The Fussy Infant

HOW TO DIAGNOSE AND TREAT COMMON INFANCY CONDITIONS

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Conflicts of Interest

I have no Conflicts of Interest to disclose

Educational Outcomes

As a result of attending this session, participants will be able to:

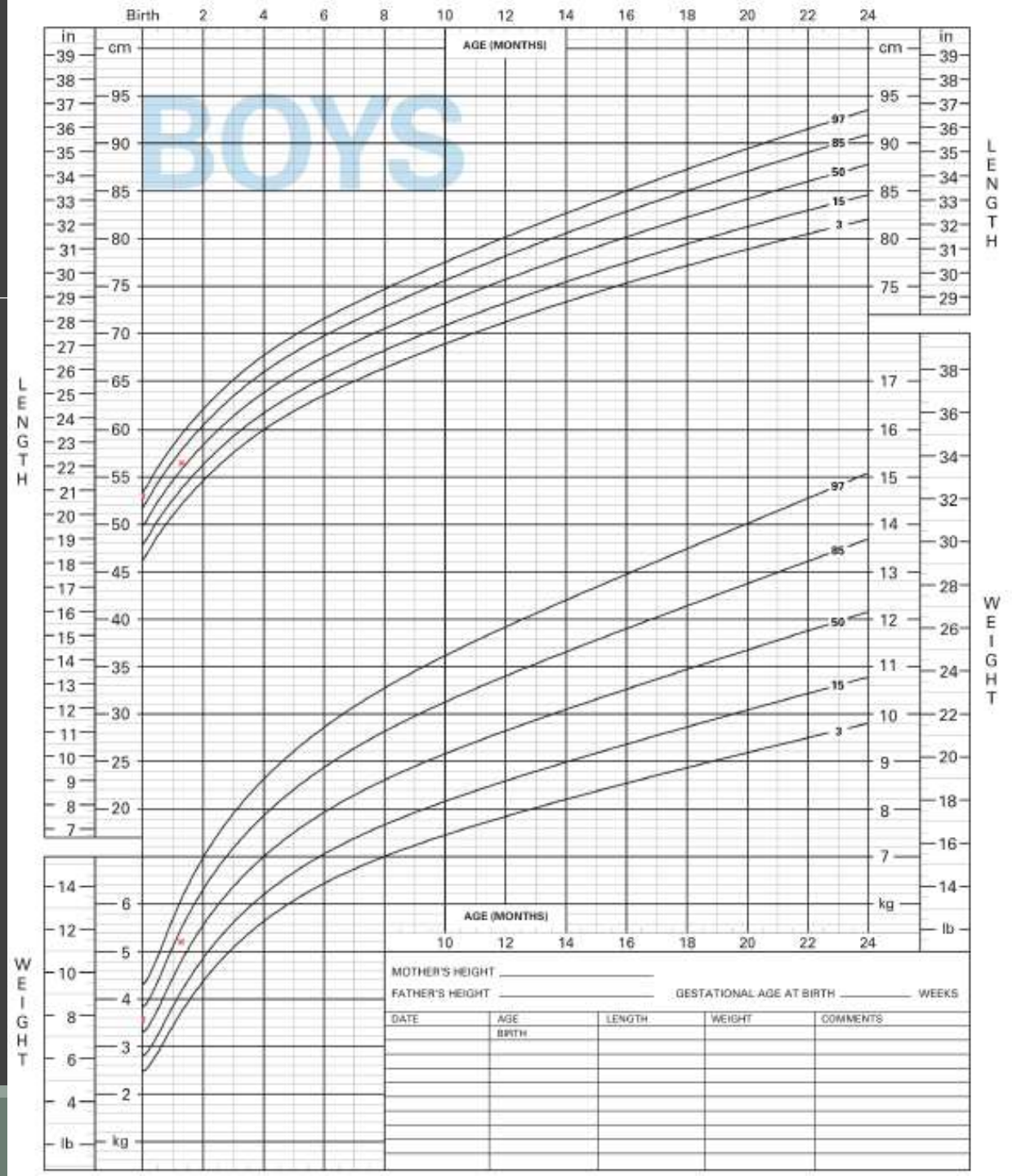
- ❑ Diagnose common infancy conditions such as colic and reflux
- ❑ Identify red flags that point to alternate diagnoses
- ❑ Counsel parents and provide treatment plans

Case 1 – Cry Baby

Age: 4 weeks
Presenting complaint: crying… pain?
PMHX: term uncomplicated pregnancy and delivery
No neonatal complications
Previously seen at 2 weeks of life and had regained birthweight
Feeding: Exclusively breastfed
Voiding well
Stools 3-4/day
No regurgitation

Growth Curve

Physical exam: unremarkable



Infantile Colic

The Rome III criteria for functional gastrointestinal disorders defines infantile colic as including all of the following in infants younger than four months of age:

- ✓paroxysms of irritability, fussiness or crying that start and stop without obvious cause;
- ✓episodes lasting 3 h or more per day and occurring at least three days per week for at least one week; and
- ✓no failure to thrive.

