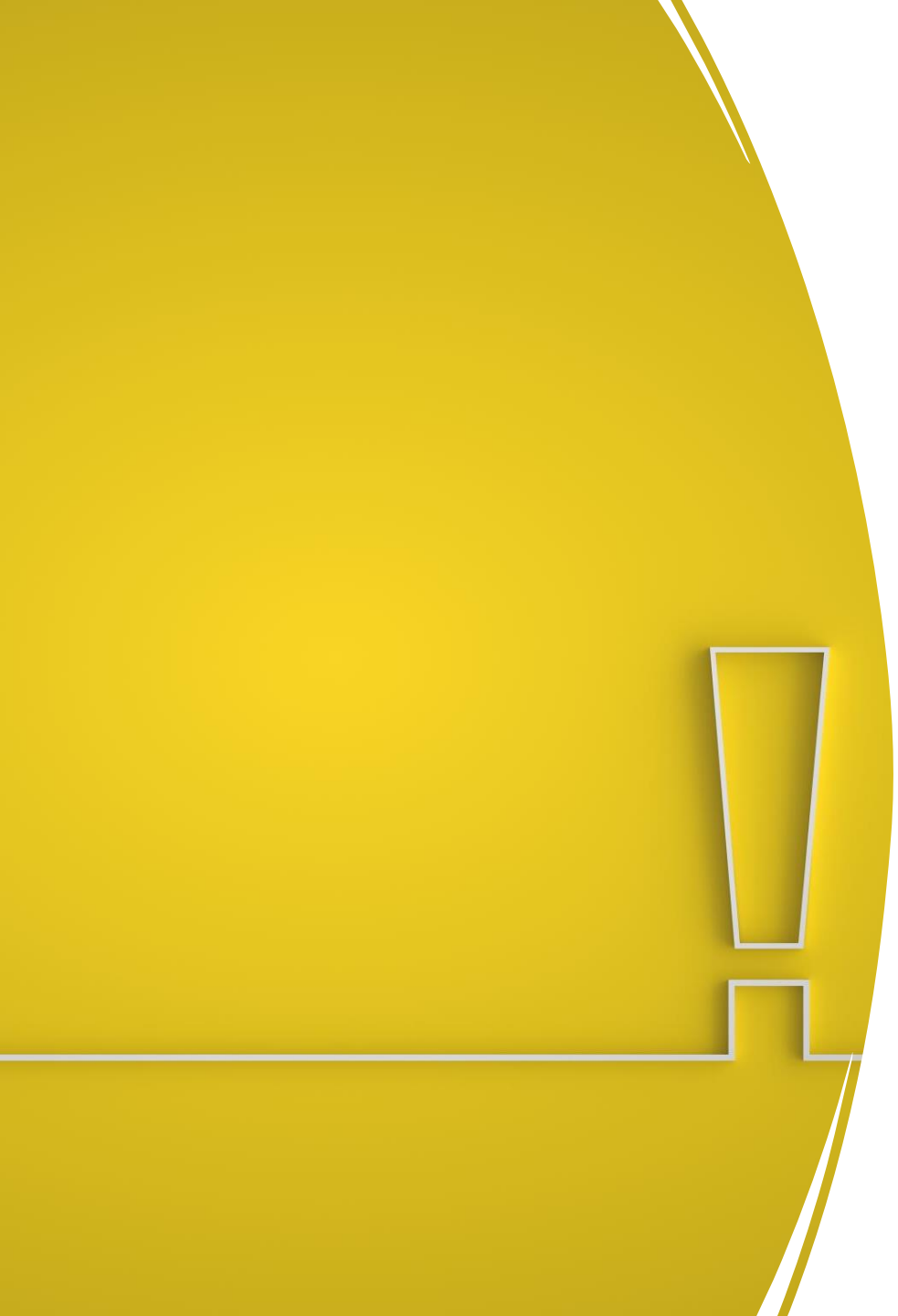
Did You Know?

In general, 48 percent of people can burp at will. But of those who don't enjoy camping, only 33 percent can burp at will.



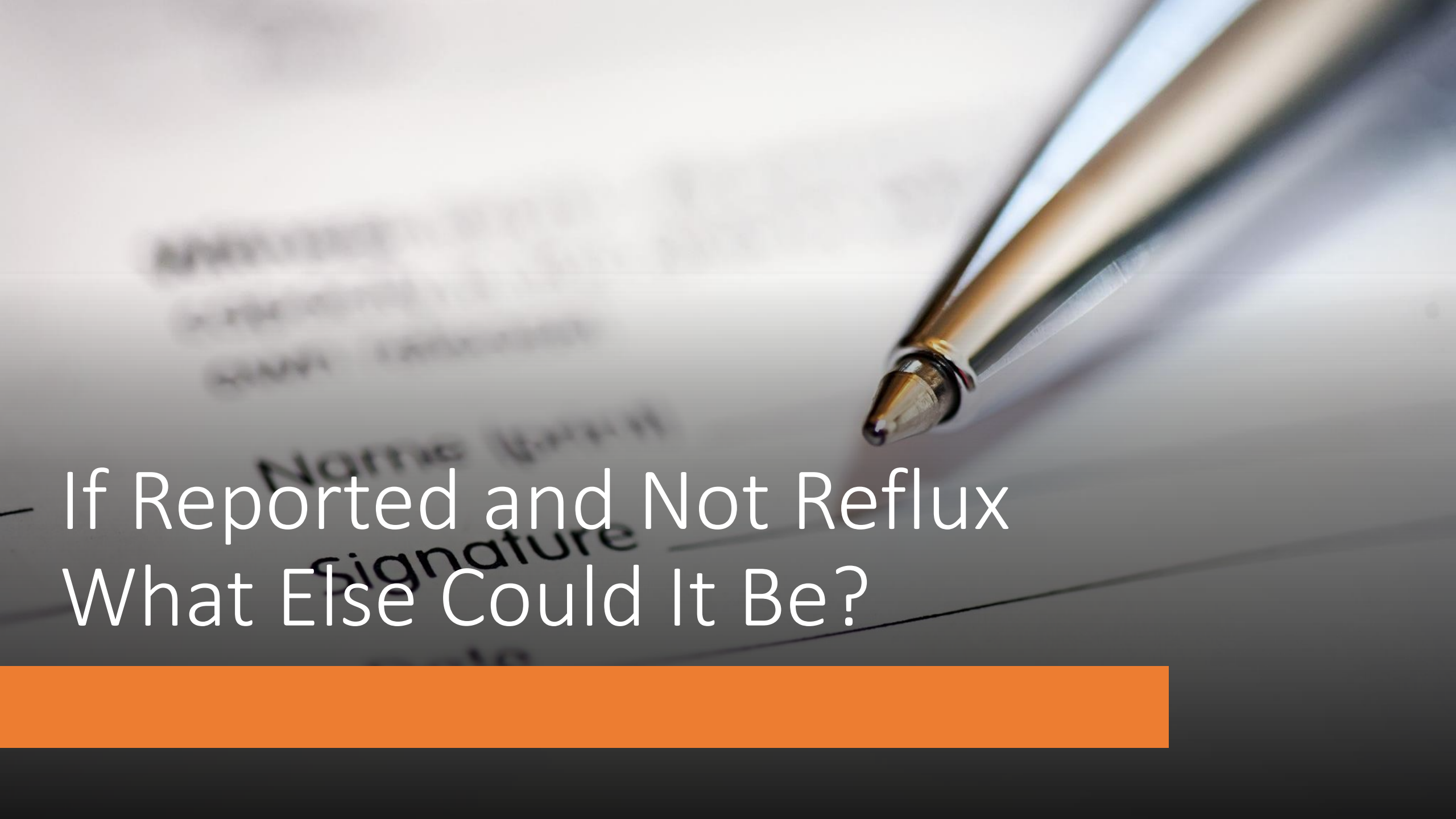
If Reported and Not Reflux What Else Could It Be?

Is it GERD or food allergy?

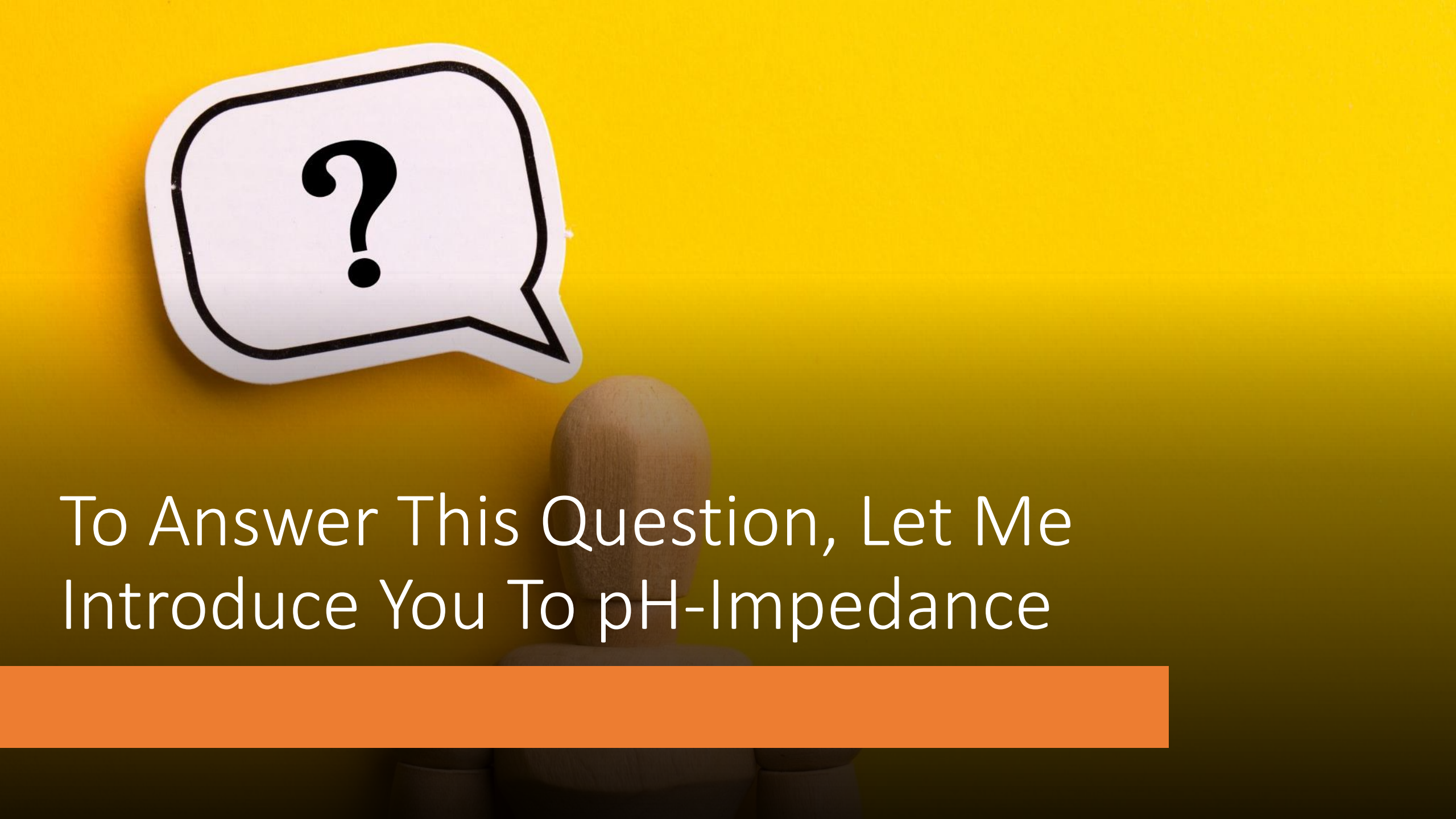


- Symptoms including regurgitation, colic/irritability, and vomiting are common among otherwise normal infants (*Iacono G et al, Dig Liver Dis, 2005;37:432-8)*

- Symptoms of GER are indistinguishable from those of food allergy (*Venter C , et al JACI 2006;1118; Sampson H.A. JACI 2004;806, Savino F et al Eur J Clin Nutr. 2006;1304)*



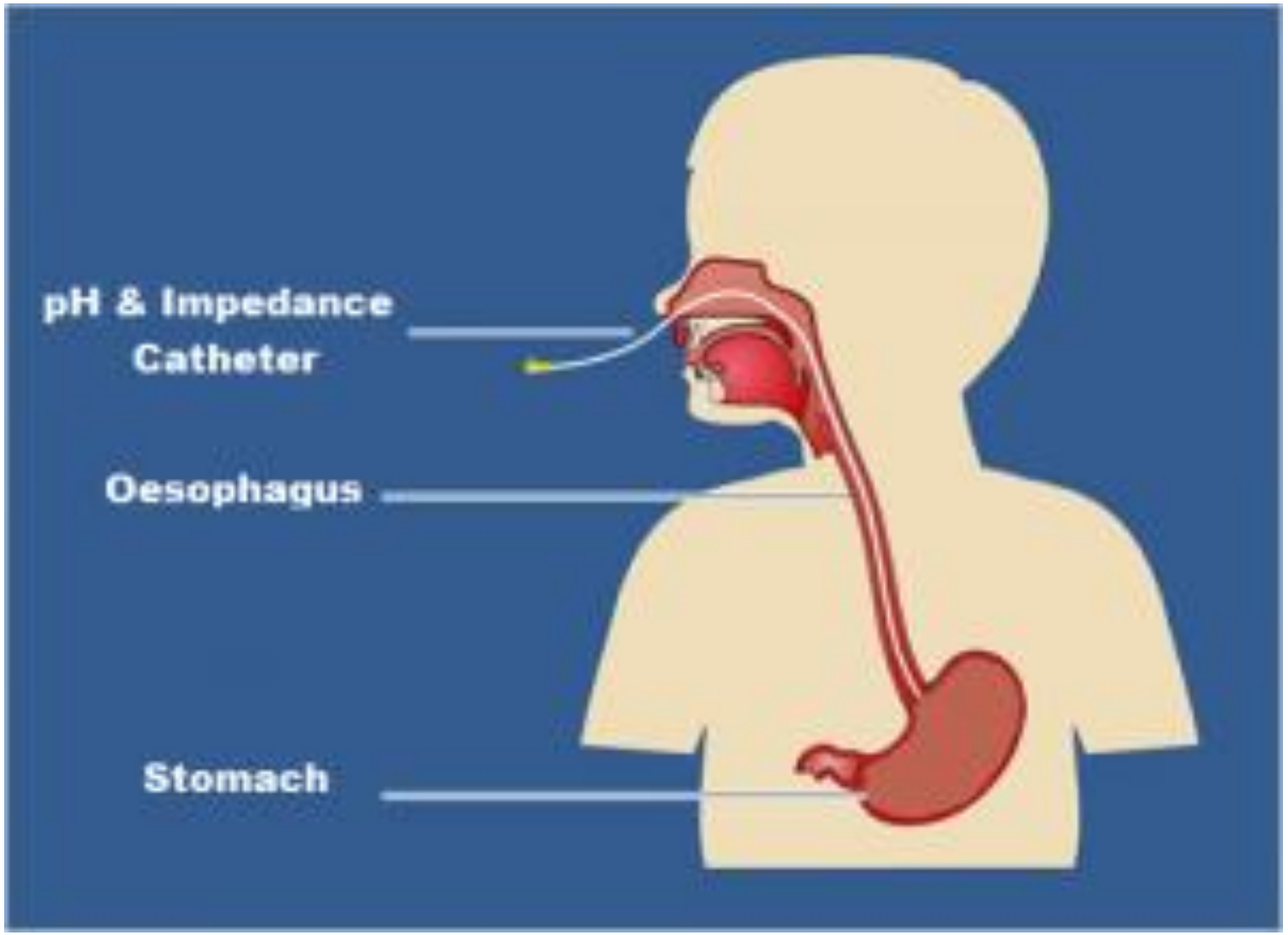
If Reported and Not Reflux What Else Could It Be?

