



Pediatric Gastroesophageal Reflux

Clinical Practice Guideline Summary

GUIDELINE SUMMARY PURPOSE

This clinical practice guideline summary was developed to assist the primary and specialist medical provider in the evaluation and management of gastroesophageal reflux in infants and children. Recommendations are based on an integration of a comprehensive and systematic review of the medical literature combined with expert opinion. The recommendations are a general guideline and are not intended as a substitute for clinical judgment or as a protocol for the management of all patients with this problem.

The following sections summarize the conclusions and recommendations of the GER Guideline Committee of the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition on the value of diagnostic tests and treatment modalities commonly used for the management of GERD, and how those interventions can be applied to clinical situations in the infant and older child.

The American Academy of Pediatrics has also endorsed the NASPGHAN pediatric GERD Guidelines.

DEFINITIONS

- Gastroesophageal reflux (GER): the retrograde passage of gastric contents into the esophagus
- GER disease (GERD): symptoms or complications of GER

CLINICAL MANIFESTATIONS OF GERD IN CHILDREN

- Vomiting
- Abdominal or substernal pain
- Poor weight gain
- Esophagitis
- Dysphagia
- Respiratory disorders

RED FLAGS IN INFANTS

- Bilious vomiting
- Hematemesis

The North American Society of Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) represents more than 1000 pediatric gastroenterologists predominantly located in the United States, Canada and Mexico. NASPGHAN strives to improve the care of infants, children and adolescents with digestive disorders by promoting advances in clinical care, research and education.

The Children's Digestive Health and Nutrition Foundation (CDHNF) was established by NASPGHAN to promote research and education that will improve the health of children with digestive and nutritional disorders.

Pediatric Gastroesophageal Reflux Clinical Practice Guidelines were published in the Journal of Pediatric Gastroenterology and Nutrition ©2001; Volume 32: Supplement 2 pages 1-31. Complete guidelines can also be found on the following websites: www.cdhnf.org or www.naspghan.org. This guideline summary represents updated information as of February 2003 and will be downloadable in Pocket PC and Palm formats from the web.



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American Academy of Pediatrics

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DIAGNOSTIC APPROACHES

History and Physical Examination

- Sufficient to reliably diagnose GER, recognize complications and initiate management in most infants with vomiting, and older children with regurgitation and heartburn.

History in Child with Suspected GERD

Feeding History <ul style="list-style-type: none">• Amount and frequency (overfeeding)• Type (preparation errors)• Positioning/burping	Pattern of Vomiting <ul style="list-style-type: none">• Frequency and amount• Painful• Forceful Family History <ul style="list-style-type: none">• Significant illness• GI problems• Metabolic/allergy	Past Medical History <ul style="list-style-type: none">• Prematurity• Growth & development• Surgery Growth Chart <ul style="list-style-type: none">• Length, weight• Head circumference Warning Signals
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Adapted from Rubinfeld et al. *J Pediatr Gastroenterol Nutr* 2001;32:511
Uranishin et al. *Gastroenterology* 1993;102:1172



Upper GI Series

- Neither sensitive nor specific enough for diagnosis of GER
- Useful for evaluation of presence of anatomic abnormalities, such as:
 - Pyloric stenosis (vomiting infant)
 - Malrotation (vomiting infant)
 - Annular pancreas (vomiting infant)
 - Hiatal hernia (older child)
 - Esophageal stricture (older child)

Esophageal pH Monitoring

- A valid and reliable measure of acid reflux
- Useful to establish presence of abnormal acid reflux
- Useful to determine if there is a temporal association between acid reflux and frequently occurring symptoms
- Useful to assess adequacy of therapy in patients who do not respond to treatment with acid suppression
- Esophageal pH monitoring may be normal in some patients with GERD, particularly those with respiratory complications.

Endoscopy and Biopsy

- Can assess the presence and severity of esophagitis, strictures and Barrett's esophagus
- Useful to exclude other disorders, such as Crohn's disease and eosinophilic or infectious esophagitis

- A normal appearance of the esophagus during endoscopy does not exclude histopathological esophagitis; subtle mucosal changes such as erythema and pallor may be normal. Esophageal biopsy is recommended when endoscopy is performed to detect microscopic esophagitis and to exclude causes of esophagitis other than GER.

THERAPY OPTIONS

Empiric Medical Therapy

A trial of time-limited medical therapy for GER is useful for determining if GER is causing a specific symptom.

Diet Changes in the Infant

- There is evidence to support a one to two-week trial of a hypoallergenic formula in formula fed infants with vomiting.
- Milk-thickening agents do not improve reflux index scores, but do decrease the number of episodes of vomiting.