Associated factors

- Gender
- Gestational age
- Type of Feeding
- Socioeconomic status
- Season

Treatment – Dietary Modifications

Time-limited trials (2 weeks)

Breast fed – eliminating cow's milk from mother's diet

Bottle fed – empiric trial of extensively hydrolyzed formula

The use of soy formulas in the treatment of infantile colic should be avoided

Canadian Paediatric Society

Breast fed - Low allergen diet (Cow's Milk, eggs, peanuts, tree nuts, wheat, soy and fish)

Bottle fed - Hydrolyzed formula

Return to usual diet after 6 months of age

AAFP

Treatment - Medications

Simethicone

Protein Pump Inhibitor

Treatment – Complementary and Alternative

Probiotics (*Lactobacillus reuteri*) – breastfed infants

Chiropractic and osteopathic manipulation

Herbal teas

Gripe water

Treatment

Parental Reassurance

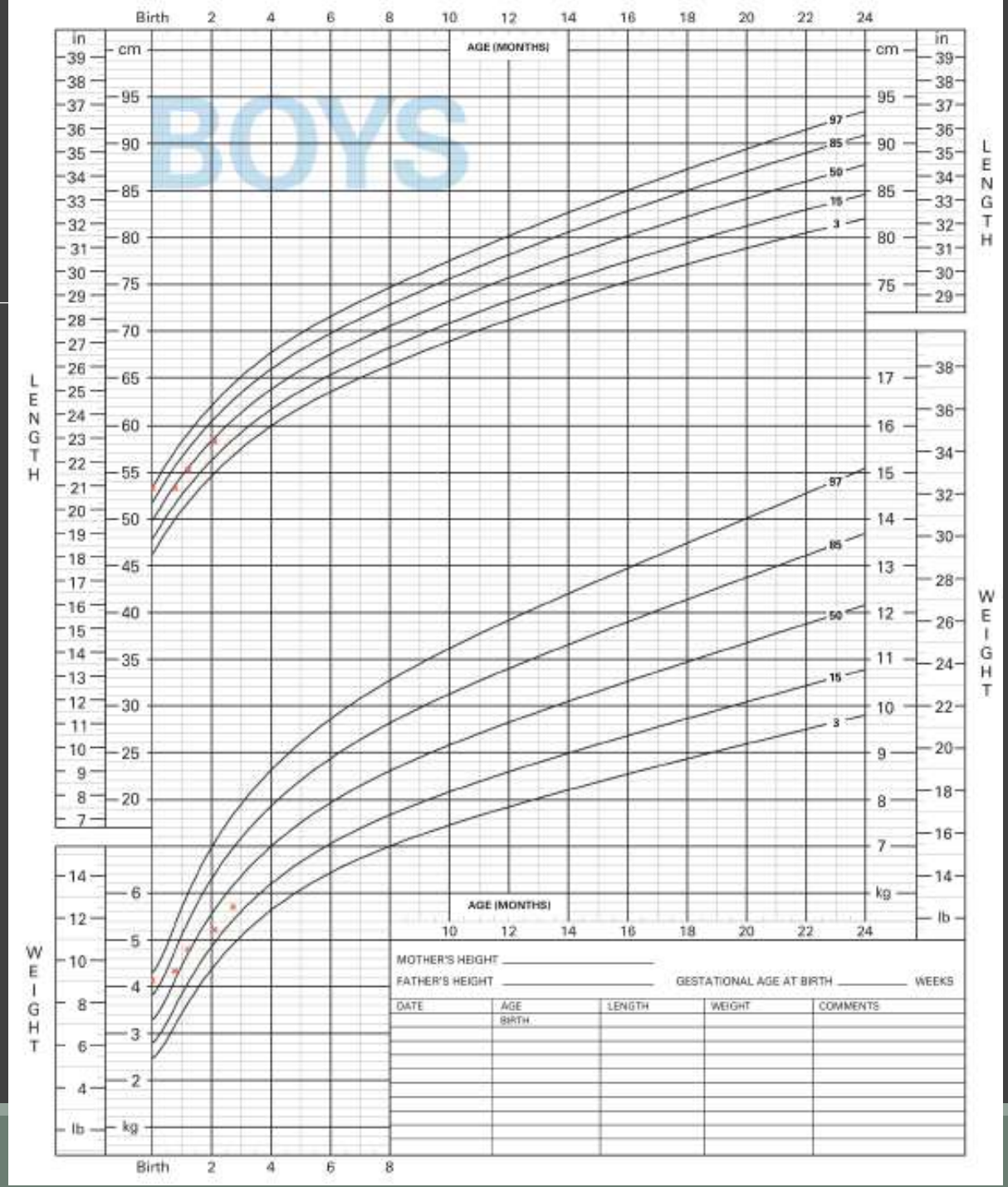
- Not “curing the colic” but rather helping the caregivers get through this challenging time
- Screen for depression and lack of social support
- Provide continued care to the family
- Use of Logs? Baby’s Day Diary vs Crying Patterns Questionnaire