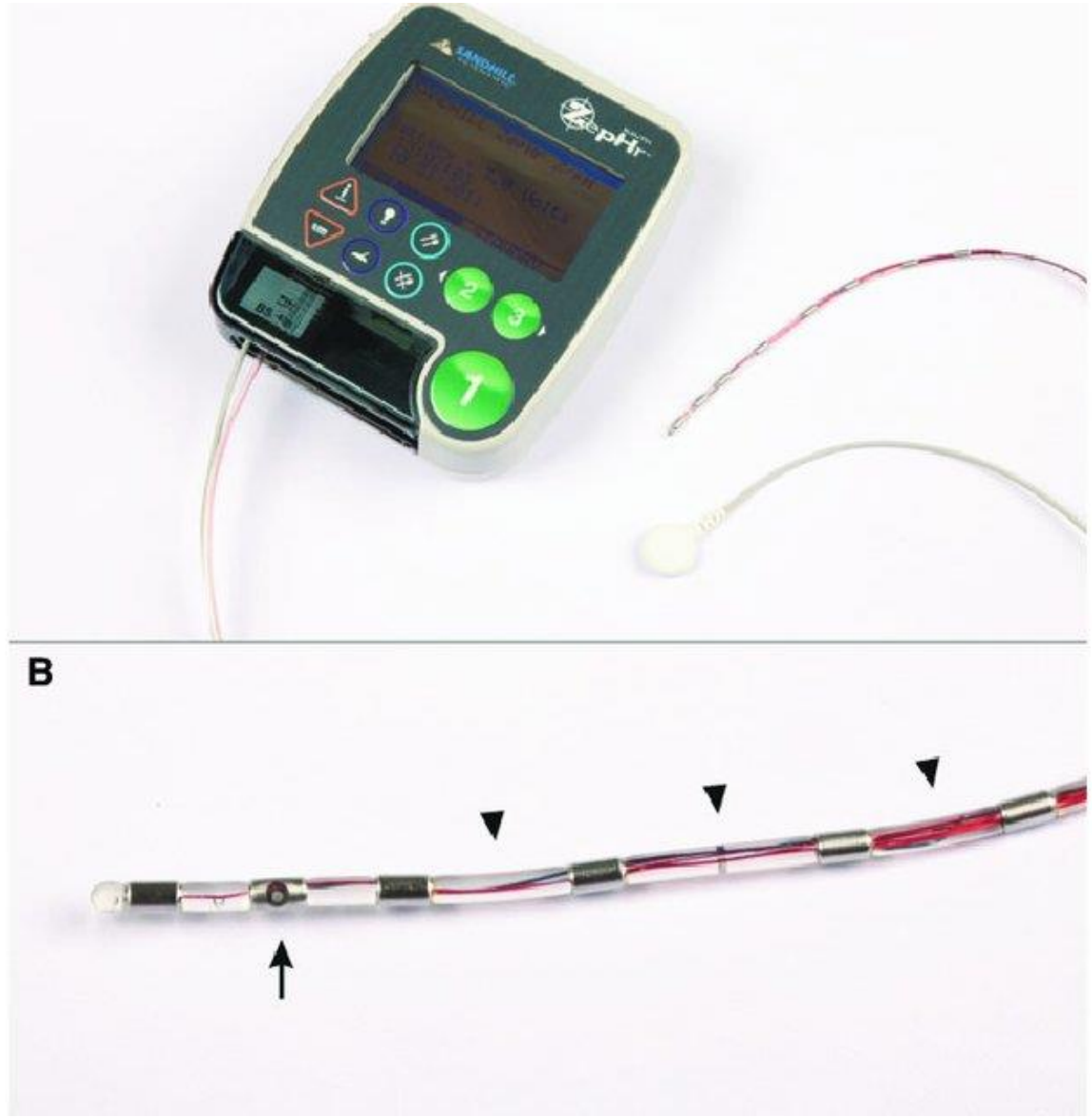


To Answer This Question, Let Me Introduce You To pH-Impedance

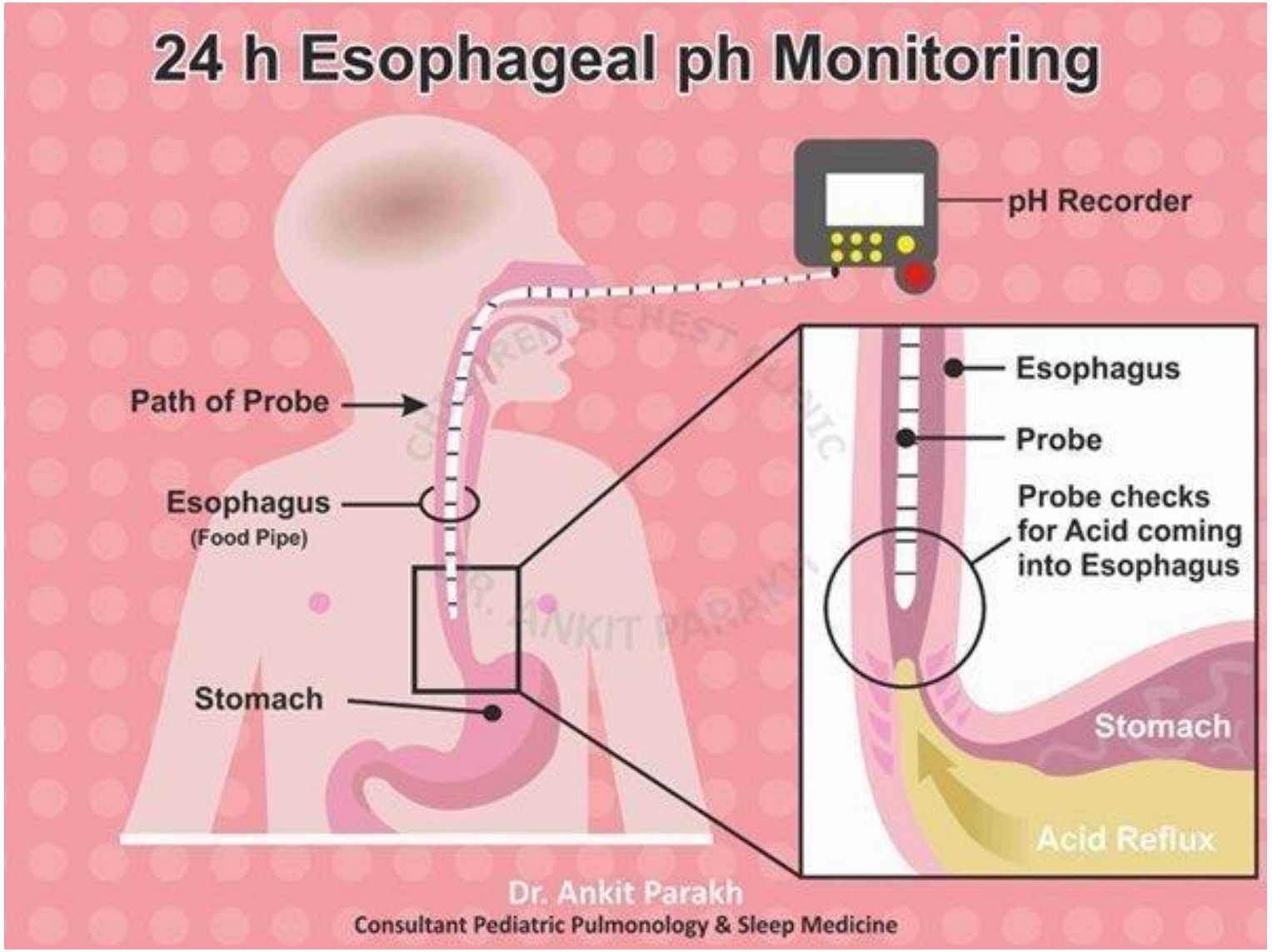

SANDHILL SCIENTIFIC
SLEUTH
ZepHr
2
3
1

pH Impedance

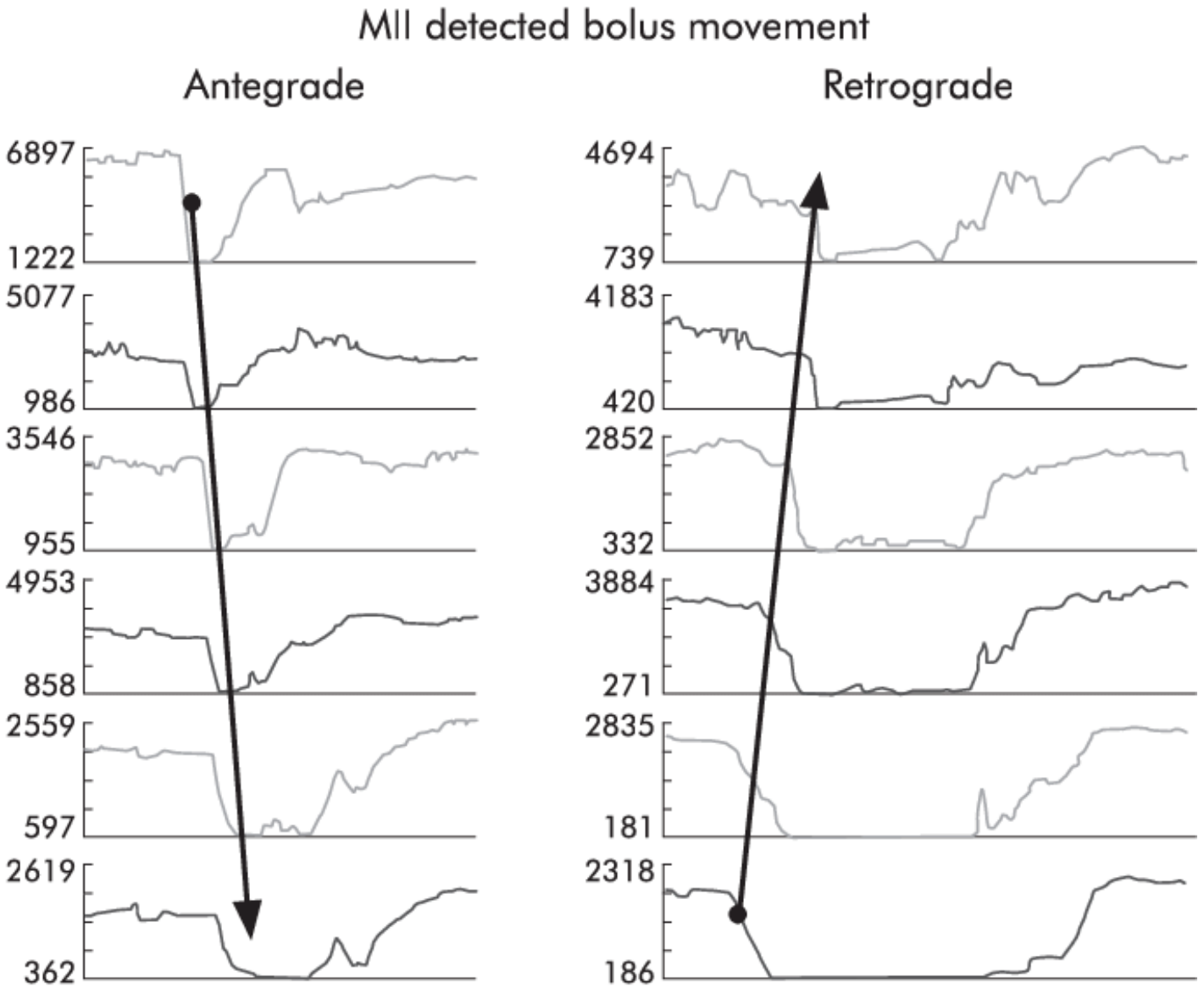



B

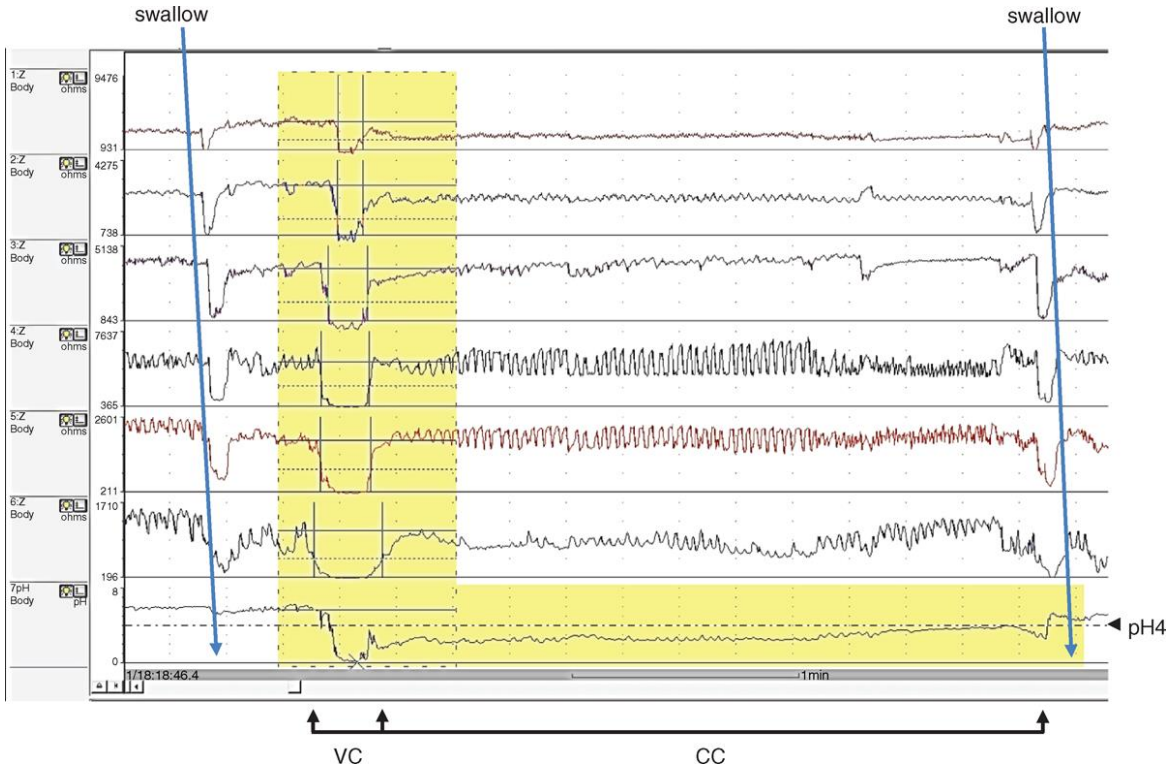
pH Impedance



Swallow Versus Reflux



Reflux and Clearance

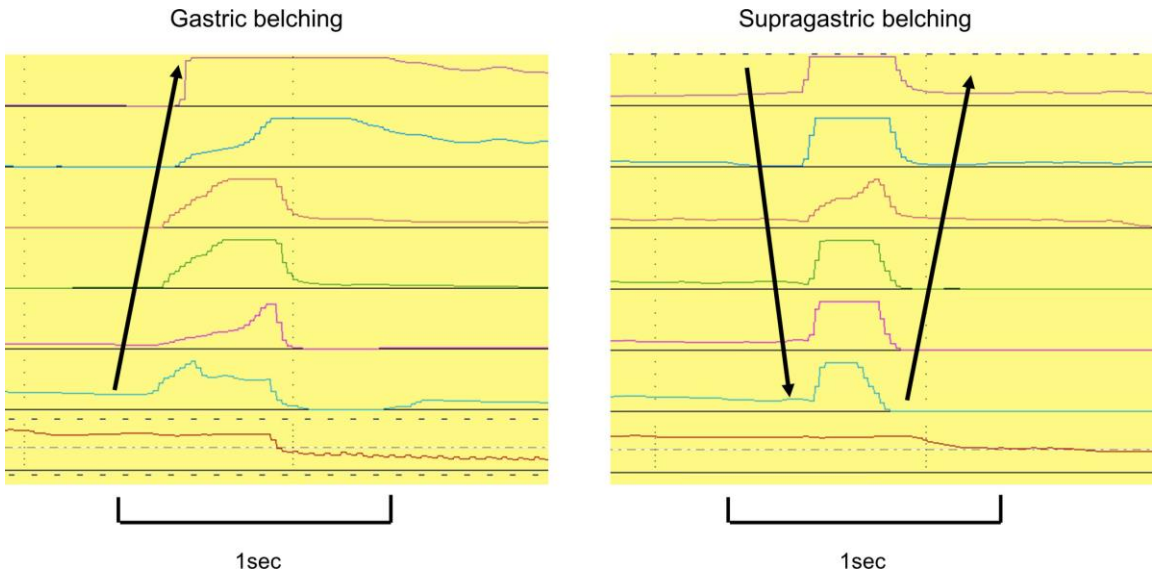


J Pediatr Gastroenterol Nutr. 2015 Jun;60(6):783-6. doi: 10.1097/MPG.0000000000000777.

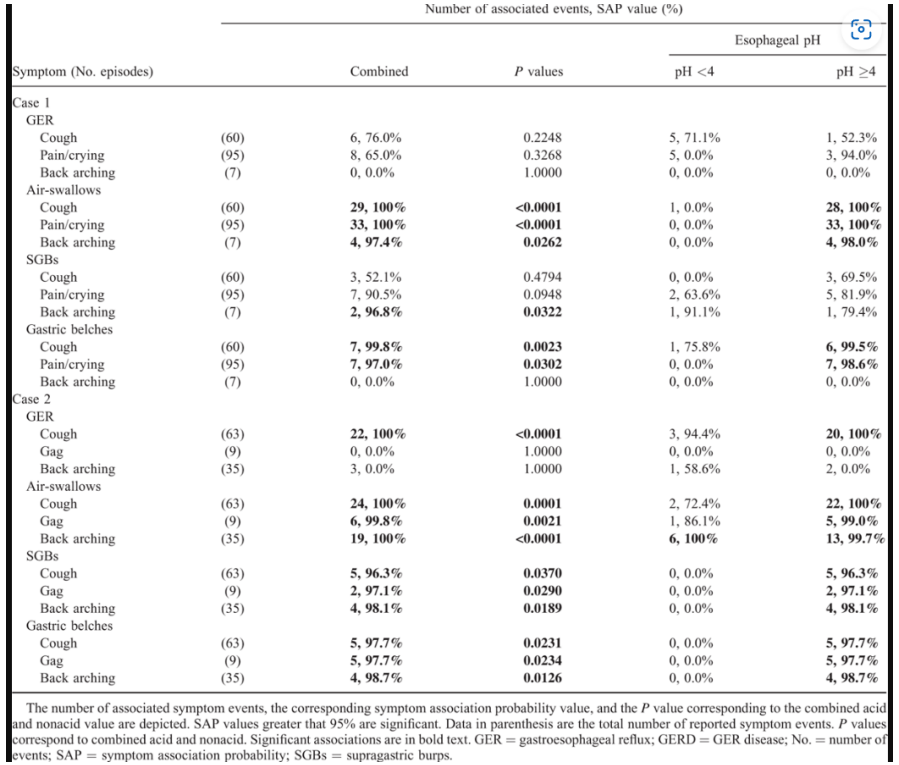
Chemical clearance in infants and children with Acid reflux in the physiologic range

Frederick W Woodley [1], Rodrigo Machado, Carlo Di Lorenzo, Hayat Mousa

You Can Also Test for Air



Esophageal air events were significantly associated with GERD-like symptom types (cough, pain/crying, back-arching, and gagging)



Symptom (No. episodes)		Number of associated events, SAP value (%) Combined	*P* values	Esophageal pH pH <4	Esophageal pH pH ≥4
Case 1					
GER					
Cough	(60)	6, 76.0%	0.2248	5, 71.1%	1, 52.3%
Pain/crying	(95)	8, 65.0%	0.3268	5, 0.0%	3, 94.0%
Back arching	(7)	0, 0.0%	1.0000	0, 0.0%	0, 0.0%
Air-swallows					
Cough	(60)	**29, 100%**	**<0.0001**	1, 0.0%	**28, 100%**
Pain/crying	(95)	**33, 100%**	**<0.0001**	0, 0.0%	**33, 100%**
Back arching	(7)	**4, 97.4%**	**0.0262**	0, 0.0%	**4, 98.0%**
SGBs					
Cough	(60)	3, 52.1%	0.4794	0, 0.0%	3, 69.5%
Pain/crying	(95)	7, 90.5%	0.0948	2, 63.6%	5, 81.9%
Back arching	(7)	**2, 96.8%**	**0.0322**	1, 91.1%	1, 79.4%
Gastric belches					
Cough	(60)	**7, 99.8%**	**0.0023**	1, 75.8%	**6, 99.5%**
Pain/crying	(95)	**7, 97.0%**	**0.0302**	0, 0.0%	**7, 98.6%**
Back arching	(7)	0, 0.0%	1.0000	0, 0.0%	0, 0.0%
Case 2					
GER					
Cough	(63)	**22, 100%**	**<0.0001**	3, 94.4%	**20, 100%**
Gag	(9)	0, 0.0%	1.0000	0, 0.0%	0, 0.0%
Back arching	(35)	3, 0.0%	1.0000	1, 58.6%	2, 0.0%
Air-swallows					
Cough	(63)	**24, 100%**	**0.0001**	2, 72.4%	**22, 100%**
Gag	(9)	**6, 99.8%**	**0.0021**	1, 86.1%	**5, 99.0%**
Back arching	(35)	**19, 100%**	**<0.0001**	**6, 100%**	**13, 99.7%**
SGBs					
Cough	(63)	**5, 96.3%**	**0.0370**	0, 0.0%	**5, 96.3%**
Gag	(9)	**2, 97.1%**	**0.0290**	0, 0.0%	**2, 97.1%**
Back arching	(35)	**4, 98.1%**	**0.0189**	0, 0.0%	**4, 98.1%**
Gastric belches					
Cough	(63)	**5, 97.7%**	**0.0231**	0, 0.0%	**5, 97.7%**
Gag	(9)	**5, 97.7%**	**0.0234**	0, 0.0%	**5, 97.7%**
Back arching	(35)	**4, 98.7%**	**0.0126**	0, 0.0%	**4, 98.7%**

The number of associated symptom events, the corresponding symptom association probability value, and the *P* value corresponding to the combined acid and nonacid value are depicted. SAP values greater that 95% are significant. Data in parenthesis are the total number of reported symptom events. *P* values correspond to combined acid and nonacid. Significant associations are in bold text. GER = gastroesophageal reflux; GERD = GER disease; No. = number of events; SAP = symptom association probability; SGBs = supragastric burps.

Case Reports › J Pediatr Gastroenterol Nutr. 2020 Jan;70(1):e7-e11.
doi: 10.1097/MPG.0000000000002514.

Novel Use of Impedance Technology Shows That Esophageal Air Events Can Be Temporally Associated With Gastroesophageal Reflux Disease–like Symptoms

Frederick W Woodley [1 2 3], Steven L Ciciora [1 2 3], Karla Vaz [1 2 3], Kent Williams [1 2 3], Carlo Di Lorenzo [1 2 3], Sudarshan Jadcherla [1 2 4 3]

Common Things Are Common

Two Things Can Be True and Unrelated

2 Conclusions!

1- Symptoms Are Common, But Not Necessarily Related to Reflux or Acidity

2- Can Not React to Parental Report Starting PPIs

We Need To Be Judicious

At The Time of Prescribing PPIs

The Use of PPIs Comes With A Cost

Acid-suppressive medications

- Necrotizing enterocolitis
- Sepsis/bacteremia
- Pneumonia
- Gastrointestinal infections

Review > Hosp Pediatr. 2013 Jan;3(1):16-23. doi: 10.1542/hpeds.2012-0077.

Are there risks associated with empiric acid suppression treatment of infants and children suspected of having gastroesophageal reflux disease?