Positioning in the Infant

Esophageal pH monitoring has demonstrated that infants have significantly less GER when placed in the prone position than in the supine position. However, the prone position is associated with a higher rate of the sudden infant death syndrome (SIDS).

- In infants from birth to 12 months of age with GERD, the risk of SIDS generally outweighs the potential benefits of prone sleeping.
- Non-prone positioning during sleep is recommended.
- Supine positioning confers the lowest risk of SIDS and is preferred.
- Prone positioning during sleep is only considered in unusual cases where the risk of death from complications of GER outweighs the potential increased risk of SIDS.
- When prone positioning is necessary, it is particularly important that parents be advised not to use soft bedding, which increases the risk of SIDS in infants placed prone.

Positioning in the Child and Adolescent

In children older than one year:

- It is likely that there is a benefit to left side positioning during sleep
- It is likely that there is a benefit to elevation of the head of the bed.

Lifestyle Changes in the Child and Adolescent

- Avoid caffeine
- Avoid chocolate

- Avoid spicy foods
- Obesity is associated with GER
- Exposure to tobacco smoke is associated with GER
- Exposure to alcohol is associated with GER

It is not known whether lifestyle changes have an additive benefit in patients receiving pharmacological therapy.

Acid-Suppressant Therapy

- Histamine-2 receptor antagonists (H2RAs)
 - Produce relief of symptoms and mucosal healing
- Proton Pump Inhibitors (PPIs)
 - Most effective acid suppressant medications
 - Superior to H2RAs in relieving symptoms and healing esophagitis

Chronic over-the-counter antacid therapy is generally not recommended since more convenient and safe alternatives are available.

Prokinetic Therapy

No prokinetic agents available in the United States and Canada, including metoclopramide and bethanechol, have been shown to be effective in the treatment of GERD in children.

Surgical Therapy

Case studies indicate that surgical therapy generally results in reduction in symptoms of GERD, but the risk of complications including dumping syndrome, intractable gagging and retching needs to be balanced with those of continued medical treatments. The potential risks, benefits and costs of successful, prolonged medical therapy versus fundoplication have not been well studied in infants or children with various symptom presentations.

Physiologic Gastroesophageal Reflux
(Mean upper limit of normal)

	Infants (N=509)	Children (N=48)	Adults (N=432)
No. of daily reflux episodes	73	25	45
No. of reflux episodes \geq 5 min	9.7	6.8	3.2
Reflux index (% of time pH < 4)	11.7%	5.4%	6%

HUTTON ET AL. J PEDIATR GASTROENTEROL NUTR 2001;32:51

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- Other diagnostic tests may be indicated if there are symptoms of poor weight gain, excessive crying, irritability, disturbed sleep, feeding or respiratory problems.
- **Management:**
- Parental education, reassurance and guidance
 - Thickening of formula and brief trial of hypoallergenic formula are other treatment options.
 - If symptoms worsen or do not improve by 18 – 24 months of age, re-evaluation is recommended (upper GI and consultation with a pediatric gastroenterologist).

2. The Infant with Recurring Vomiting and Poor Weight Gain

- **Diagnosis:**
- Assess adequacy of calories and effectiveness of swallowing
 - If there is poor weight gain despite adequate caloric intake, conduct diagnostic evaluations to uncover other causes for vomiting or weight loss. This may include the following:
 - Complete blood count
 - Electrolytes
 - Bicarbonate
 - Urea nitrogen
 - Creatinine
 - Alanine aminotransferase
 - Ammonia
 - Glucose
 - Urinalysis
 - Urine ketones and reducing substances
 - Review of newborn screening tests
 - Upper GI series to evaluate anatomy

EVALUATION AND MANAGEMENT OF INFANTS AND CHILDREN WITH SUSPECTED GERD

1. The Infant with Recurring Vomiting - Uncomplicated GER (Happy Spitter)

- **Diagnosis:**
- A thorough history and physical examination, with attention to warning signals, is generally sufficient to establish a diagnosis of uncomplicated GER.
 - An upper GI series is not required unless there are signs of GI obstruction.

► **Management May Include:**

- Thickening of formula
- Trial of hypoallergenic formula
- Increasing caloric density of the formula
- Acid suppression therapy
- Prone positioning, in select cases

► **Further Management Options:**

- Endoscopy with biopsy
- Hospitalization for observation
- Tube feedings
- Surgical therapy (rarely)
- Careful follow-up to assure adequate weight gain

3. The Infant with Recurrent Vomiting and Irritability

Normal infants typically fuss or cry intermittently for an average of two hours daily, which may be perceived as excessive by some parents. A symptom diary may be useful to determine the extent to which the infant is irritable and has disturbed sleep.