Case 2 – Too much laundry!

Age: 6 weeks
Presenting complaint: regurgitation
PMHX: term pregnancy complicated by GDM
Born at 38 weeks by c/s
Neonatal hypoglycemias, resolved with formula supplementation
Feeding: Breast feeding with occasional bottle feeds (formula) and “top offs”
Voiding well
Stools 3-4/day
Regurgitation “all the time”

Growth Curve

Physical exam: unremarkable



Definitions

GER: the passage of gastric contents into the esophagus with or without regurgitation and vomiting

GERD: when GER leads to troublesome symptoms that affect daily functioning and/or complications

Refractory GERD: GERD, not responding to optimal treatment after 8 weeks

Optimal treatment: Maximum pharmacologic and/or non-pharmacologic therapy based on the available health-care facilities in the region of practice of the subspecialist

* Adapted from NASPGHAN Guidelines

History

Age of onset of symptoms (1 week to 6 months)

Feeding history (length of feeds, volume, type of formula vs milk supply, restriction of allergens, time interval between feeds)

Pattern of regurgitation/vomiting (ex immediately post prandial, digested vs undigested, nocturnal)

The growth curve

Prior interventions – behavioral, pharmacologic and dietary

Presence/absence of warning signs

TABLE 3: *'Red flags' suggesting more worrisome disorders requiring further investigation and management.*

SIGNS AND SYMPTOMS	REMARKS
General	
Weight loss	Suggests a variety of conditions, including systemic infections
Lethargy	
Fever	
Excessive irritability/pain	
Dysuria	May suggest urinary tract infection, especially in infants
Onset of regurgitation/vomiting >6 months increasing/persisting >12-18 months of age	Late onset as well as symptoms increasing or persistings 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	
Gastrointestinal	
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
Hematemeisis	Suggests a potentially serious bleed from the esophagus, stomach or upper gut, possibly GERD-associated, occurring from acid-peptic disease.* Mallory-Weiss tear† or reflux-esophagitis.
Chronic diarrhea	May suggest food protein-induced gastroenteropathy‡
Rectal bleeding	Indicative of multiple conditions, including bacterial gastroenteritis, inflammatory bowel disease, as well as acute surgical conditions and food protein-induced gastroenterapthy rectal bleeding‡ (bleeding caused by proctocolitis)
Abdominal distension	Indicative of obstruction, dysmotility, or anatomic abnormalities

GERD = gastroesophageal reflux disease
*Especially with non-steroidal anti-inflammatory drugs
†Associated with vomiting.
‡More likely in infants with eczema and/or a strong family history of atopic disease.