Erica Y Chung [1], Jeremy Yardley

JAMA Pediatr. 2023 Oct 1;177(10):1028-1038. doi: 10.1001/jamapediatrics.2023.2900.

Proton Pump Inhibitor Use and Risk of Serious Infections in Young Children

Marion Lassalle [1], Mahmoud Zureik [1 2], Rosemary Dray-Spira [1]

Overall Risk of Serious Infections Associated With PPI Exposure in Children

Exposure	No. of events/No. of person-years	Incidence rate (95% CI)[a]	Crude HR (95% CI)	aHR (95% CI)[b]
PPI exposure over time				
Unexposed	126 864/4 810 746	2.64 (2.62-2.65)	1 [Reference]	1 [Reference]
Exposed	25 191/271 874	9.27 (9.15-9.38)	1.42 (1.40-1.44)	1.34 (1.32-1.36)

Bacterial pathogen				
PPI exposure over time				
Unexposed	24 715/5 386 573	0.46 (0.45-0.46)	1 [Reference]	1 [Reference]
Exposed	3177/299 527	1.06 (1.02-1.10)	1.78 (1.71-1.85)	1.56 (1.50-1.63)

Viral pathogen				
PPI exposure over time				
Unexposed	58 833/5 141 632	1.14 (1.14-1.15)	1 [Reference]	1 [Reference]
Exposed	14 598/285 310	5.12 (5.03-5.20)	1.38 (1.36-1.41)	1.30 (1.28-1.33)

JAMA Pediatr. 2023 Oct 1;177(10):1028-1038. doi: 10.1001/jamapediatrics.2023.2900.

Proton Pump Inhibitor Use and Risk of Serious Infections in Young Children

Marion Lassalle [1], Mahmoud Zureik [1 2], Rosemary Dray-Spira [1]

Risk of Serious Infections Associated With PPI Exposure in Children by Site and Pathogen

Site or pathogen	No. of events/No. of person-years	Incidence rate (95% CI)[a]	Crude HR (95% CI)	aHR (95% CI)[b]
Digestive tract				
PPI exposure over time				
Unexposed	50 608/5 235 608	0.97 (0.96-0.98)	1 [Reference]	1 [Reference]
Exposed	9412/292 237	3.22 (3.16-3.29)	1.61 (1.57-1.65)	1.52 (1.48-1.55)
Musculoskeletal system				
PPI exposure over time				
Unexposed	2473/5 481 052	0.05 (0.04-0.05)	1 [Reference]	1 [Reference]
Exposed	203/303 579	0.07 (0.06-0.08)	1.38 (1.19-1.60)	1.17 (1.01-1.37)
Nervous system				
PPI exposure over time				
Unexposed	1914/5 482 847	0.03 (0.03-0.04)	1 [Reference]	1 [Reference]
Exposed	200/303 443	0.07 (0.06-0.08)	1.50 (1.27-1.76)	1.31 (1.11-1.54)
Lower respiratory tract				
PPI exposure over time				
Unexposed	36 607/5 260 133	0.70 (0.69-0.70)	1 [Reference]	1 [Reference]
Exposed	10 446/290 030	3.60 (3.53-3.67)	1.35 (1.32-1.39)	1.22 (1.19-1.25)

Risk of Serious Infections Associated With PPI Exposure in Children by Site and Pathogen

				1.76)
Skin				
PPI exposure over time				
Unexposed	6127/5 469 711	0.11 (0.11-0.11)	1 [Reference]	1 [Reference]
Exposed	360/303 384	0.12 (0.11-0.13)	1.16 (1.03-1.29)	1.08 (0.97-1.21)

Kidneys or urinary tract				
PPI exposure over time				
Unexposed	12 826/5 416 027	0.24 (0.23-0.24)	1 [Reference]	1 [Reference]
Exposed	2798/300 543	0.93 (0.90-0.97)	1.23 (1.18-1.29)	1.20 (1.15-1.25)

Risk of Serious Infections Associated With PPI Exposure in Children by Site and Pathogen

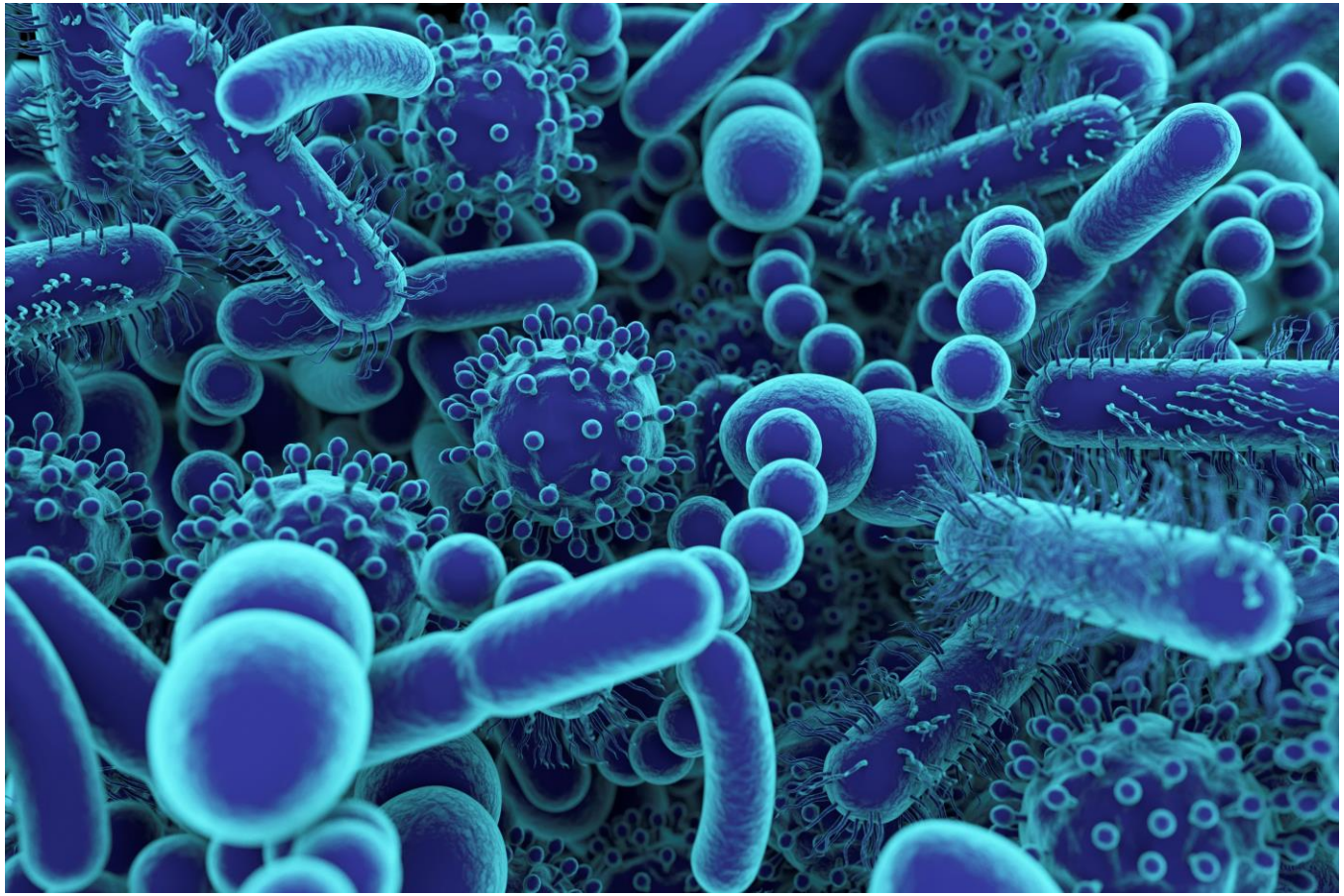
				1.61)
ENT				
PPI exposure over time				
Unexposed	25 052/5 375 283	0.47 (0.46-0.47)	1 [Reference]	1 [Reference]
Exposed	3700/298 771	1.24 (1.20-1.28)	1.60 (1.54-1.66)	1.47 (1.41-1.52)

Review > Acta Paediatr. 2020 Aug;109(8):1531-1538. doi: 10.1111/apa.15213. Epub 2020 Mar 18.

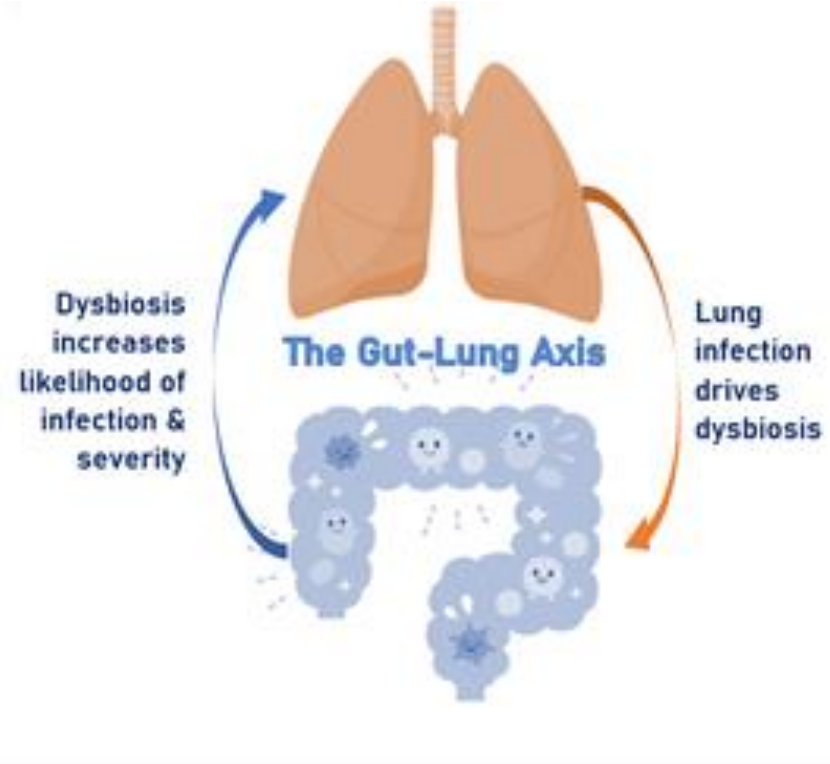
The effects of proton pump inhibitors on the microbiome in young children

Elvira I Levy [1], Delphine M Hoang [1], Yvan Vandenplas [1]

Proton pump inhibitor (PPI) use may lead to infections through alteration of the microbiota or direct action on the immune system. However, only a few studies were conducted in children, with conflicting results.



PPI use may lead to respiratory infections via microaspiration of gastric fluid enriched in bacteria or via the gut-lung axis.



Review > Gastroenterology. 2017 Mar;152(4):706-715. doi: 10.1053/j.gastro.2017.01.031.

The Risks and Benefits of Long-term Use of Proton Pump Inhibitors: Expert Review and Best Practice Advice From the American Gastroenterological Association

Daniel E Freedberg [1], Lawrence S Kim [2], Yu-Xiao Yang [3]

JAMA Pediatr. 2023 Oct 1;177(10):1028-1038. doi: 10.1001/jamapediatrics.2023.2900.

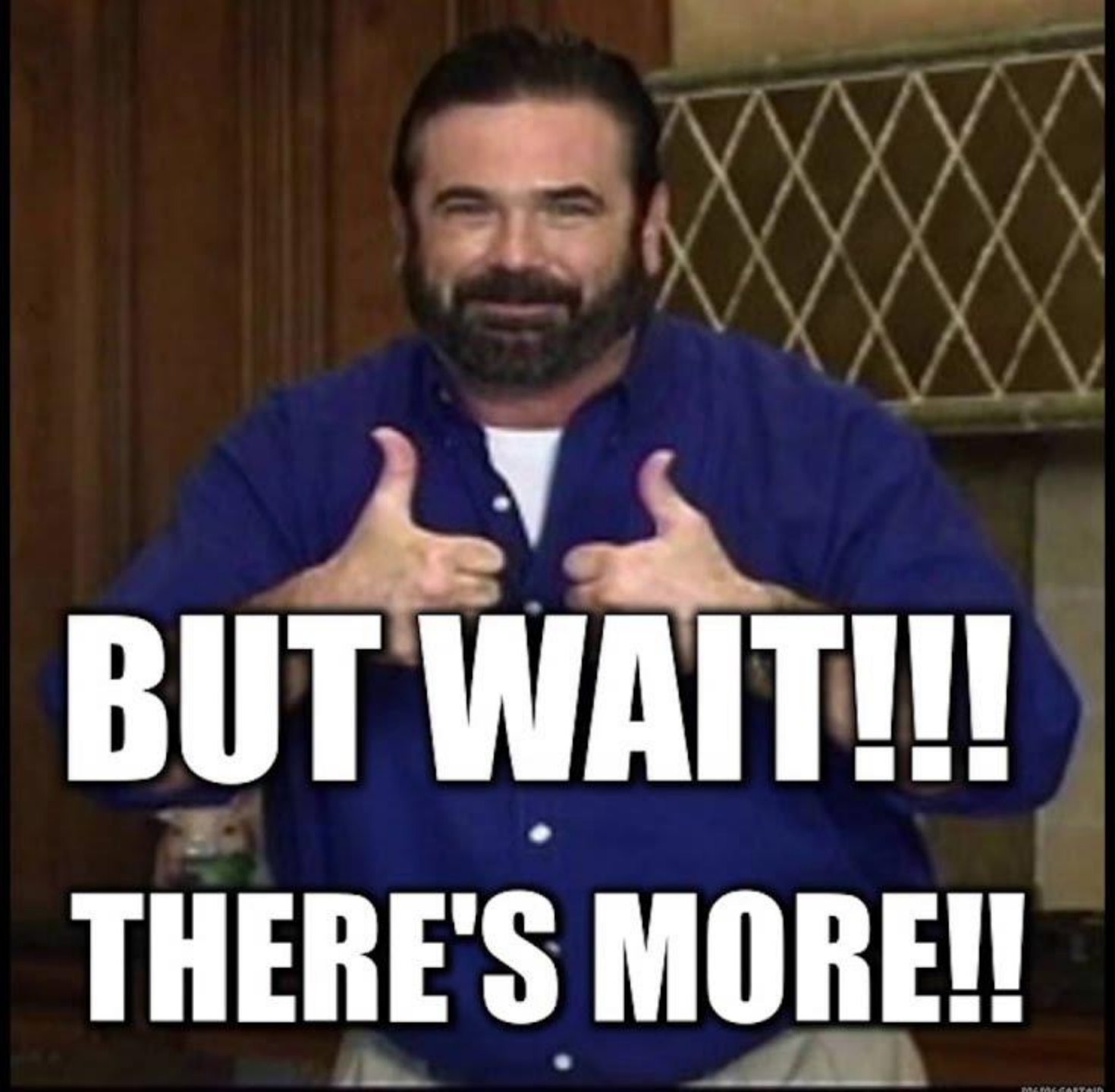
Proton Pump Inhibitor Use and Risk of Serious Infections in Young Children

Marion Lassalle [1], Mahmoud Zureik [1 2], Rosemary Dray-Spira [1]

Risk of serious infections gradually decreased with time since PPI treatment withdrawal

Withdrawal since ≤3 months: aHR, 1.13; 95% CI, 1.10-1.16

Withdrawal since >12 months: aHR, 1.03; 95% CI, 1.01-1.05)


BUT WAIT!!!
THERE'S MORE!!

57% increased risk of asthma among children who initiated PPI uses, compared with that of those who did not.

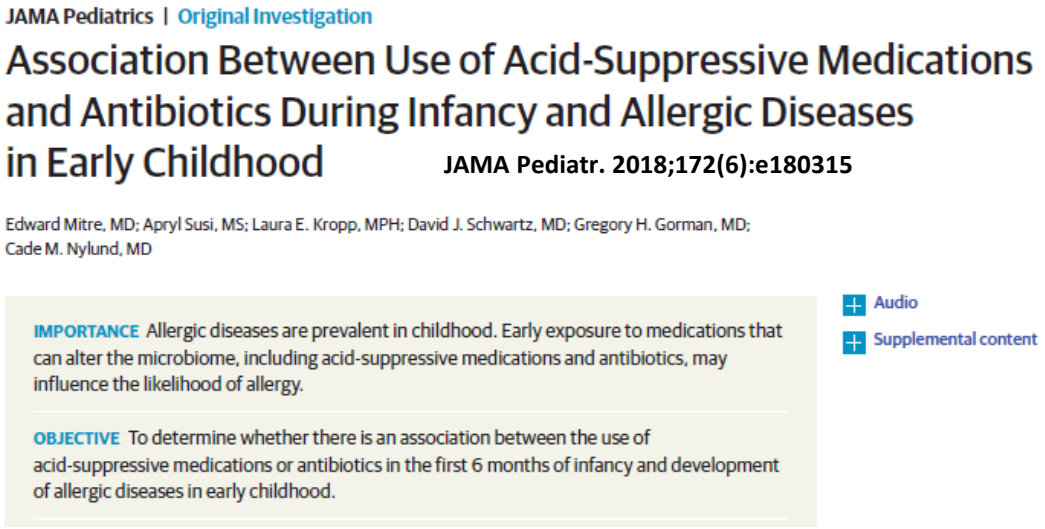
RISK FACTORS | DECEMBER 01 2021

Association Between Proton Pump Inhibitor Use and Risk of Asthma in Children

YH Wang, V Wintzell, JF Ludvigsson, H Svanström, B Pasternak. . *JAMA Pediatr*. . 2021;175(4): 394–403

Waheeda Samady, MD, MSCI; Ruchi Gupta, MD, MPH

Pediatrics (2021) 148 (Supplement 3): S43–S44.



JAMA Pediatrics | Original Investigation

Association Between Use of Acid-Suppressive Medications and Antibiotics During Infancy and Allergic Diseases in Early Childhood

JAMA Pediatr. 2018;172(6):e180315

Edward Mitre, MD; Apryl Susi, MS; Laura E. Kropp, MPH; David J. Schwartz, MD; Gregory H. Gorman, MD; Cade M. Nylund, MD

IMPORTANCE Allergic diseases are prevalent in childhood. Early exposure to medications that can alter the microbiome, including acid-suppressive medications and antibiotics, may influence the likelihood of allergy.

OBJECTIVE To determine whether there is an association between the use of acid-suppressive medications or antibiotics in the first 6 months of infancy and development of allergic diseases in early childhood.

Audio

Supplemental content

Associations between the use of acid-suppressive medications and antibiotics during the first 6 months of infancy and subsequent development of food allergies.

Acid-suppressive medications and antibiotics should be used during infancy only in situations of clear clinical benefit.