► **Diagnosis and Treatment:**

- Empiric treatment with either a sequential or simultaneous two-week trial of a hypoallergenic formula and acid suppression
- If there is no improvement, either esophageal pH monitoring to determine the adequacy of therapy or upper endoscopy with biopsy to diagnose esophagitis
- If there is no response to therapy and these studies are normal, it is unlikely that GER is the cause of symptoms.
- Alternatively, evaluation can begin with esophageal pH monitoring to determine if episodes of irritability and sleep disturbance are temporarily associated with acid reflux.

4. The Child or Adolescent with Recurrent Vomiting or Regurgitation

In otherwise normal children who have recurrent vomiting or regurgitation after the age of 2 years, management options include:

- Upper GI series
- Upper endoscopy with biopsy

5. Heartburn in the Child or Adolescent

► **Management:**

- Lifestyle changes
- Two to four-week therapeutic trial of an H2RA or PPI

– If symptoms persist:

- Referral to a pediatric gastroenterologist for upper endoscopy with biopsy
- In some cases, long-term therapy

6. Esophagitis

► **Management:**

- Lifestyle changes
- H2RA or PPI therapy
- In patients with only histopathological esophagitis, monitor efficacy of therapy by degree of symptom relief.
- In patients with erosive esophagitis, repeat endoscopy to assure healing.

7. Dysphagia or Odynophagia

► **Diagnosis and Management:**

- In the child with difficulty swallowing or with painful swallowing, a barium esophagram is recommended.
- If initial history is suggestive of esophagitis, upper endoscopy is recommended.
- Treatment without prior diagnostic evaluation is not recommended.
- In an infant with feeding refusal, empiric therapy for GER is not generally recommended.
- If there are other signs of GERD, then a time-limited course of medical therapy can be considered.

8. Apnea or Apparent Life-Threatening Events (ALTE)

In patients with ALTEs recurrent regurgitation or emesis is common. However, investigations in unselected patients with ALTE have not demonstrated a convincing temporal relationship between esophageal acidification and apnea or bradycardia.

► **Diagnosis:**

- There are no randomized studies to evaluate the usefulness of esophageal pH monitoring in infants with ALTE.
- In patients with frequent ALTEs in which the role of GER is uncertain, esophageal pH monitoring may be useful to determine if there is a temporal association of acid reflux with ALTE.
- Evidence suggests that infants with ALTE and GER may be more likely to respond to anti-reflux therapy when:
 - There is gross emesis or oral regurgitation at the time of the ALTE.
 - Episodes occur in the awake infant.
 - The ALTE is characterized by obstructive apnea.

► **Management:**

- Thickened feedings
- Acid suppressant therapy
- Surgery is considered only in severe cases.

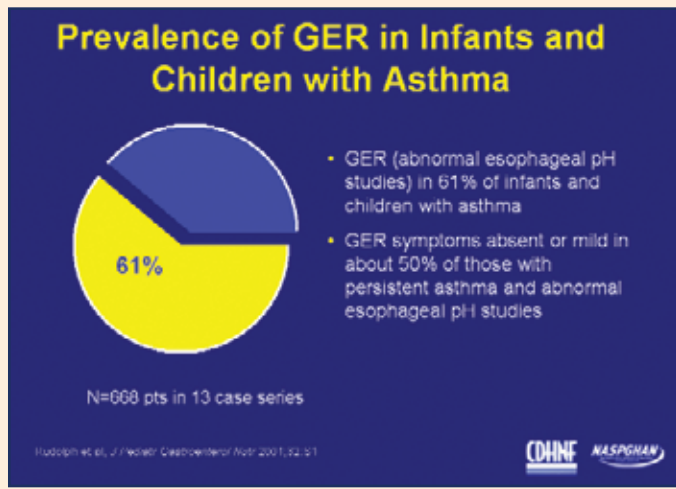
9. Asthma

► **Management:**

- In patients where symptoms of asthma and GER coexist, and in infants and toddlers with chronic vomiting or regurgitation and recurrent episodes of cough and wheezing:
 - A three month trial of vigorous acid suppressant therapy of GER is recommended.
- In patients with persistent asthma without symptoms of GER:
 - Esophageal pH monitoring is recommended in selected patients, including:
 - Patients with radiographic evidence of recurrent pneumonia
 - Patients with nocturnal asthma more than once a week
 - Patients requiring either continuous oral corticosteroids, high-dose inhaled corticosteroids, or more than two bursts per year of oral corticosteroids
 - Patients with persistent asthma unable to wean medical management
 - If esophageal pH monitoring demonstrates an increased frequency or duration of esophageal acid exposure, a trial of prolonged medical therapy for GER is recommended.