Differential Diagnosis

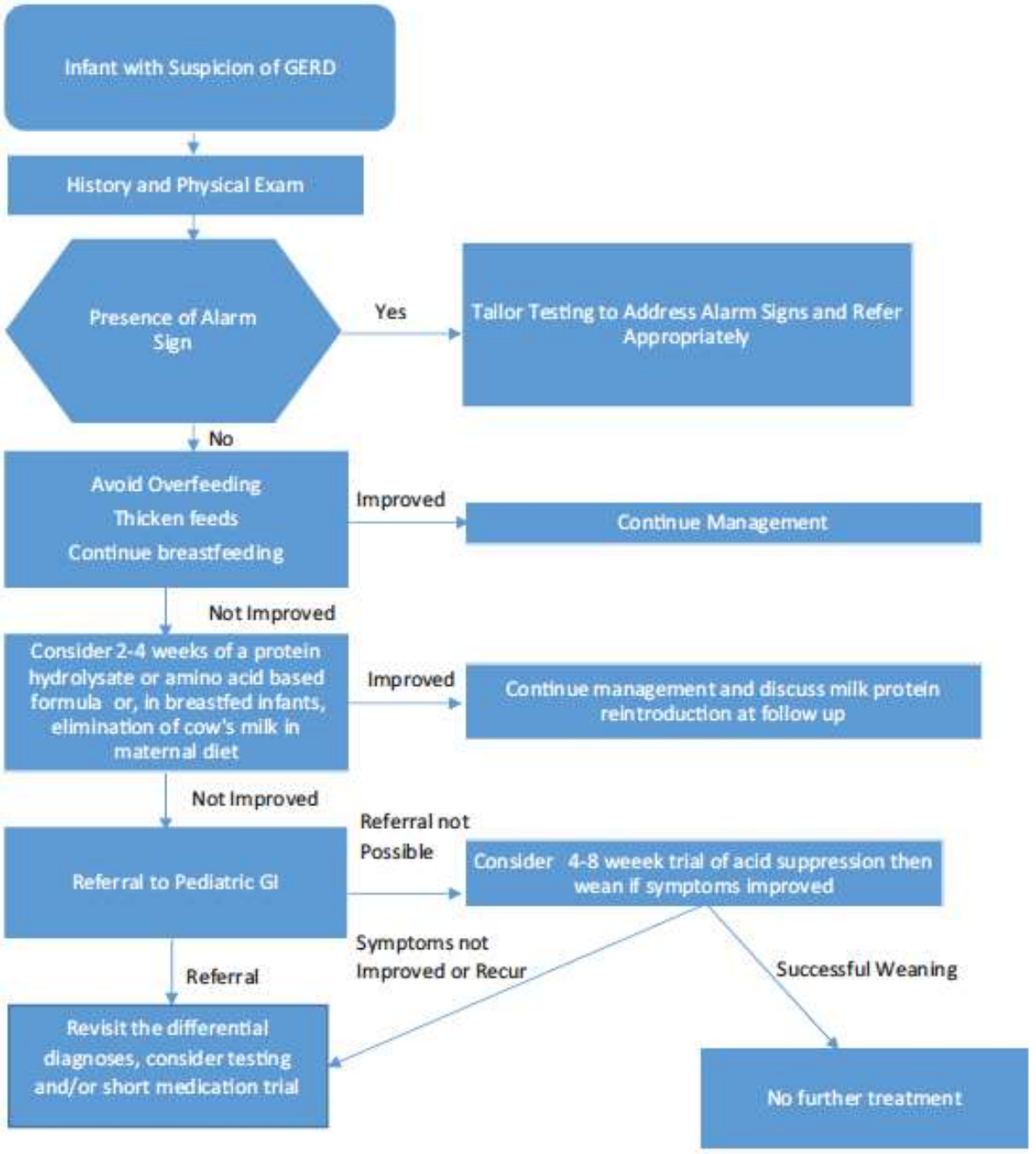
TABLE 3. Differential diagnosis of gastroesophageal reflux disease

Gastrointestinal obstruction	Other gastrointestinal disorders
Pyloric stenosis	Achalasia
Malrotation with volvulus	Gastroparesis
Intussusception	Gastroenteritis
Hirschsprung disease	Peptic ulcer
Antral/duodenal web	Eosinophilic esophagitis
Foreign body	Food allergy/intolerance
Incarcerated hernia	Inflammatory bowel disease
Superior mesenteric artery (SMA) syndrome	Pancreatitis
	Appendicitis
Neurologic	Infectious
Hydrocephalus	Sepsis/meningitis
Subdural hematoma	Urinary tract infection
Intracranial hemorrhage	Upper/lower airway infection
Intracranial mass	Otitis media
	Hepatitis
Metabolic/endocrine	Others
Galactosemia	Pediatric condition falsification (PCF)/factitious disorder by proxy (FDP)
Hereditary fructose intolerance	Child neglect or abuse
Urea cycle defects	Self-induced vomiting
Amino and organic acidemias	Cyclic vomiting syndrome
Fatty acid oxidation disorders	Rumination syndrome
Metabolic acidosis	
Congenital adrenal hyperplasia/adrenal crisis	
Toxic	Renal
Lead poisoning	Obstructive uropathy
Other toxins	Renal insufficiency
Cardiac	
Heart failure	
Vascular ring	
Autonomic dysfunction	

ESPGHAN = European Society for Pediatric Gastroenterology, Hepatology, and Nutrition; GERD = gastroesophageal reflux disease; NASPGHAN = North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition.

*Adapted from the ESPGHAN/NASPGHAN 2009 GERD guidelines.

NASPGHAN ALGORITHM



ALGORITHM 1. Management of the symptomatic infant.