ARTICLE

Check for updates

Characteristics of esophageal refluxate and symptoms in infants compared between pre-treatment and on treatment with proton pump inhibitors

Zakia Sultana[1], Vedat O. Yildiz[1,2] and Sudarshan R. Jadcherla[1,3,4]✉

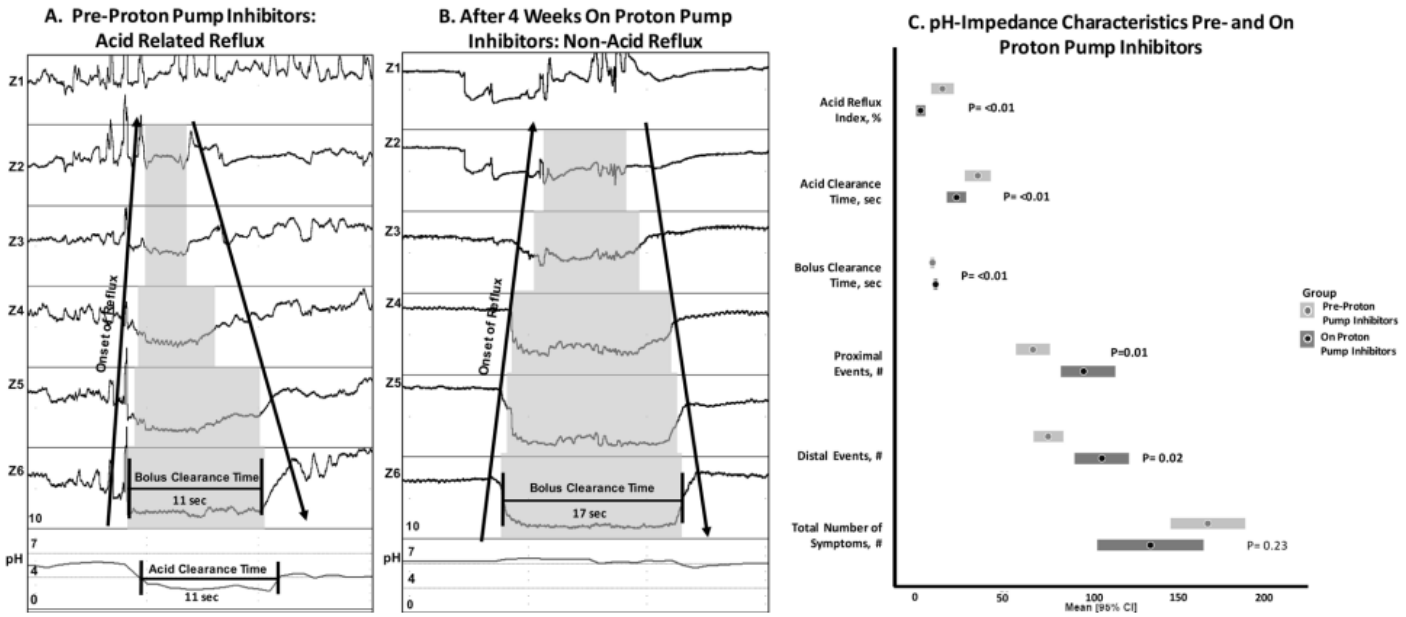


Fig. 2 pH-impedance patterns and characteristics of gastroesophageal reflux events pre-vs. on proton pump inhibitors treatment. A Pre

CONCLUSIONS: Prescription of proton pump inhibitors for objectively determined GERD should have time limits, as prolonged treatment can result in prolonged esophageal bolus clearance time without relieving symptoms.

Use of antireflux medications at the time of extremely low birth weight infants has no effect on growth or development at 18 months follow-up evaluation.

› Pediatrics. 2008 Jan;121(1):22-7. doi: 10.1542/peds.2007-0381.

Use of medications for gastroesophageal reflux at discharge among extremely low birth weight infants

William F Malcolm [1], Marie Gantz, Richard J Martin, Ricki F Goldstein, Ronald N Goldberg, Charles M Cotten;
National Institute of Child Health and Human Development Neonatal Research Network


HOW CAN WE
MAKE IT
BETTER


SAFETY
FIRST

Esophagus: short, limited capacity

Poorly accommodating stomach

Gravity + excessive relative volume ⟹ regurgitation

Avoid overfeeding

180 ml

5 kg

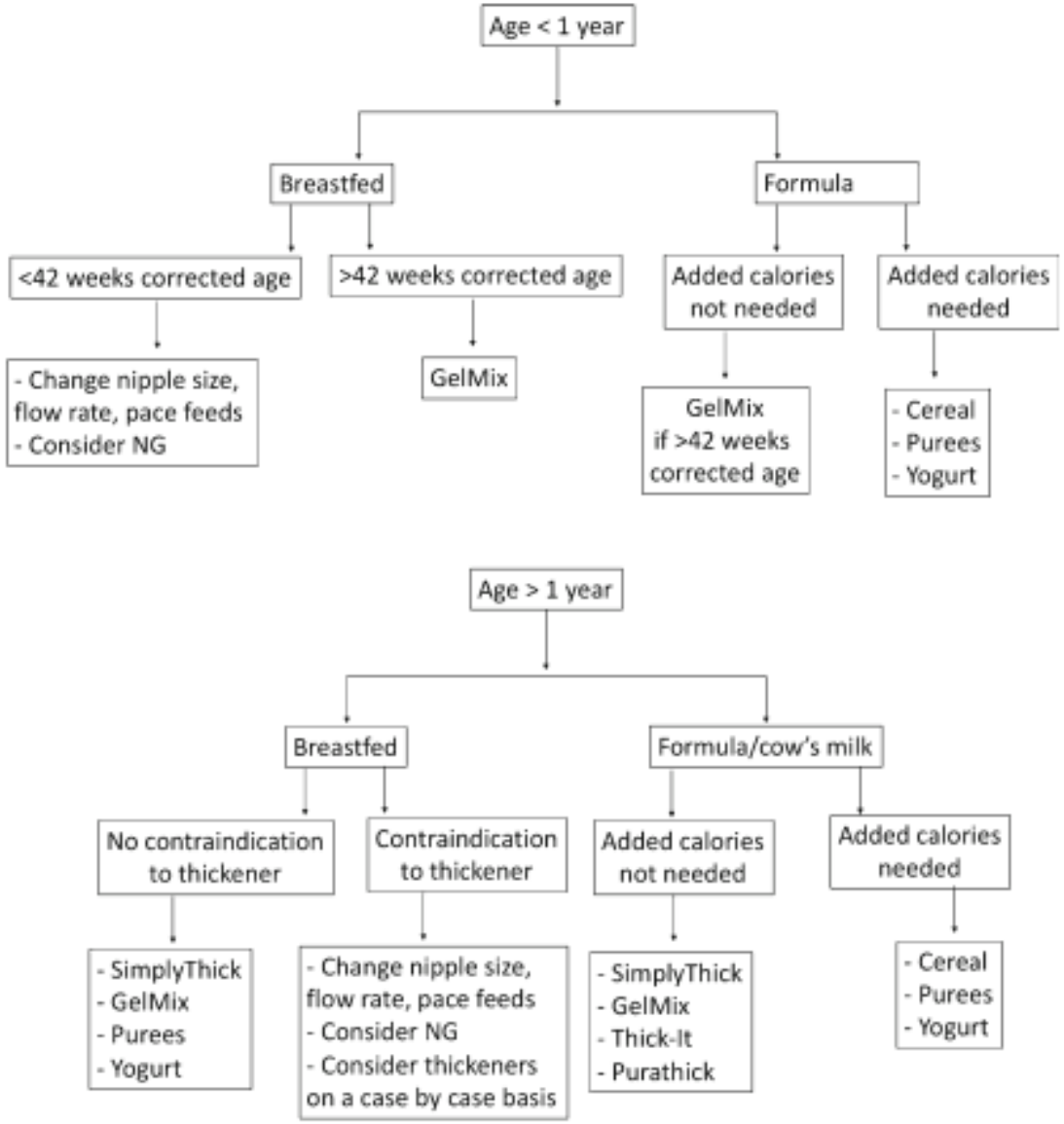
3 liters

80 kg

Equivalent amounts consumed in 10 minutes

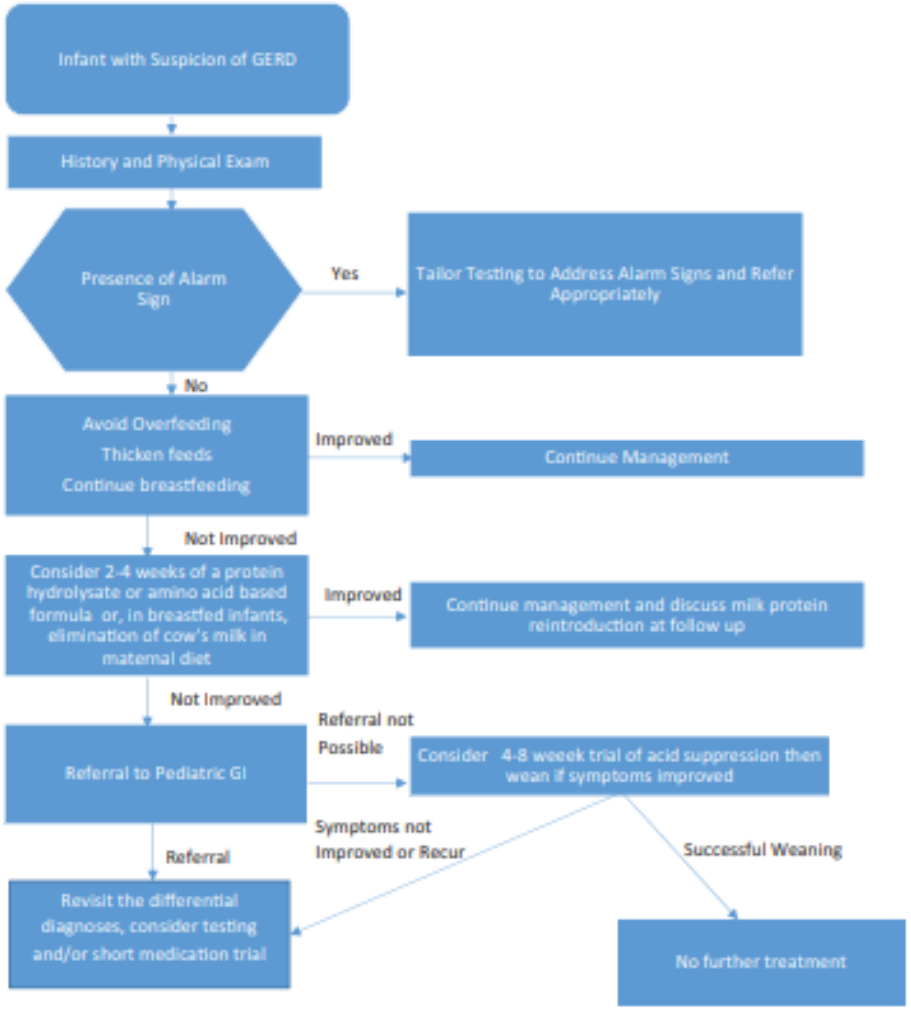

THINGS TO DO
FIRST

How to thicken?



It may make more sense to switch the formula than to start acid suppression.

But if you do, please switch to a hydrolysate formula



ALGORITHM 1. Management of the symptomatic infant.

Your Friendly Pediatric GI

Endoscopy Or Other Testing

Infants and Toddlers with EoE

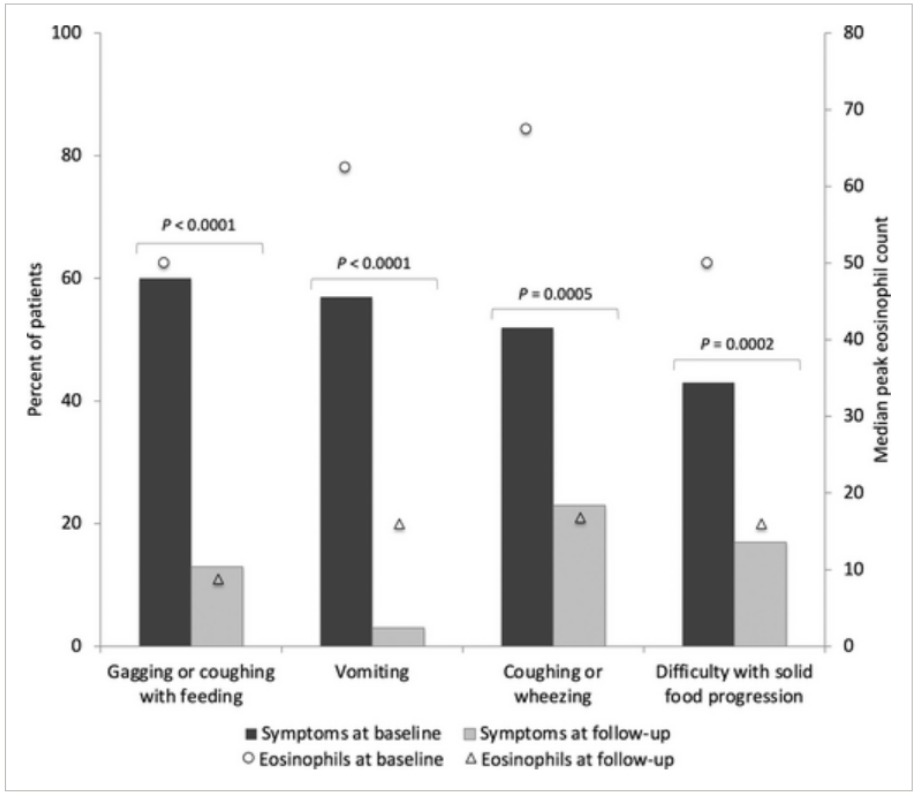
- Commonly male, personal and family history of atopy, feeding difficulties, vomiting, or respiratory symptoms.

- May mimic other common GI diagnoses: reflux, milk protein allergy, or aspiration

J Pediatr Gastroenterol Nutr. 2023 Jul 1;77(1):86-92. doi: 10.1097/MPG.0000000000003803. Epub 2023 Apr 21.

Characterization of Eosinophilic Esophagitis in Infants and Toddlers

Suzanna Hirsch [1], Alexandra Cohen [1], Reza Rahbar [2], Eitan Rubinstein [1], Rachel Rosen [1]



J Pediatr Gastroenterol Nutr. 2023 Jul 1;77(1):86-92. doi: 10.1097/MPG.0000000000003803. Epub 2023 Apr 21.

Characterization of Eosinophilic Esophagitis in Infants and Toddlers

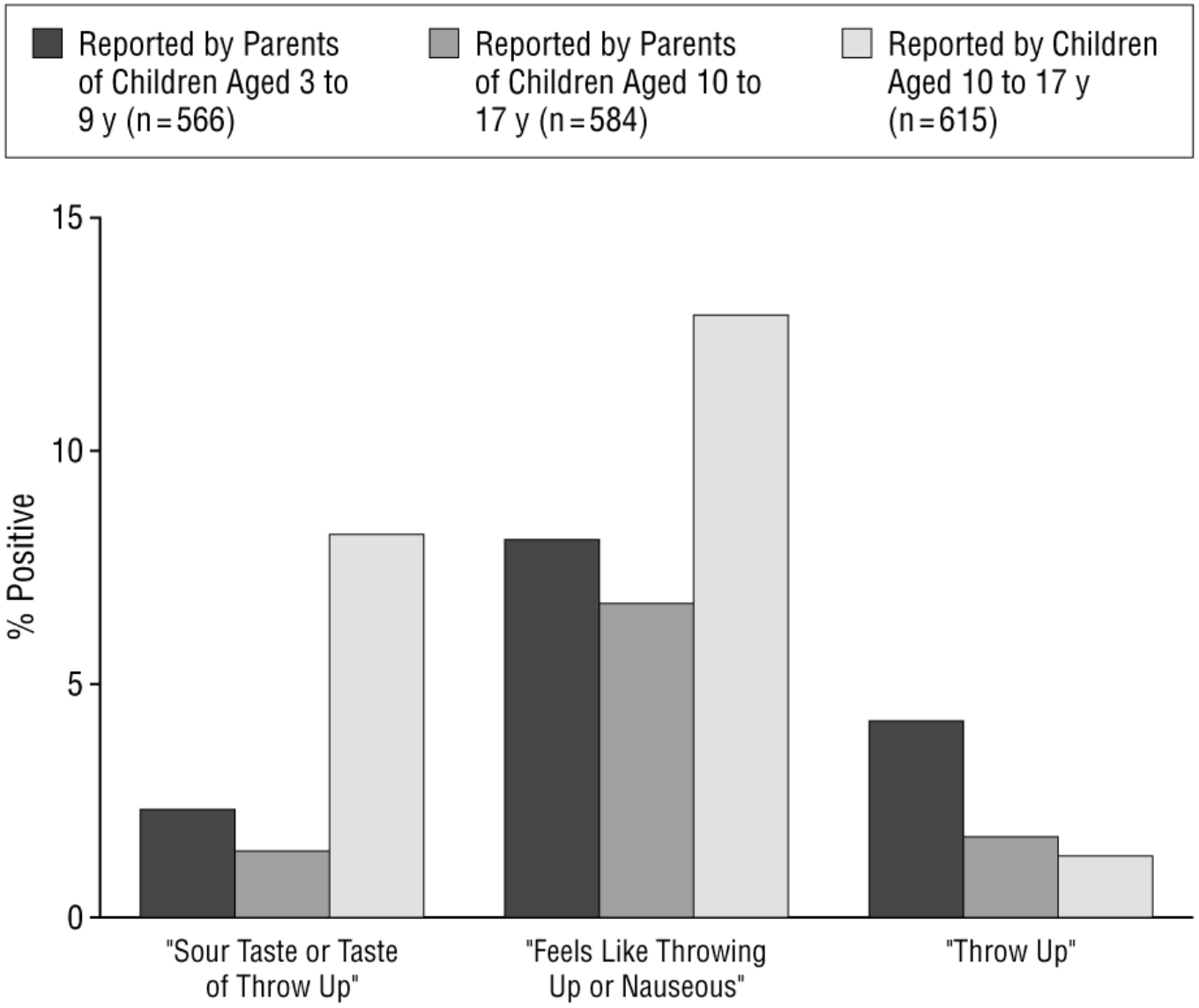
Suzanna Hirsch [1], Alexandra Cohen [1], Reza Rahbar [2], Eitan Rubinstein [1], Rachel Rosen [1]

The Problem Does Not End There…

It Happens Again…

Frequency of health care visits for GERD from infancy to childhood is bimodal

Symptoms peaks in early infancy, drops in the preschool years and increases again in school-aged children and adolescents




“And now for something completely different.”
Monty Python

Heartburn

GERD

Is It?

Is It Not?