10. Recurrent Pneumonia

GER can cause recurrent pneumonia in the absence of esophagitis or when esophageal pH monitoring is normal. There is insufficient evidence to provide recommendations for a uniform approach to diagnosis and treatment. Diagnostic evaluation may include:



- Flexible bronchoscopy with pulmonary lavage for lipid-laden macrophages
- Nuclear scintigraphy
- Assessment of air protective mechanisms during swallowing.

11. Upper Airway Symptoms

There is insufficient evidence to provide recommendations for diagnosis and treatment for such upper airway symptoms as:

- Hoarseness
- Chronic cough
- Stridor
- Globus sensation

GUIDELINE SUMMARY DISCLAIMER

This guideline is not intended for the management of:

- Neonates less than 72 hours old
- Premature infants
- Infants and children with either neurologic impairments or anatomic disorders of the upper gastrointestinal tract.

CHILDREN'S DIGESTIVE HEALTH AND NUTRITION FOUNDATION

Pediatric GERD Education Campaign

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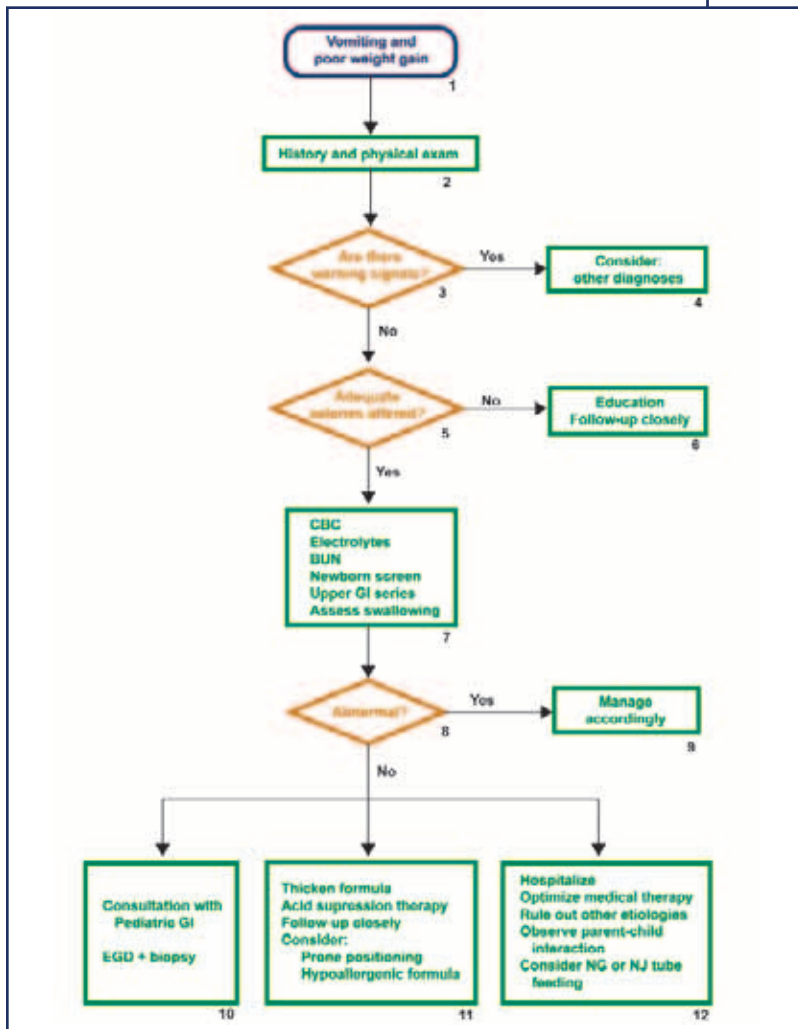
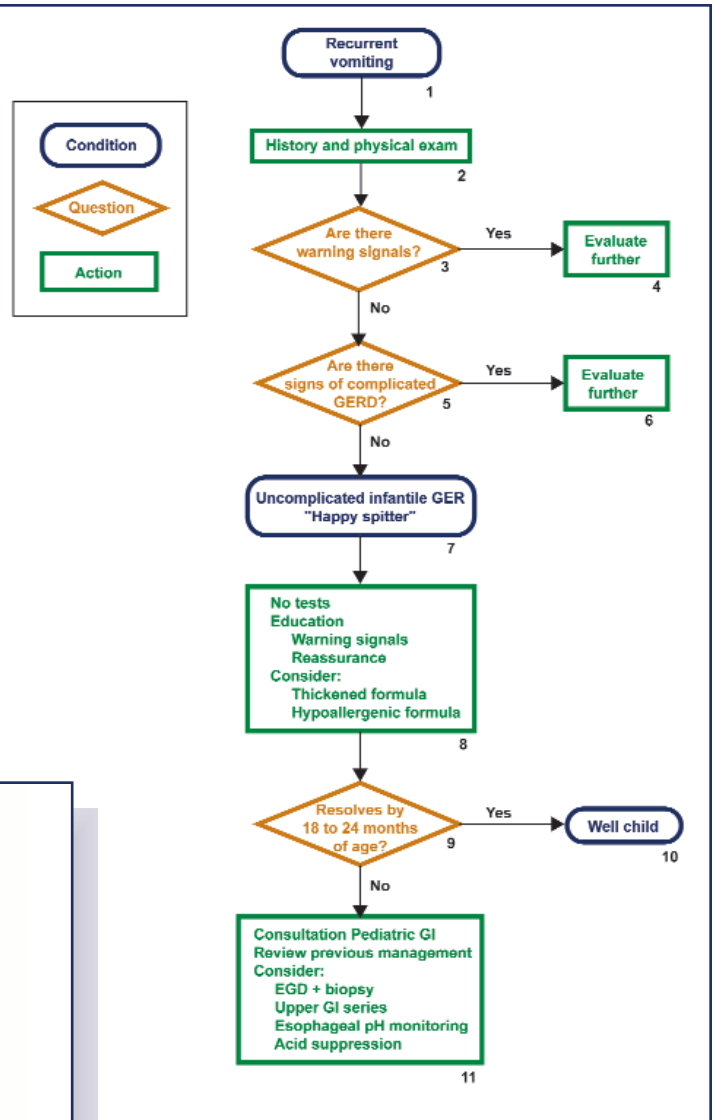
*Drugs demonstrated to be effective in gastroesophageal reflux disease