Investigations

Not recommended

- Barium study (can identify TEF or esophageal stasis)
- Ultrasonography (pyloric stenosis)
- Esophagogastroduodenoscopy (esophagitis, hiatal hernia or complications such as strictures/Barrett's)

Manometry – no studies to include

Non-pharmacologic treatment

Cereal based thickeners

- Advantages: dissolves thoroughly, affordability, long track record of use in infants
- Disadvantages: FDA warning, limit 100 ppb of inorganic arsenic in rice products

Commercial thickeners

- Xanthum gum (older than age 1 – NEC)
- Carob bean thickeners infants > 42 weeks gestation

Non-pharmacologic treatment

✓ Reduction of ingested volume

✓ Elimination of Cow's Milk Protein

Positioning therapy – left side or head elevation

✗ Massage therapy

✗ Prebiotics, probiotics, herbal medications

Pharmaco-therapy

TABLE 4. Dosages of most frequently used drugs for the treatment of gastroesophageal reflux disease

Drugs	Recommended pediatric dosages	Max
Histamine-2 Receptor Antagonists (H2RAs)		
Ranitidine	5–10 mg/kg/day	
Cimetidine	30–40 mg/kg/day	
Nizatidine	10–20 mg/kg/day	
Famotidine	1 mg/kg/day	
Proton Pump Inhibitors (PPIs)		
Omeprazole	1–4 mg/kg/day	
Lansoprazole	2 mg/kg/day for infants	
Esomeprazole	10 mg/day (weight <20kg) or 20 mg/day (weight >20kg)	
Pantoprazole	1–2 mg/kg/day	
Prokinetics		
Metoclopramide	0.4-0.9 mg/kg/day	
Domperidone	0.8–0.9 mg/kg/day	
Baclofen	0.5 mg/kg/day	
Antacids		
Mg alginate plus simethicone	2.5 ml 3×/day (weight < 5kg) or 5 ml 3×/day (weight >5 kg)	
Sodium alginate	225 mg sodium alginate and magnesium alginate 87.5 mg) in a total 0.65 g One sachet/day (weight <4.54 kg) or Two sachet/day (weight >4.54 kg)	

In Summary

Treatment options for GERD

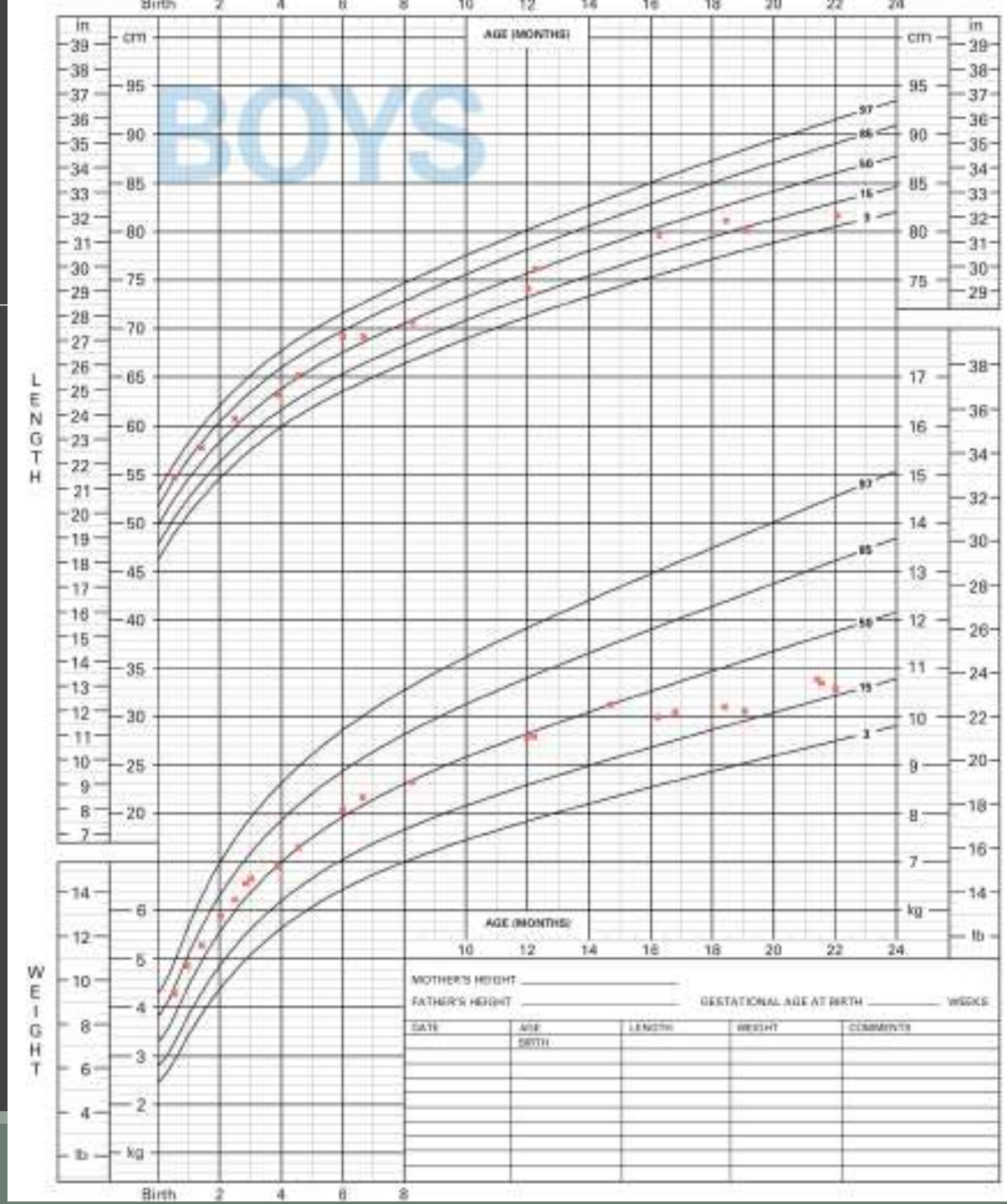
- ❑ Avoid overfeeding
- ❑ Thicken Feeds
- ❑ Hydrolysed vs. Elimination Diet (2-4 week trial)
- ❑ Antacid treatment (4-8 week trial)