No Alarm Signs…

‘Red Flag’ symptoms and signs that suggest disorders other than GERD

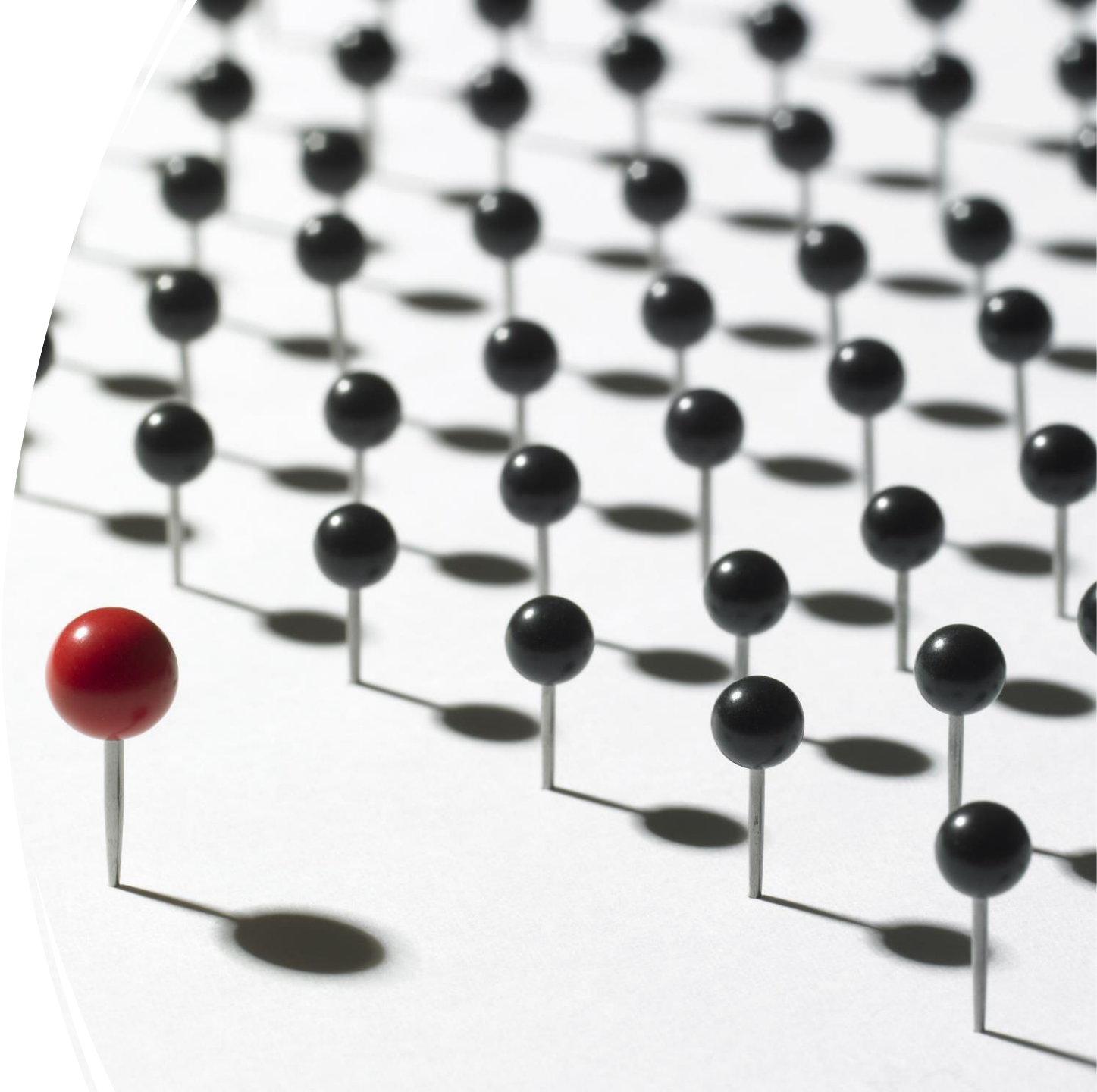
Symptoms and signs	Remarks
General:	
- Weight loss	Suggesting a variety of conditions, including systemic infections.
- Lethargy	
- Fever	
- Excessive irritability/pain	
- Dysuria	May suggest urinary tract infection, especially in infants and young children.
- Onset of regurgitation/vomiting >6 months or increasing/persisting >12–18 months of age	Late onset as well as symptoms increasing or persisting after infancy, based on natural course of the disease, may indicate a diagnosis other than GERD.
Neurological:	
- Bulging fontanel/rapidly increasing head circumference	May suggest raised intracranial pressure for example due to meningitis, brain tumor or hydrocephalus.
- Seizures	
- Macro/microcephaly	
Gastro-intestinal	
- Persistent forceful vomiting	Indicative of hypertrophic pyloric stenosis (infants up to 2 months old)
- Nocturnal vomiting	May suggest increased intracranial pressure
- Bilious vomiting	Regarded as symptom of intestinal obstruction. Possible causes include Hirschsprung disease, intestinal atresia or mid-gut volvulus or intussusception.
- Hematemesis	Suggests a potentially serious bleed from the esophagus, stomach or upper gut, possibly GERD-associated, occurring from acid-peptic disease[1], Mallory-Weiss tear[2] or reflux-esophagitis.
- Chronic diarrhea	May suggest food protein-induced gastroenteropathy[3].
- Rectal bleeding	Indicative of multiple conditions, including bacterial gastroenteritis, inflammatory bowel disease, as well as acute surgical conditions and food protein-induced gastroenteropathy rectal bleeding[3] (bleeding caused by proctocolitis).
- Abdominal Distension	Indicative of obstruction, dysmotility, or anatomic abnormalities

[1] Especially with NSAID use

[2] Associated with vomiting

[3]

Most Will Be Managed By Pediatrician



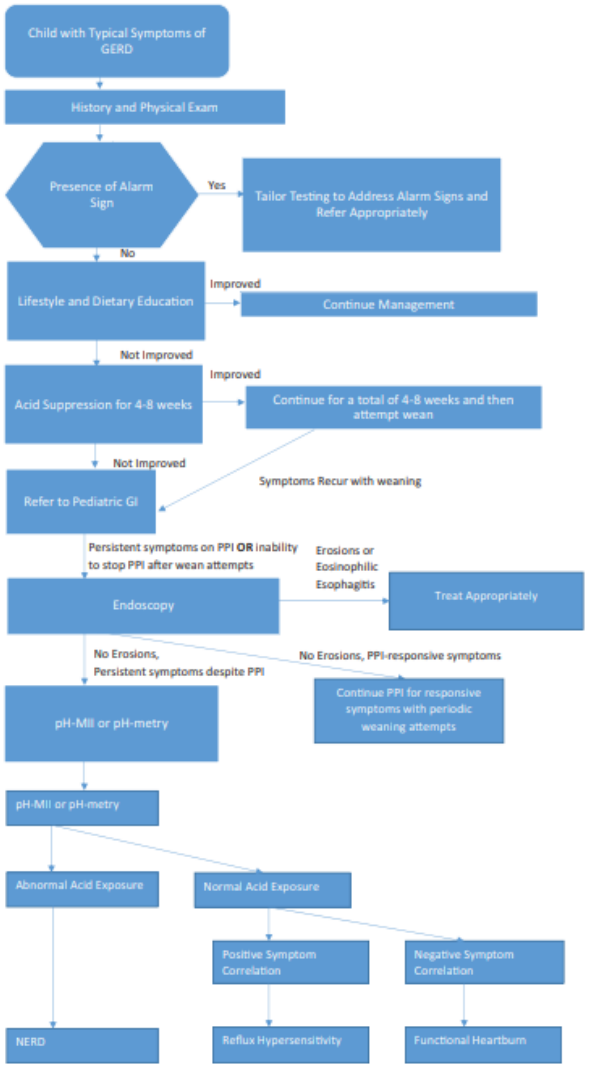
Review > World J Gastrointest Endosc. 2023 Mar 16;15(3):84-102. doi: 10.4253/wjge.v15.i3.84.

Gastroesophageal reflux disease in children: What's new right now?

Palittiya Sintusek [1], Mohamed Mutalib [2], Nikhil Thapar [3 4 5]

The signs and symptoms of gastroesophageal reflux disease and alarm features of its most significant mimics

Symptoms	Signs	Red flags from other serious conditions that may underlie or mimic GERD
General	**General**	**General**
Irritability	Dental erosion, not dental caries (Figure 2)	Excessive irritability
Failure to thrive	Anemia	Weight loss
Feeding refusal		Fever
Sandifer syndrome		Lethargy
Gastrointestinal	**Gastrointestinal**	**Gastrointestinal**
Recurrent regurgitation	Esophagitis	Onset of regurgitation at > 6 mo of age
Recurrent vomiting	Esophageal stricture	Persistent or progressive regurgitation at > 1 yr of age
Heartburn	Barrett esophagus	Vomiting: Persistent forceful, nocturnal or bilious vomiting



ALGORITHM 2. Diagnostic and therapeutic algorithm for typical reflux symptoms in the older child.

Step By Step Thought Process and Workup

Should I Tell?
When?
Who?

- So Now, PPI Are Not Evil?
- Role In Some Cases
- But… Not All Cases

Not To Be Used For
A Long Time

(Unless Necessary)

Your Friendly Pediatric GI

Endoscopy Or Other Testing

When EGD?

- When alarm symptoms are present
- Detect complications
- Diagnose conditions that predispose to GERD (such as hiatal hernia)
- Diagnose conditions that might mimic GERD (such as eosinophilic esophagitis, infectious esophagitis).

Eosinophilic Esophagitis

Older Children

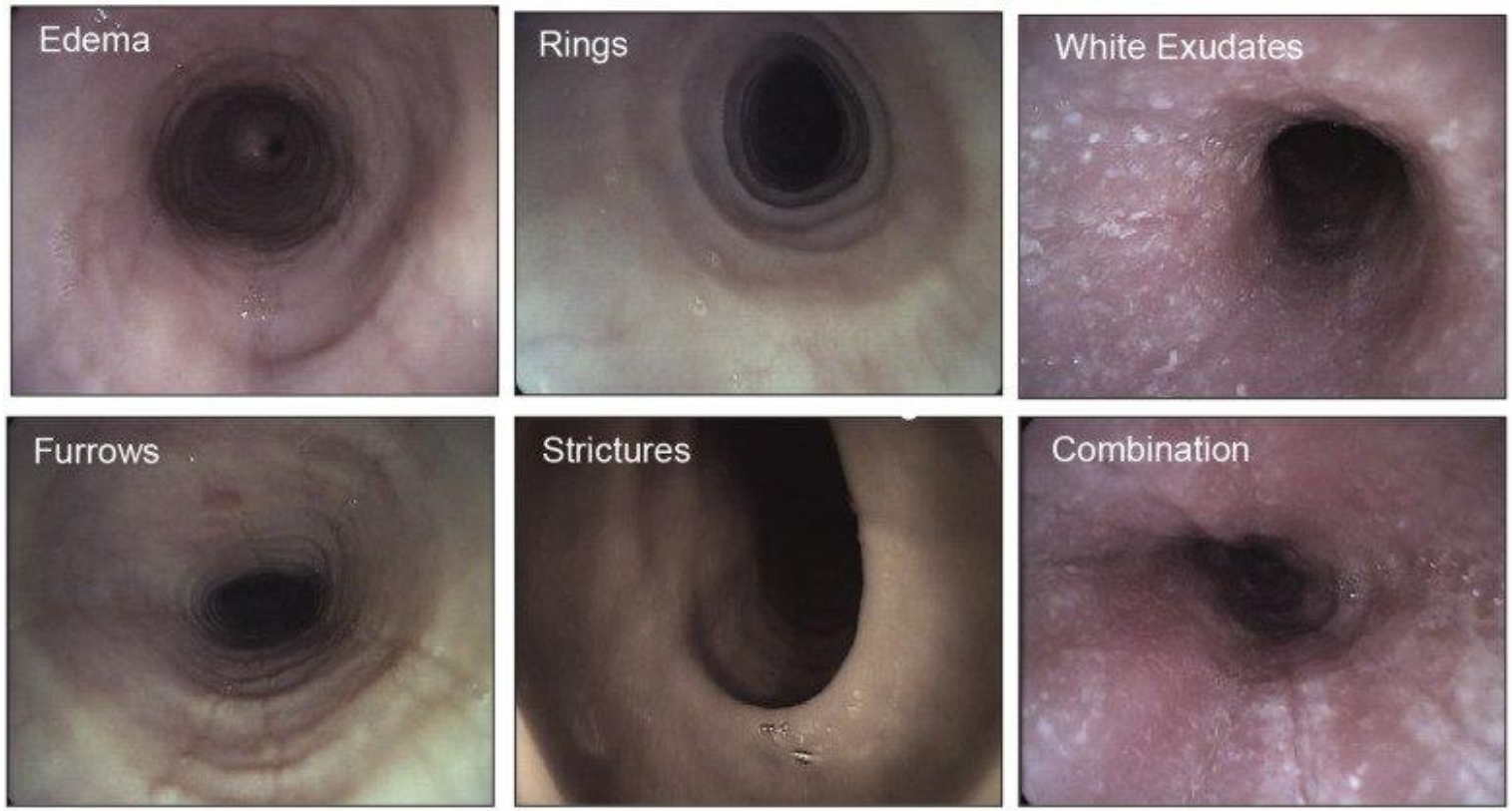
Heartburn, dysphagia and food impaction

Review > Curr Pediatr Rev. 2020;16(3):206-214. doi: 10.2174/157339

Eosinophilic Esophagitis in Children: C Findings and Diagnostic Approach

rianna De Matteis [1], Giuseppe Pagliaro [2], Vito Domenico Corleto [3], Cla nilio Di Giulio [3], Maria Pia Villa [4], Pasquale Parisi [4], Francesca Vassallo iovanni Di Nardo [4]

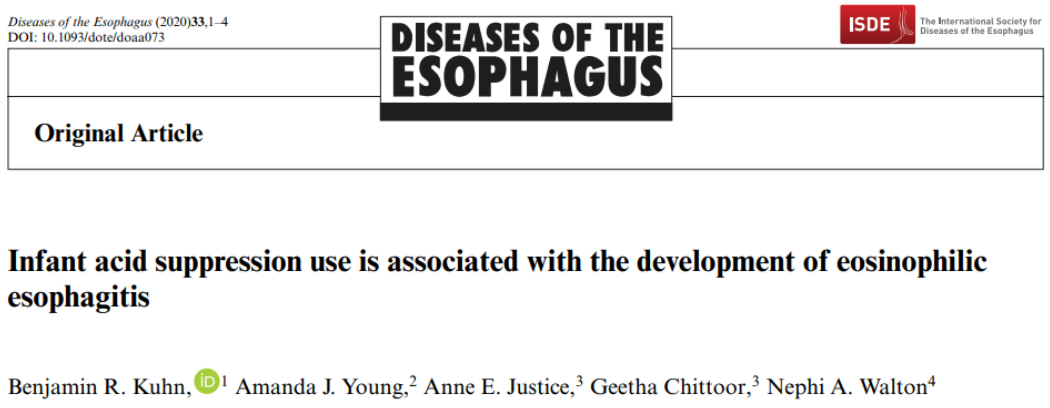
Eosinophilic Esophagitis



PPIs and Eosinophilic Esophagitis

Love Hate Relationship

Acid suppression in infancy significantly associated with EoE



Diseases of the Esophagus (2020)**33**,1–4
DOI: 10.1093/dote/doaa073

DISEASES OF THE ESOPHAGUS

ISDE The International Society for Diseases of the Esophagus

Original Article

Infant acid suppression use is associated with the development of eosinophilic esophagitis

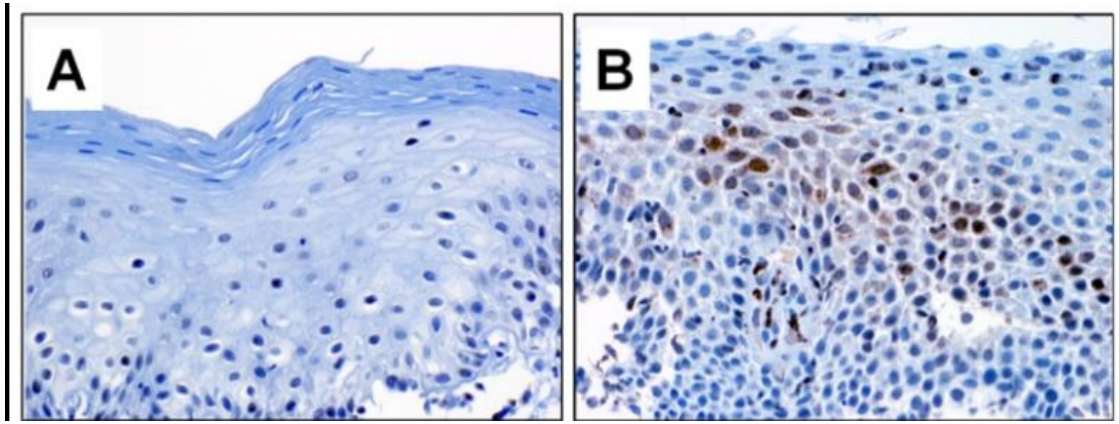
Benjamin R. Kuhn,[1] Amanda J. Young,[2] Anne E. Justice,[3] Geetha Chittoor,[3] Nephi A. Walton[4]

- PPI: 5.7% EoE cases vs. 1.6% controls
- H2 antagonists: 8.8% EoE cases vs. 4.5% controls

Review > Front Pediatr. 2018 May 8:6:119. doi: 10.3389/fped.2018.00119. eCollection 2018.

The Role of Proton Pump Inhibitors in the Management of Pediatric Eosinophilic Esophagitis

Carolina Gutiérrez-Junquera [1], Sonia Fernández-Fernández [2], M Luz Cilleruelo [1], Ana Rayo [2], Enriqueta Román [1]



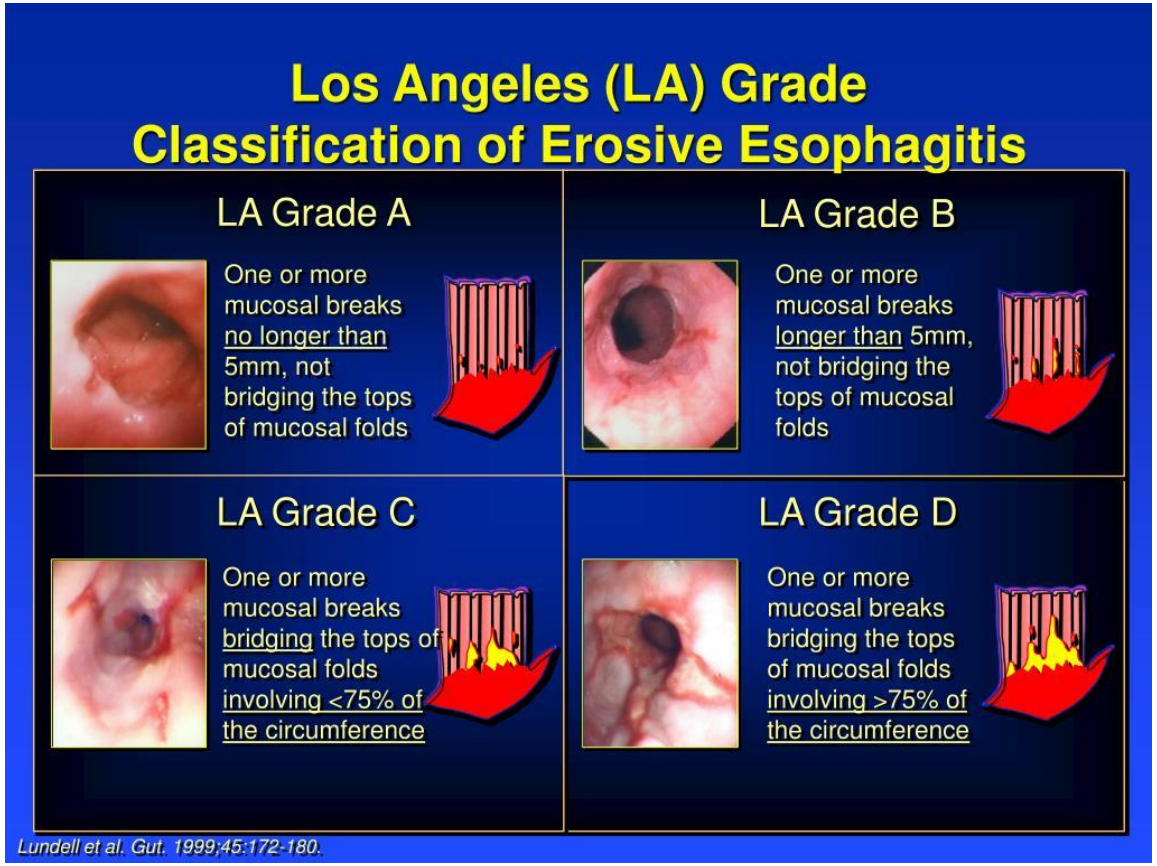
A) Normal squamous epithelium shows no eotaxin-3 immunostaining. B) Eotaxin-3 labels epithelial cells with variable intensity in biopsies with esophageal eosinophilia.

PLoS One. 2014 Jul 2;9(7):e101391. doi: 10.1371/journal.pone.0101391. eCollection 2014.

Proton pump inhibitors decrease eotaxin-3 expression in the proximal esophagus of children with esophageal eosinophilia

Jason Y Park [1], Xi Zhang [1], Nathalie Nguyen [2], Rhonda F Souza [3], Stuart J Spechler [3], Edaire Cheng [4]

Erosive Esophagitis



Majority of patients with typical reflux symptoms such as chest pain, heartburn, and regurgitation do not have esophageal mucosal lesions

Patients who cannot reduce PPIs should consider ambulatory esophageal pH/impedance monitoring before committing to lifelong PPIs to help distinguish GERD from a functional syndrome.

Review > Gastroenterology. 2017 Mar;152(4):706-715. doi: 10.1053/j.gastro.2017.01.031.