Type of medicine	Recommended oral dosage	Adverse effects/precautions
Histamine2-receptor antagonists		
Cimetidine (Tagamet)	40 mg/kg/day divided TID or QID (adult dose: 800-1200 mg/dose BID or TID)	rash, bradycardia, dizziness, nausea, vomiting, hypotension, gynecomastia, reduces hepatic metabolism of theophylline and other medications, neutropenia, thrombocytopenia, agranulocytosis, doses should be decreased with renal insufficiency
Famotidine (Pepcid)	1 mg/kg/day divided BID (adult dose: 20 mg BID)	headaches, dizziness, constipation, diarrhea, nausea, doses should be decreased with renal insufficiency
Nizatidine (Axid)	10 mg/kg/day divided BID, (adult dose: 150 mg BID or 300 mg qhs)	headaches, dizziness, constipation, diarrhea, nausea, anemia, urticaria, doses should be decreased with renal insufficiency
Ranitidine (Zantac)	5 to 10 mg/kg/day divided TID or BID (Adult dose: 300 mg BID)	headache, dizziness, fatigue, irritability, rash, constipation, diarrhea, thrombocytopenia, elevated transaminases, doses should be decreased with renal insufficiency
Proton pump inhibitors - Ideal time for PPI administration is 15 - 30 minutes before first meal of the day		
Esomeprazole (Nexium)	No pediatric dose available (adult dose: 40 mg qd)	headache, diarrhea, abdominal pain, nausea
Lansoprazole (Prevacid)	1.4 mg/kg/day (adult dose: 15-30 mg qd)	headache, diarrhea, abdominal pain, nausea,
Omeprazole (Prilosec)	1 - 3.3 mg/kg/day (adult dose 20 mg qd)	headache, diarrhea, abdominal pain, nausea, rash, constipation, vitamin B12 deficiency
Pantoprazole (Protonix)	No pediatric dose available (adult dose: 40 mg qd)	headache, diarrhea, abdominal pain, nausea
Rabeprazole (Aciphex)	No pediatric dose available (adult dose: 20 mg qd)	headache, diarrhea, abdominal pain, nausea

*Drug information updated February 19, 2003

Management of an Infant with Uncomplicated GER (the "Happy Spitter")

(Pediatric GI = pediatric gastroenterologist; EGD = esophagogastroduodenoscopy; UGI = upper gastrointestinal series radiography).



Management of an Infant with Vomiting and Poor Weight Gain

(CBC = complete blood count; BUN = blood urea nitrogen; NG = nasogastric; NJ = nasojejunal).

Management of a Child or Adolescent with Chronic Heartburn

(H2RA = histamine-2 receptor antagonist; PPI = proton pump inhibitor).

Continued Management of a Child or Adolescent with Esophagitis