Case 3 – Pooped

Age: 4 weeks
Presenting complaint: are these poops normal?
PMHX: 32 yo G3P3 term uncomplicated pregnancy
Mild RDS at birth requiring CPAP x 6 hours
Feeding: Breast feeding
Voiding well
Stools 7-8/day
Greenish/mucous
Occasional reflux

Growth Curve:

Physical Exam: eczema



Definitions

Food allergy - adverse reaction caused by an immune response that is specific and manifests itself in a reproducible manner after repeated exposure to the food

Intolerance - non immune reaction to food,

- Enzymatic ex lactase
- Pharmacologic ex vasoactive amines or histamine containing food
- Toxic ex Scrombroidosis
- Unspecified - sulfite, msg

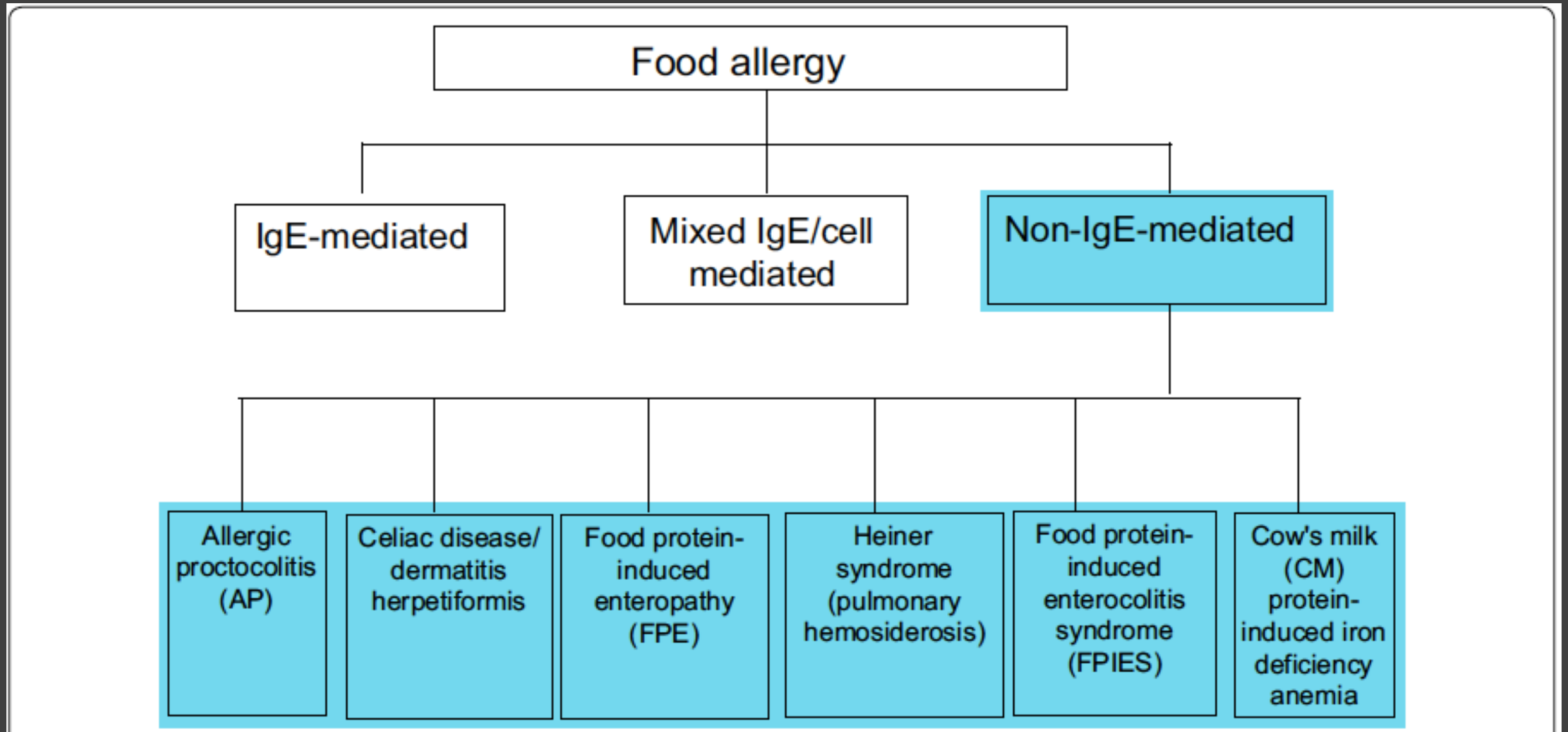


Fig. 1 Classification of non-IgE-mediated food hypersensitivity

Food Protein-Induced Allergic Proctocolitis

Symptoms usually present between 1-4 weeks of age

Blood streaked, mucousy stool → diarrhea

Otherwise healthy and growing well

Predominantly breastfed infants

Family history of atopy (25%)

Diagnosis

Exclude other sources of blood in the stools

Therapeutic trial of an exclusion diet

After resolution of symptoms can reintroduce offending food to confirm the diagnosis (!)

Presence of Eosinophilia

No skin testing

Management

Breastfed: Elimination of cow milk → soy → meat

Formula fed: hydrolyzed formula

Nutritionist

Support Groups

Natural Evolution

Most resolve by age 9-12 months

Milk Ladder

Features of FPIES vs AP

Table 1 Key features of FPIES, AP and FPE [1–4]

	FPIES	AP
Typical age of onset	Days to 1 year; may be older in case of solid foods	Days to 6 months, usually 1–4 weeks; later onset in older children also reported
Food proteins implicated		