The Risks and Benefits of Long-term Use of Proton Pump Inhibitors: Expert Review and Best Practice Advice From the American Gastroenterological Association

Daniel E Freedberg [1], Lawrence S Kim [2], Yu-Xiao Yang [3]

Symptomatic Patients Without Erosions: 3 Phenotypes

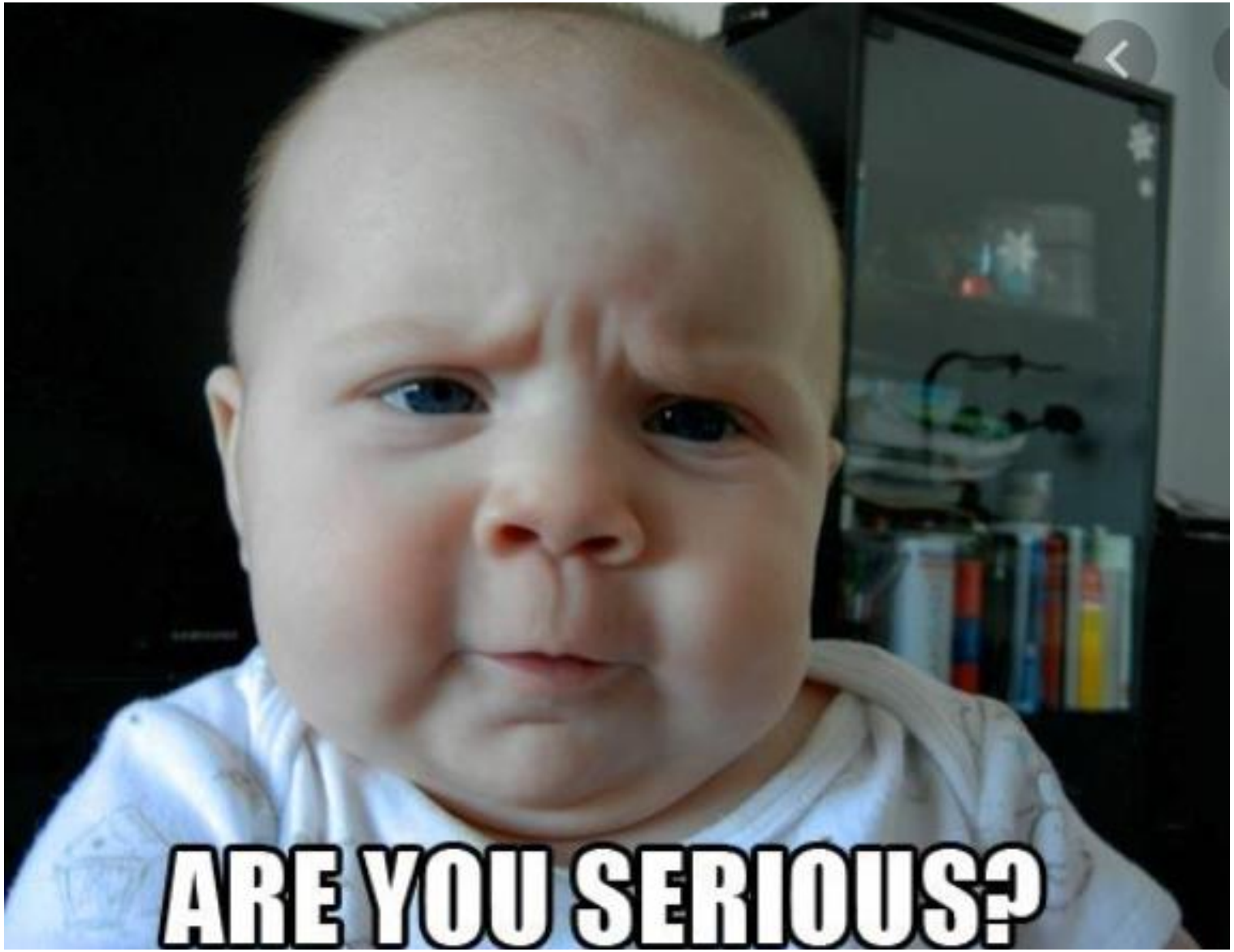
Abnormal esophageal acid exposure (NERD)

Normal esophageal acid exposure but a positive symptom association to acid or nonacid reflux (reflux hypersensitivity)

Normal esophageal acid exposure and a negative symptom association (functional heartburn).

You Are Making It Too Complicated,

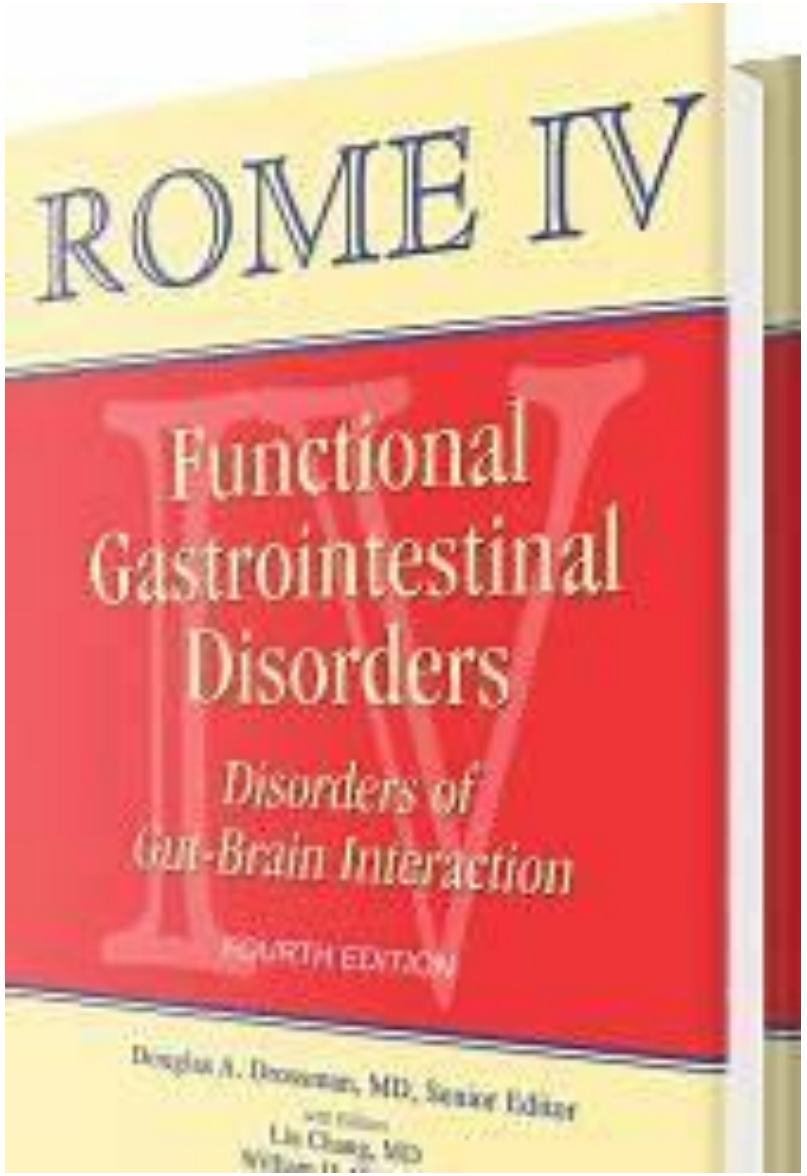
Why Should I Care?



Gastroenterology. 2016 Feb 15:S0016-5085(16)00178-5. doi: 10.1053/j.gastro.2016.02.012. Online ahead of print.

Functional Esophageal Disorders

Qasim Aziz [1], Ronnie Fass [2], C Prakash Gyawali [3], Hiroto Miwa [4], John E Pandolfino [5], Frank Zerbib [6]



Disorders of Gut-Brain Interaction

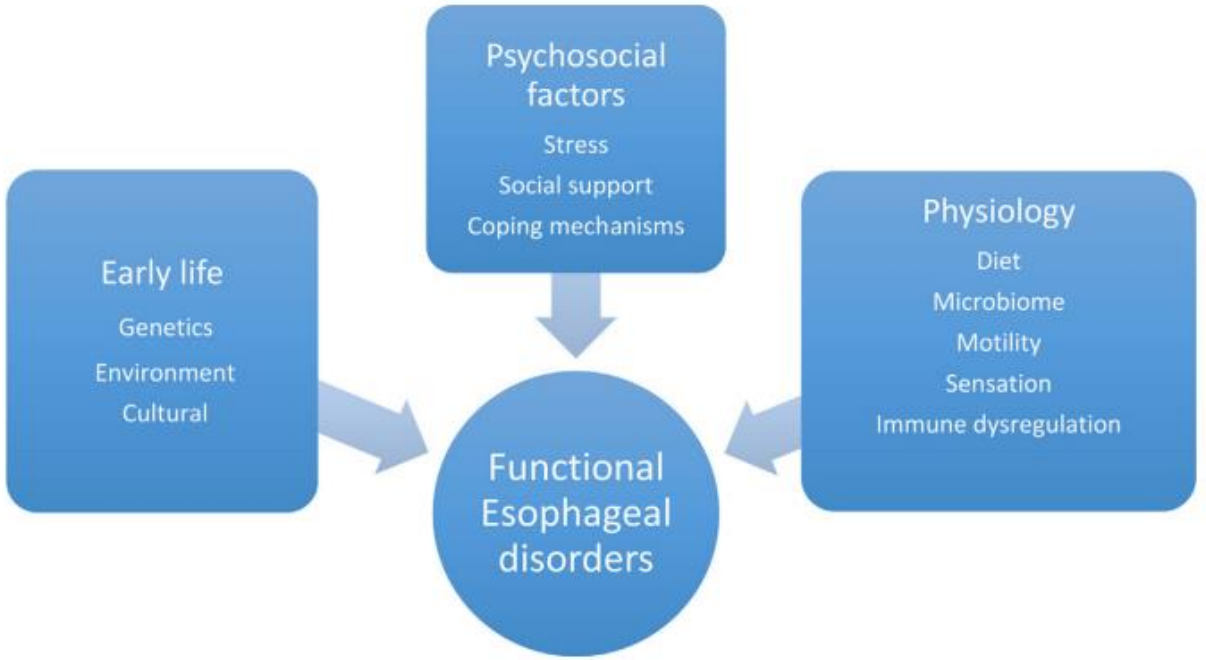


Fig. 2. Interactions between factors related to early life, psychosocial stress, and physiology as the possible pathogenesis of functional esophageal disorders.

Adults

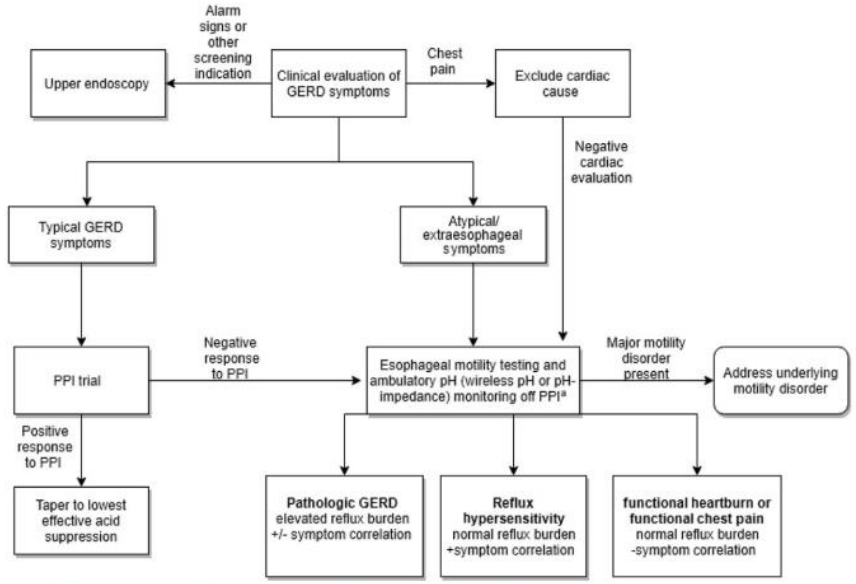


Fig. 1. A recommended algorithm in the clinical evaluation of GERD symptoms leading to definable functional esophageal disorders. PPI, proton pump inhibitor; GERD, gastroesophageal reflux disease. [a]In patients with known pathologic GERD and symptoms on PPI would recommend pH-impedance testing on PPI.

Functional Chest Pain and Esophageal Hypersensitivity

A Clinical Approach

Richa Bhardwaj, MBBS[a], Rita Knotts, MD, MSc[b], Abraham Khan, MD[b,*]

Review > Clin Gastroenterol Hepatol. 2022 May;20(5):984-994.e1. doi: 10.1016/j.cgh.2022.01.025.
Epub 2022 Feb 2.

AGA Clinical Practice Update on the Personalized Approach to the Evaluation and Management of GERD: Expert Review

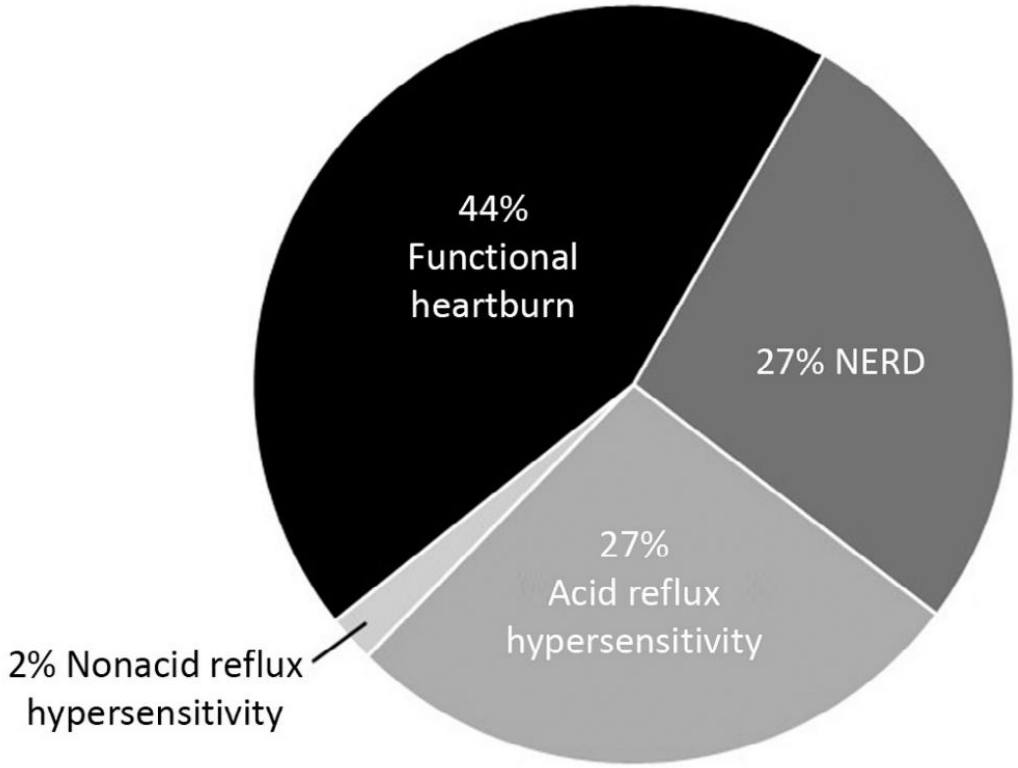
Rena Yadlapati [1], C Prakash Gyawali [2], John E Pandolfino [3];
CGIT GERD Consensus Conference Participants

BEST PRACTICE ADVICE 11: Clinicians should provide pharmacologic neuromodulation, and/or referral to a behavioral therapist for hypnotherapy, cognitive behavioral therapy, diaphragmatic breathing, and relaxation strategies in patients with functional heartburn or reflux disease associated with esophageal hypervigilance reflux hypersensitivity and/or behavioral disorders.

J Pediatr. 2017 Oct:189:86-91. doi: 10.1016/j.jpeds.2017.06.019. Epub 2017 Jul 12.

The Prevalence of Rome IV Nonerosive Esophageal Phenotypes in Children

Lisa B Mahoney [1], Samuel Nurko [1], Rachel Rosen [2]




so
what?

Treatment

- Reflux hypersensitivity- acid suppression and selective serotonin reuptake inhibitors with psychogastroenterology approaches.

- Functional heartburn- Education, pharmacologic neuromodulation, relaxation strategies and psychological interventions (gut-directed hypnotherapy and cognitive behavioral therapy)

Review > Clin Gastroenterol Hepatol. 2022 May;20(5):984-994.e1. doi: 10.1016/j.cgh.2022.01.025. Epub 2022 Feb 2.

AGA Clinical Practice Update on the Personalized Approach to the Evaluation and Management of GERD: Expert Review

Rena Yadlapati [1], C Prakash Gyawali [2], John E Pandolfino [3];
CGIT GERD Consensus Conference Participants


WHAT
ELSE?

› Gastroenterology. 2016 Feb 15:S0016-5085(16)00178-5. doi: 10.1053/j.gastro.2016.02.012. Online ahead of print.

Functional Esophageal Disorders

Qasim Aziz [1], Ronnie Fass [2], C Prakash Gyawali [3], Hiroto Miwa [4], John E Pandolfino [5], Frank Zerbib [6]

Globus

Must include all of the following:

1. Persistent or intermittent, non-painful sensation of a lump or foreign body in the throat with no structural lesion identified on physical examination, laryngoscopy, or endoscopy
2. Occurrence of the sensation between meals
3. Absence of dysphagia or odynophagia.

› Gastroenterology. 2016 Feb 15:S0016-5085(16)00178-5. doi: 10.1053/j.gastro.2016.02.012. Online ahead of print.

Functional Esophageal Disorders

Qasim Aziz [1], Ronnie Fass [2], C Prakash Gyawali [3], Hiroto Miwa [4], John E Pandolfino [5], Frank Zerbib [6]

Rome IV Diagnostic Criteria for Globus ☆

Official Rome IV criteria for the diagnosis of globus.

INSTRUCTIONS

Use in patients with symptoms suggestive of globus, such as a persistent or intermittent non-painful sensation of a lump or foreign body in the throat, for at least 6 months.

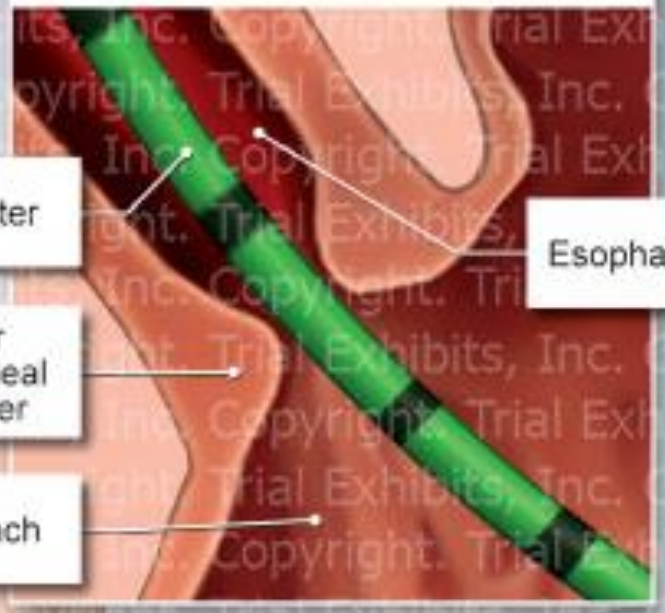
Patients with any of the following features must be evaluated clinically for other diagnoses even though globus may be present:

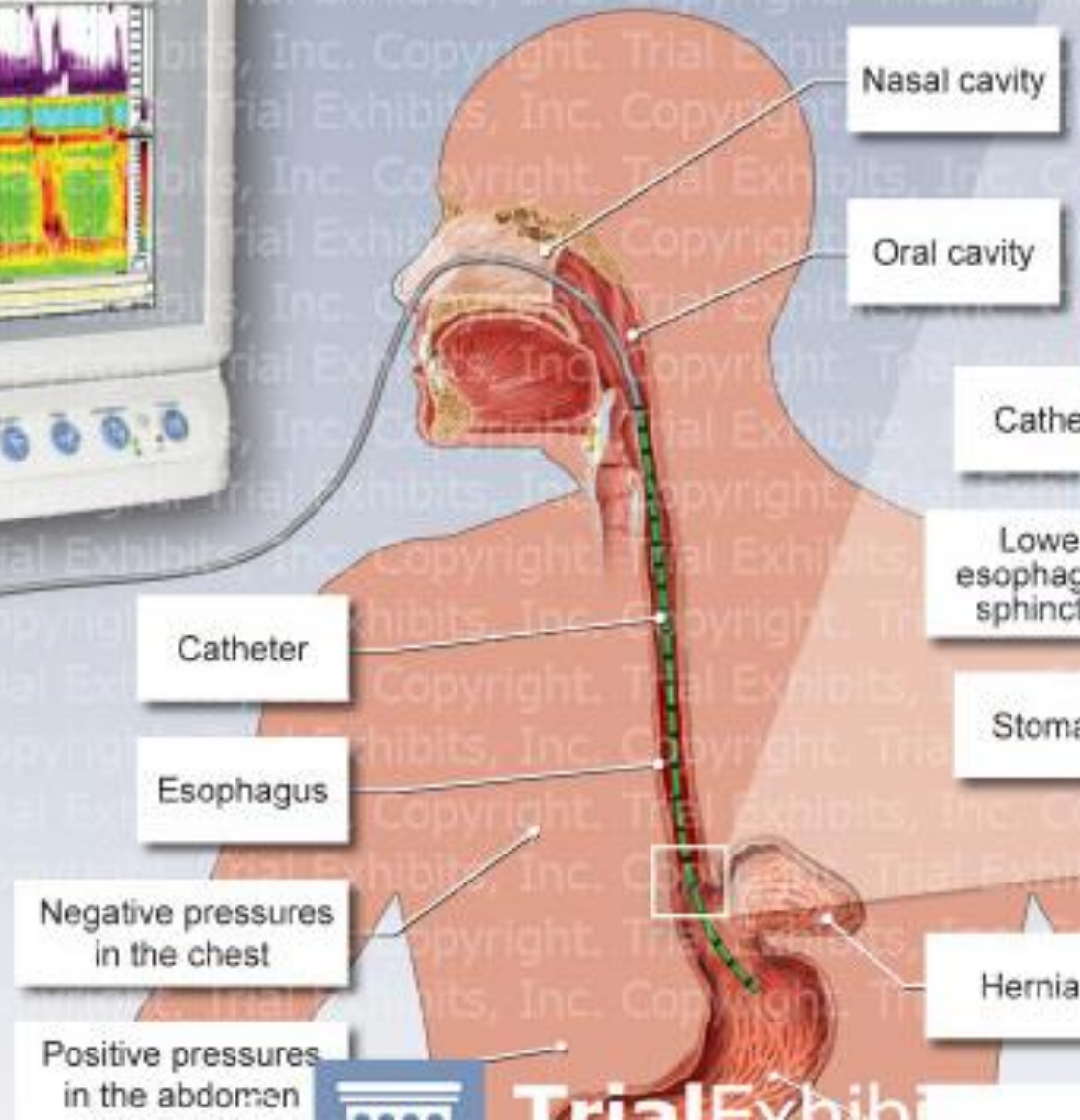
- Dysphagia.
- Odynophagia.
- Sore throat.
- Unexplained iron deficiency anemia.
- Unintentional weight loss.

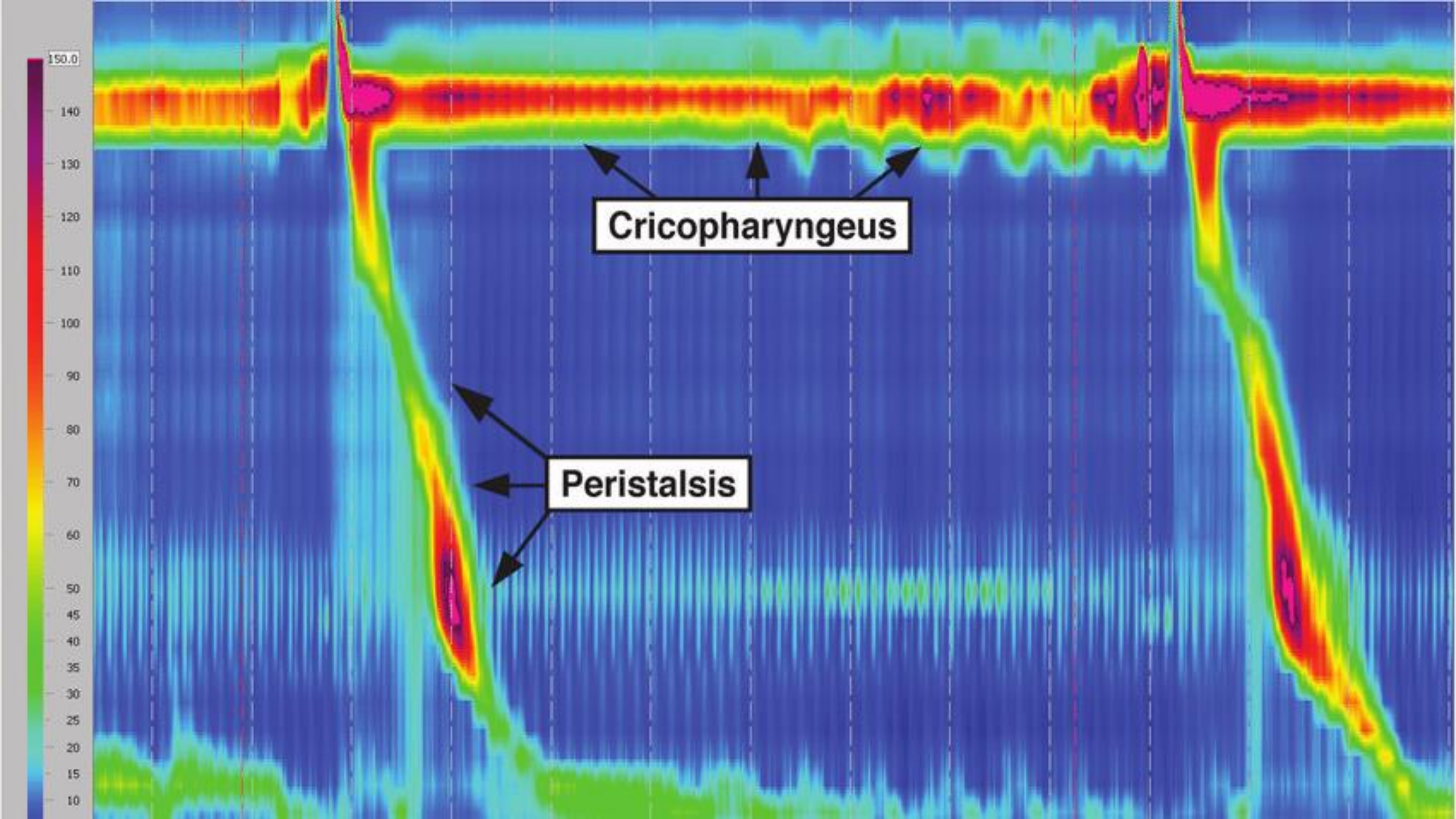
In Some Cases

Monitor with Pressure Wave Tracings

The esophageal manometry catheter measures the effectiveness of the esophageal sphincters and pressure changes in the esophagus during swallowing.



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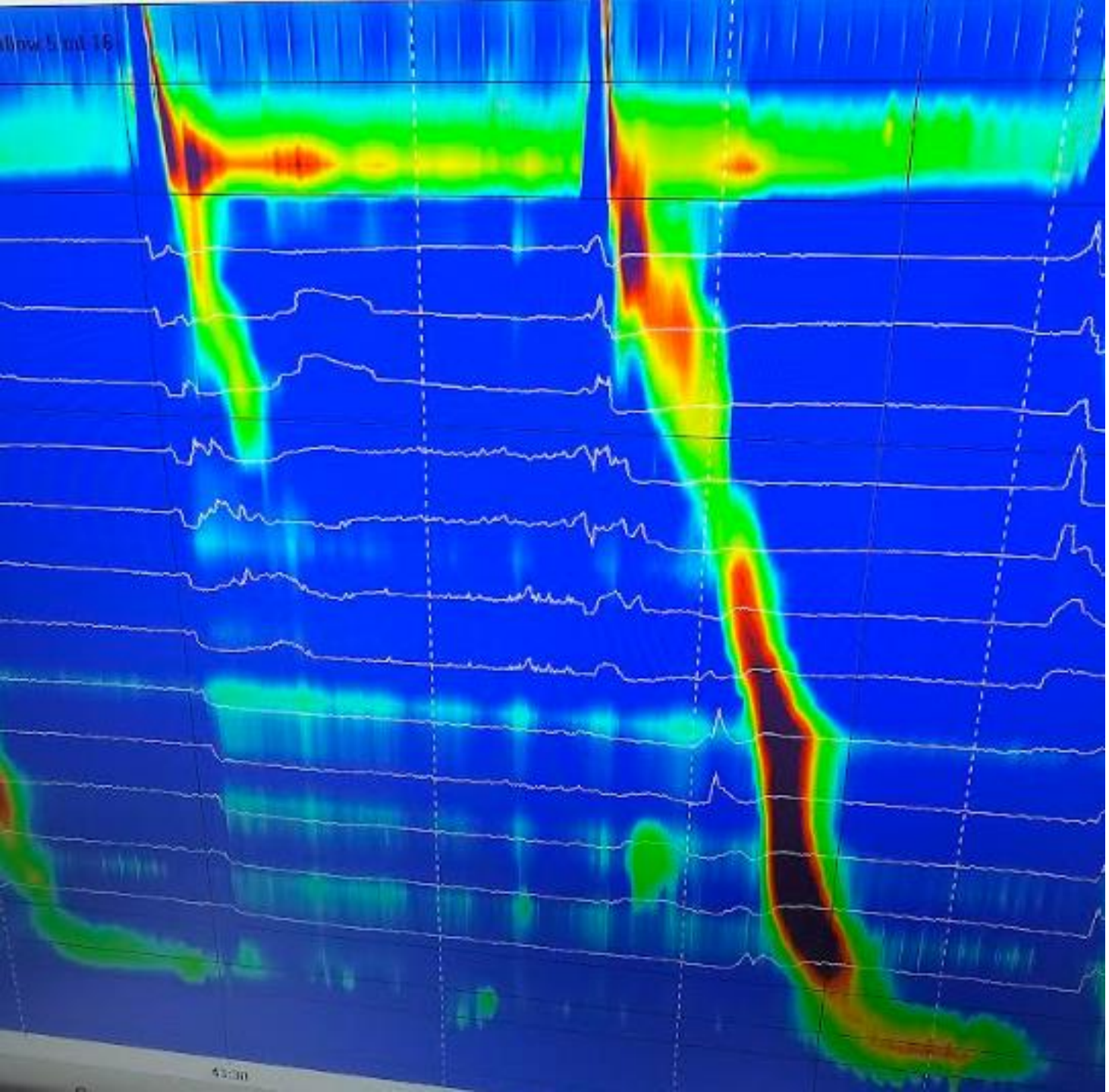
Cricopharyngeus
Peristalsis



Globus

Randomized Controlled Trial > Neurogastroenterol Motil. 2019 Aug;31(8):e13632.

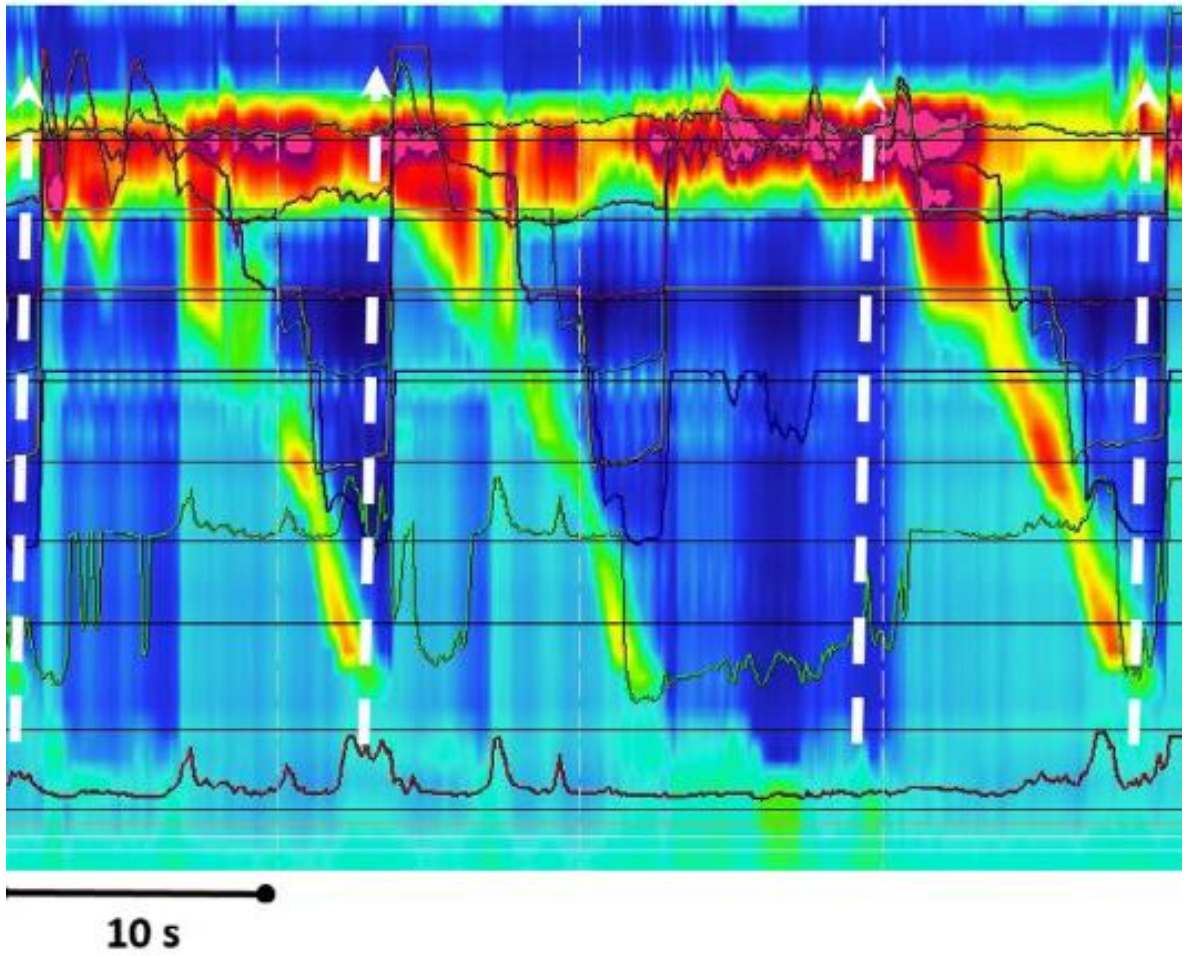
doi: 10.1111/nmo.13632. Epub 2019 May 23.

Effect of citalopram on esophageal motility in healthy subjects-Implications for reflux episodes, dysphagia, and globus

Anastassios C Manolakis [1 2], Charlotte Broers [1], Hannelore Geysen [1], Nick Goelen [1], Brecht Van Houtte [1], Nathalie Rommel [3], Tim Vanuytsel [1 4], Jan Tack [1 4], Ans Pauwels [1]

Abelchia

No dysphagia or odynophagia



Int J Pediatr Otorhinolaryngol. 2022 Oct;161:111261. doi: 10.1016/j.ijporl.2022.111261. Epub 2022 Aug 4.

"I've never been able to burp": Preliminary description of retrograde cricopharyngeal dysfunction in children

Matthew R Hoffman [1], Breanne Schiffer [2], Raza A Patel [3], Marshall E Smith [4]

Case Reports Gastroenterology. 1987 Oct;93(4):818-22. doi: 10.1016/0016-5085(87)90445-8.

Dysfunction of the belch reflex. A cause of incapacitating chest pain

P J Kahrilas, W J Dodds, W J Hogan

Abelchia

- Improvement in supine position, with vomiting or nasogastric tube.
- Patients avoid carbonated beverages and foods that may cause gas.

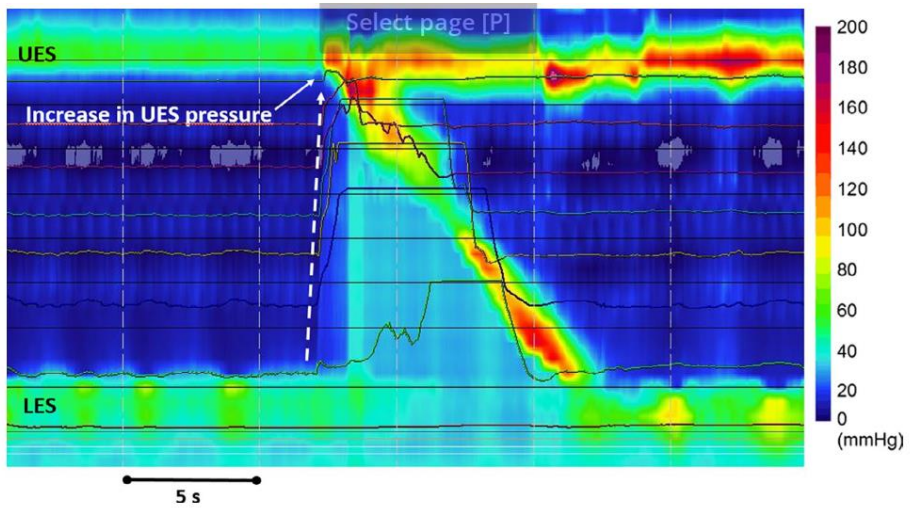


FIGURE 1 Gastroesophageal gas reflux event recorded with high-resolution impedance manometry in a patient with inability to belch. The sequence of events during a gas reflux event was characterized by: (1) retrograde flow of air from the stomach up to the level of the UES; (2) an increase in esophageal pressure to the level of the gastric pressure (common cavity phenomenon) (3) an increased or unchanged UES pressure; (4) failure of UES relaxation with consequently no venting of air across the UES (5) secondary peristalsis transporting the air from the esophagus back to the stomach

Abelchia

Borborigmi, pain neck, chest, abdomen, abdominal distension and flatulence.

Dysfunctional Belch Reflex - DBR ›

PUBLIC GROUP · 72 MEMBERS

Join Group

About

Abelchia

› OTO Open. 2020 Jun 29;4(2):2473974X20938342. doi: 10.1177/2473974X20938342. eCollection 2020 Apr-Jun.

The Long-term Efficacy of Botulinum Toxin Injection to Treat Retrograde Cricopharyngeus Dysfunction

Rebecca C Hoesli [1], Melissa L Wingo [1], Robert W Bastian [1]

Not Enough Belching?

What About Too Much Belching?

25-30 day

Belching is associated with dyspepsia and heartburn

J Neurogastroenterol Motil. 2021 Oct 30;27(4):581-587. doi: 10.5056/jnm20225.

Heartburn, Functional Dyspepsia, Anxiety/Depression, and Sleep Disturbances Are Associated With Clinically Significant Belching

Yasuhiro Fujiwara [1], Masatsugu Okuyama [2], Yasuaki Nagami [1], Koichi Taira [1], Hirotaka Ishizu [2], Osamu Takaishi [2], Hiroshi Sato [2], Toshio Watanabe [1]

Gastric belching related reflux is seen in children with acid exposure

Editorial > Neurogastroenterol Motil. 2022 Jan;34(1):e14194. doi: 10.1111/nmo.14194. Epub 2021 Jun 30.