Most common	CM, soy	CM, soy
Less common	Rice, oat, egg, barley, chicken, turkey, fish, pea	Wheat, egg, corn, meat, fish, sesame
Symptoms		
Emesis	Prominent	Absent
Diarrhea	Severe in chronic FPIES	Absent or mild
Bloody stools	Severe in chronic FPIES	Prominent
Edema	Acute, severe	Mild, infrequent
Shock	15–20%	Absent
Failure to thrive	Moderate in chronic FPIES	Absent
Lethargy, pallor	Moderate	Absent
Laboratory findings		
Anemia	Moderate	Mild, infrequent
Hypoalbuminemia	Acute	Mild, infrequent
Malabsorption[D]	Absent	Absent
Leukocytosis with neutrophils	Prominent	Absent

Major criteria + >= 2 minor criteria

TABLE V. Diagnostic criteria for the interpretation of OFCs in patients with a history of possible or confirmed FPIES

Major criterion	Minor criteria
Vomiting in the 1- to 4-h period after ingestion of the suspect food and the absence of classic IgE-mediated allergic skin or respiratory symptoms	1. Lethargy 2. Pallor 3. Diarrhea 5-10 h after food ingestion 4. Hypotension 5. Hypothermia 6. Increased neutrophil count of ≥1500 neutrophils above the baseline count

Treatment

Oral rehydration if mild symptoms, otherwise…

IV rehydration NS bolus 20 ml/kg

Methylpred 1-2 mg/kg

Vasopressors if persistent hypotension

Methylene Blue

Bicarb for acidosis

Ondansetron 0.15mg/kg/dose IV (some case studies)

FPIES Culprits

TABLE VIII. Common food coallergies in children with FPIES

FPIES to:	Clinical cross-reactivity/ coallergy	Observed occurrence*
CM	Soy	<30% to 40%
	Any solid food	<16%
Soy	CM	<30% to 40%
	Any solid food	<16%
Solid food (any)	Another solid food	<44%
	CM or soy	<25%
Legumes*	Soy	<80%
Grains: rice, oats, etc*	Other grains (including rice)	About 50%
Poultry*	Other poultry	<40%