Belching in children: Prevalence and association with gastroesophageal reflux disease

Daisuke Masui [1 2], Kornilia Nikaki [1], Akinari Sawada [1 3], Shirley Sonmez [1], Etsuro Yazaki [1], Daniel Sifrim [1]

Supragastric Belching responsible of 1/3 of esophageal exposure to acid

› Neurogastroenterol Motil. 2022 Dec 20;e14520. doi: 10.1111/nmo.14520. Online ahead of print.

The influence of supragastric belching severity on esophageal acid exposure and motility

Ilia Sergeev [1 2], Monica Velosa [1 2], Roxana Mardare [1 2], Etsuro Yazaki [1 2], Daniel Sifrim [1 2]

Yes, There Is...

Too Much Vomiting?

Is It Really Vomiting?

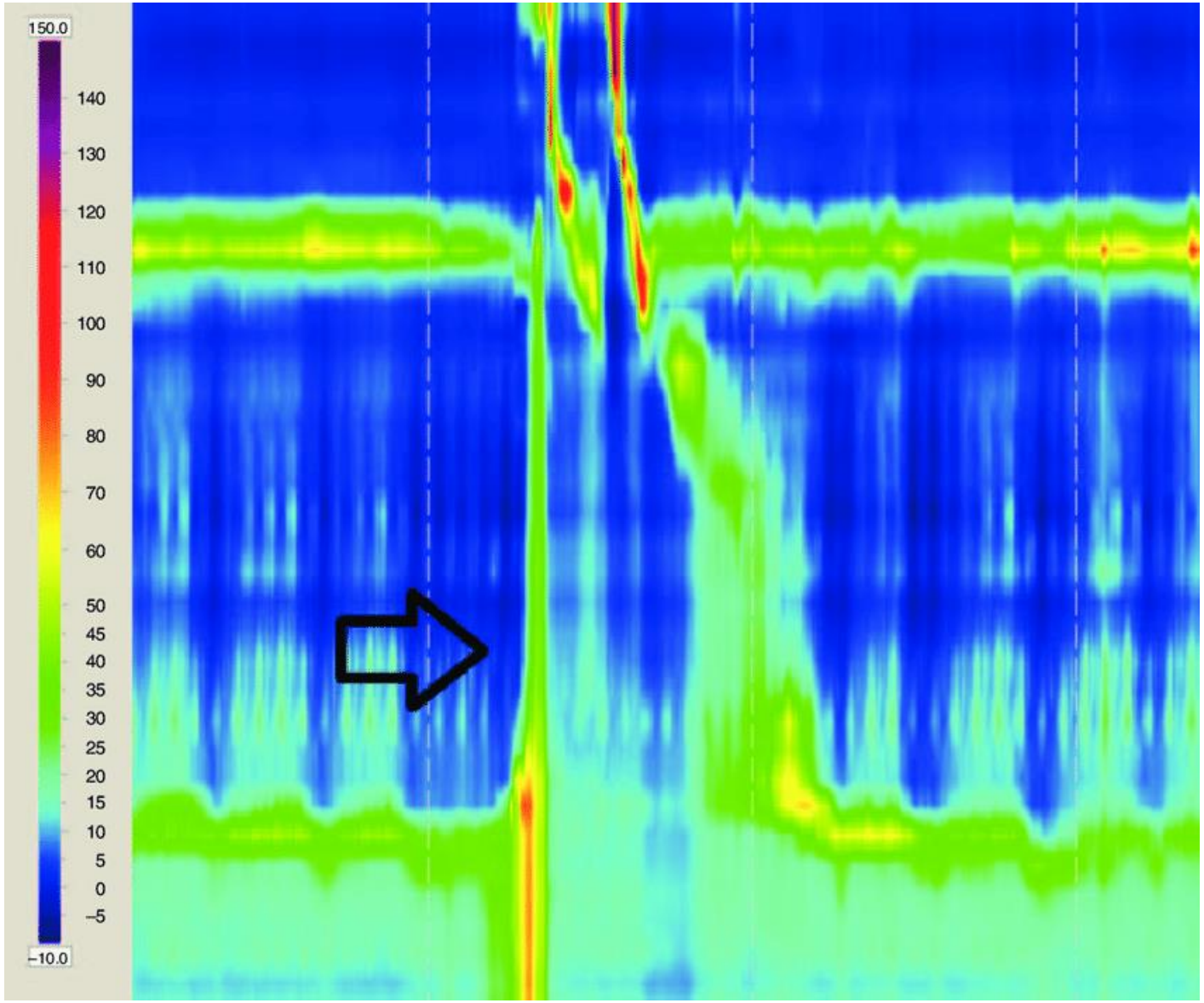
Rumination

G2. RUMINATION SYNDROME

Diagnostic criteria *Must include **all** of the following for at least 2 months:*

1. Repetitive contractions of the abdominal muscles, diaphragm, and tongue
2. Effortless regurgitation of gastric contents, which are either expelled from the mouth or rechewed and reswallowed
3. Three or more of the following:
    1. Onset between 3 and 8 months
    2. Does not respond to management for GERD and regurgitation
    3. Unaccompanied by signs of distress
    4. Does not occur during sleep and when the infant is interacting with individuals in the environment

Rumination


150.0
140
130
120
110
100
90
80
70
60
50
45
40
35
30
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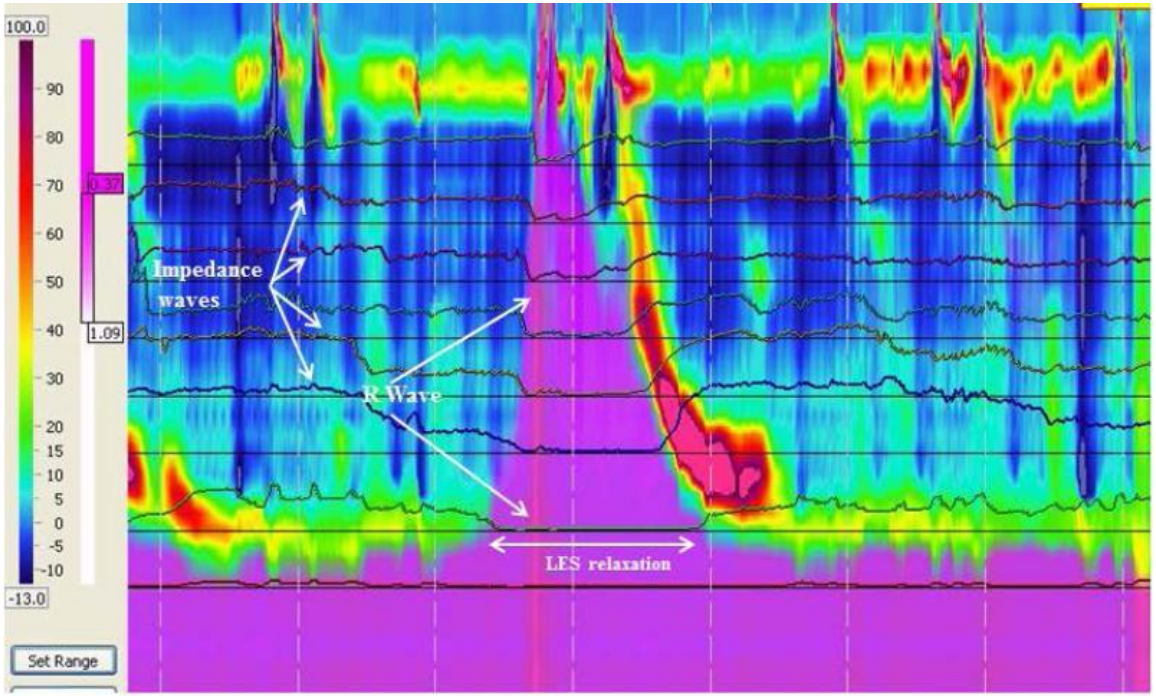
20
15
10
5
0
−5
−10.0

Secondary rumination

There is LES relaxation with retrograde flow before the R wave occurs



› Neurogastroenterol Motil. 2017 May;29(5):10.1111/nmo.12998. doi: 10.1111/nmo.12998. Epub 2016 Dec 21.

Pediatric rumination subtypes: A study using high-resolution esophageal manometry with impedance

R Rosen [1], L Rodriguez [1], S Nurko [1]

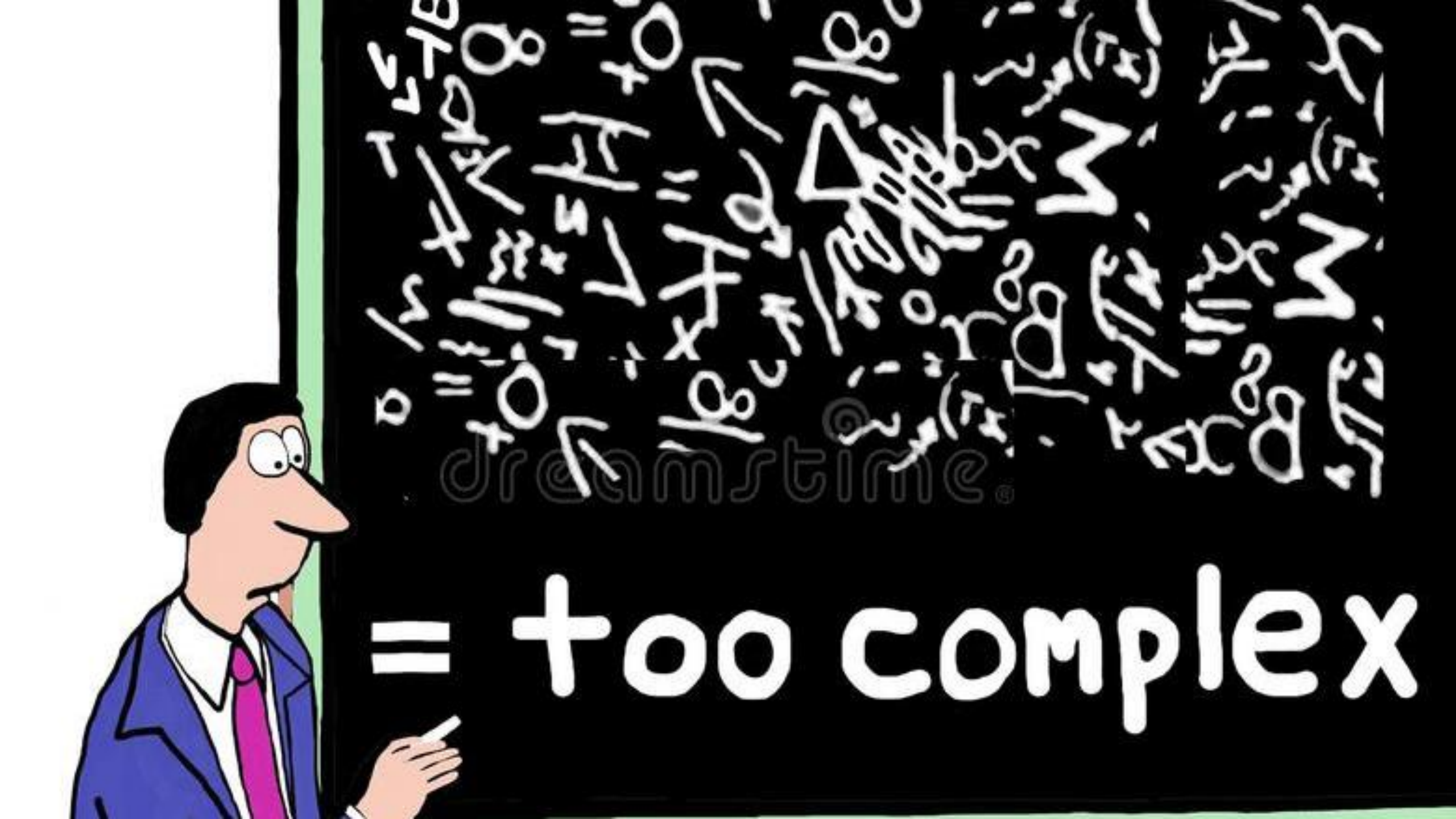
It Is Vomiting, And A Lot of It…

Cyclic Vomiting Syndrome

H1a. Diagnostic Criteria for Cyclic Vomiting Syndrome

Must include all of the following:

1. The occurrence of 2 or more periods of intense, unremitting nausea and paroxysmal vomiting, lasting hours to days within a 6-month period.
2. Episodes are stereotypical in each patient
3. Episodes are separated by weeks to months with return to baseline health between episodes.
4. After appropriate medical evaluation, the symptoms cannot be attributed to another condition.

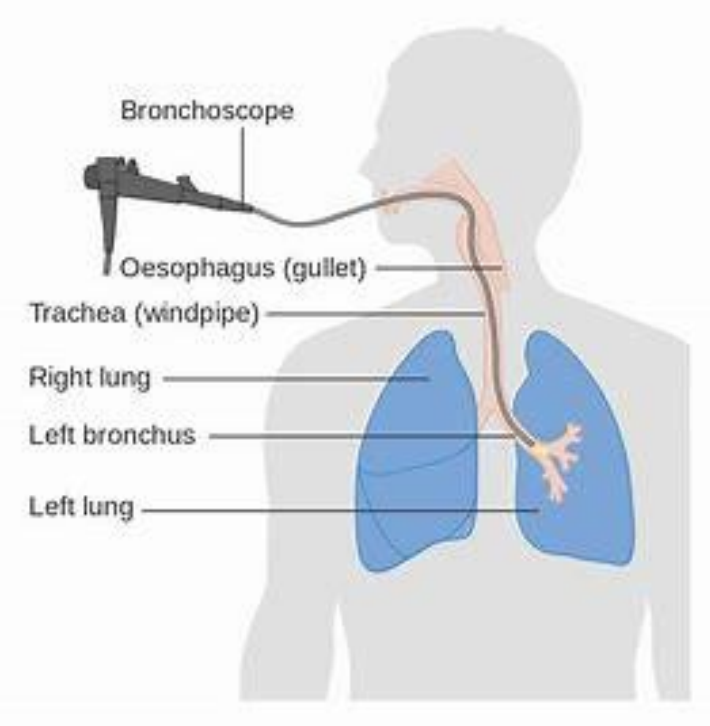

= too complex

Cannot
Do It Alone

Interdisciplinary Team

Aerodigestive Programs

Esophagogastroduodenoscopy/ bronchoscopy/laryngoscopy



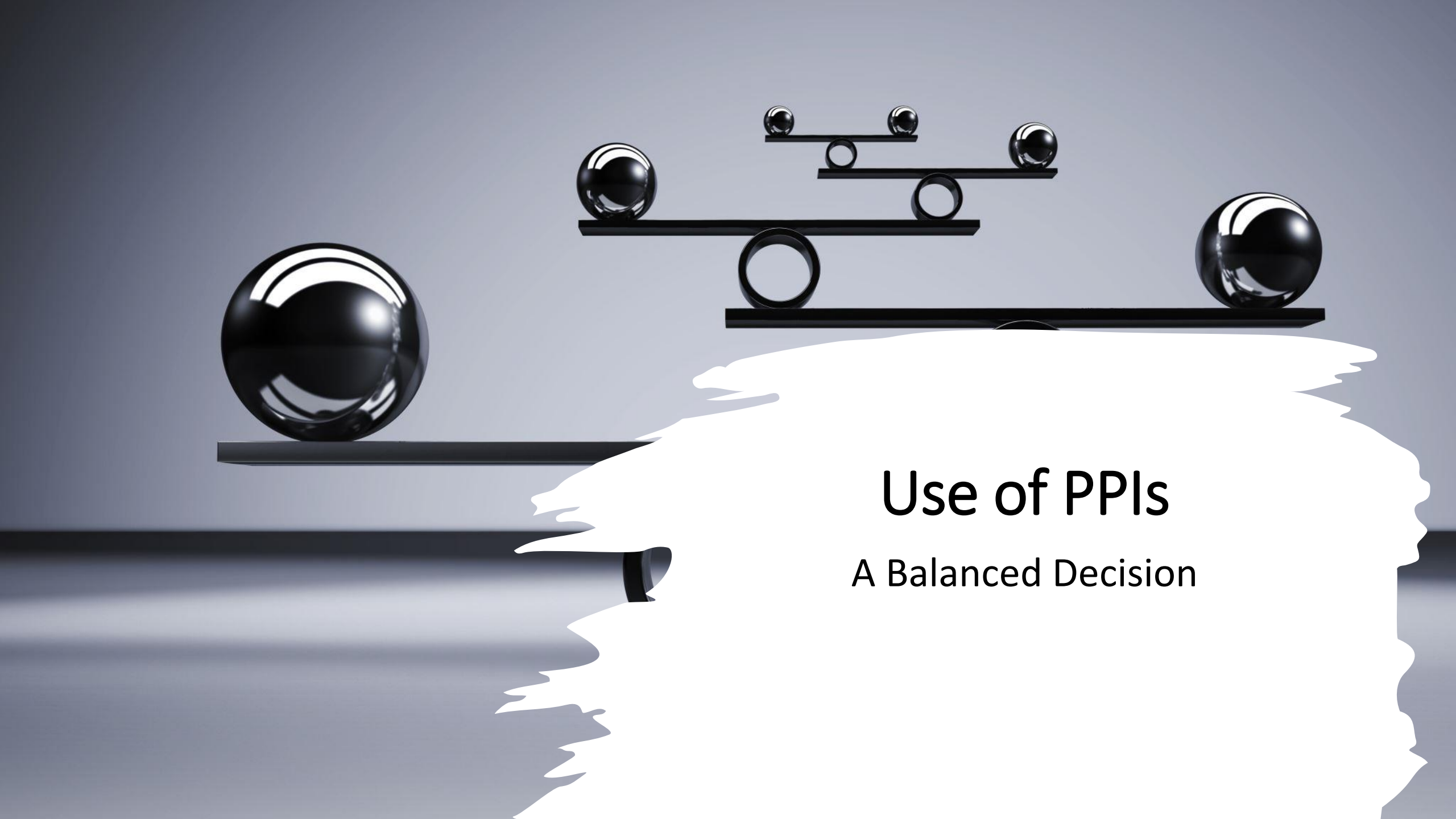
Pediatrics. 2018 Mar;141(3):e20171701. doi: 10.1542/peds.2017-1701. Epub 2018 Feb 7.

Structure and Functions of Pediatric Aerodigestive Programs: A Consensus Statement

R Paul Boesch [1], Karthik Balakrishnan [2], Sari Acra [3], Dan T Benscoter [4], Shelagh A Cofer [2], Joseph M Collaco [5], John P Dahl [6], Cori L Daines [7], Alessandro DeAlarcon [4], Emily M DeBoer [8], Robin R Deterding [8], Joel A Friedlander [8], Benjamin D Gold [9], Rayna M Grothe [2], Catherine K Hart [4], Mikhail Kazachkov [10], Maureen A Lefton-Greif [5], Claire Kane Miller [4], Paul E Moore [3], Scott Pentiuk [4], Stacey Peterson-Carmichael [6], Joseph Piccione [11], Jeremy D Prager [8], Philip E Putnam [4], Rachel Rosen [12], Michael J Rutter [4], Matthew J Ryan [11], Margaret L Skinner [5], Cherie Torres-Silva [4], Christopher T Wootten [3], Karen B Zur [11], Robin T Cotton [4], Robert E Wood [4]

Take Home

- GER is common
- Treat when bothersome
- Education
- Pathophysiology



Use of PPIs

A Balanced Decision

Take Home

- Not everything is GER or should be treated with PPIs
- Recognize adverse effects of PPIs
- Differential diagnosis
- Interdisciplinary


THANK YOU

“Pediatric Aero-Digestive Disorders in the New Century”

A Valley-Mount Sinai Kravis Children's Hospital educational symposium.

Valley Health System

Mount Sinai

CHILDREN’S HEALTH