TABLE VI. Management of acute FPIES episode at the medical facility

Presenting symptoms		
Mild	**Moderate**	**Severe**
Symptoms		
1-2 Episodes of emesis No lethargy	>3 Episodes of emesis and mild lethargy	>3 Episodes of emesis, with severe lethargy, hypotonia, ashen or cyanotic appearance
Management		
1. Attempt oral rehydration (eg, breast-feeding or clear fluids) 2. If age 6 mo and older: consider ondansetron intramuscular, 0.15 mg/kg/dose; maximum, 16 mg/dose 3. Monitor for resolution about 4-6 h from the onset of a reaction	1. If age greater than 6 mo: administer ondansetron intramuscular 0.15 mg/kg/dose; maximum, 16 mg/dose 2. Consider placing a peripheral intravenous line for normal saline bolus 20 mL/kg, repeat as needed 3. Transfer the patient to the emergency department or intensive care unit in case of persistent or severe hypotension, shock, extreme lethargy, or respiratory distress 4. Monitor vital signs 5. Monitor for resolution at least 4-6 h from the onset of a reaction 6. Discharge home if patient is able to tolerate clear liquids	1. Place a peripheral intravenous line and administer normal saline bolus, 20 mL/kg rapidly; repeat as needed to correct hypotension 2. If age 6 mo and older: administer intravenous ondansetron, 0.15 mg/kg/dose; maximum, 16 mg/dose 3. If placement of intravenous line is delayed because of difficult access and age is 6 mo or older, administer ondansetron intramuscular, 0.15 mg/kg/dose; maximum, 16 mg/dose 4. Consider administering intravenous methylprednisolone, 1 mg/kg; maximum, 60-80 mg/dose 5. Monitor and correct acid base and electrolyte abnormalities 6. Correct methemoglobinemia, if present 7. Monitor vital signs 8. Discharge after 4-6 h from the onset of a reaction when the patient is back to baseline and is tolerating oral fluids 9. Transfer the patient to the emergency department or intensive care unit for further management in case of persistent or severe hypotension, shock, extreme

TABLE IX. Empiric guidelines for selecting weaning foods in infants with FPIES

Ages and stages	Lower-risk foods*	Moderate-risk foods*	Higher-risk foods*
4-6 mo (as per AAP, CoN)	Vegetables		
If developmentally appropriate and safe and nutritious foods are available: ● Begin with smooth, thin purees and progress to thicker purees ● Choose foods that are high in iron ● Add vegetables and fruits	Broccoli, cauliflower, parsnip, turnip, pumpkin	Squash, carrot, white potato, green bean (legume)	Sweet potato, green pea (legume)
6 mo (as per WHO)	Fruits		
Complementary feeding should begin no later than 6 mo of age: ● In the breast-fed infant, high-iron foods or supplemental iron (1 mg/kg/d) are suggested by 6 mo of age ● Continue to expand variety of fruits, vegetables, legumes, grains, meats, and other foods as tolerated.	Blueberries, strawberries, plum, watermelon, peach, avocado	Apple, pear, orange	Banana
8 mo of age or when developmentally appropriate:	High-iron foods		
● Offer soft-cooked and bite-and-dissolve textures from around 8 mo of age or as tolerated by infant.	Lamb, fortified quinoa cereal, millet	Beef, fortified grits and corn cereal, wheat (whole wheat and fortified), fortified barley cereal	Higher-iron foods: fortified, infant rice and oat cereals
12 mo of age or when developmentally appropriate:	Other		
● Offer modified tolerated foods from the family: table-chopped meats, soft cooked vegetables, grains, and fruits	Tree nuts and seed butters* (sesame, sunflower, etc.) *Thinned with water or infant puree for appropriate infant texture and to prevent choking	Peanut, other legumes (other than green pea)	Milk, soy, poultry, egg, fish

Natural evolution

Resolution in childhood

In Summary

Diagnosis is based on a thorough history, physical examination and elimination of alternate diagnoses

Growth is preserved for colic, GER and AP

Investigations are rarely needed

Diagnosis is confirmed by treatment trials

Guidelines are available

Thank you

Questions?

References

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Publication: Journal of Allergy and Clinical Immunology

Publisher: Elsevier

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Canadian Pediatric Society

PRACTICE POINT

Infantile colic: Is there a role for dietary interventions?

Posted: Jan 1 2011 | **Reaffirmed:** Feb 28 2018

POSITION STATEMENT

Using probiotics in the paediatric population

Posted: Dec 3 2012 | **Updated:** Jun 18 2019