

Understanding gastroesophageal reflux disease in children

Chloe Friedman; Gianna Sarantos; Sarah Katz; Sheryl Geisler, MS, PA-C

ABSTRACT

Gastroesophageal reflux disease (GERD) is a common disorder with increasing prevalence in children. The diagnosis and management of GERD remains a challenge because of its nonspecific symptomatology from infancy through adolescence. Certain presenting alarm symptoms warrant a further, more extensive workup. Treatment of pediatric GERD begins with lifestyle and nonpharmacologic management, including postural adjustments, dietary changes, and weight loss if indicated. Pharmacologic interventions can be prescribed to relieve symptoms for patients whose disease does not respond to lifestyle management. Patients with refractory symptoms can be managed with surgical intervention. Complications may arise if GERD remains untreated, ranging from worsening oral health to failure to thrive.

Keywords: gastroesophageal reflux disease, GERD, pediatric, lifestyle management, regurgitation, gastrointestinal endoscopy, proton pump inhibitors

Learning objectives

- Discuss the incidence, prevalence, and pathophysiology of pediatric GERD.
- List the risk factors for developing pediatric GERD.
- Discuss the typical and atypical symptoms of GERD including the recommended workup.
- List the differential diagnoses for pediatric GERD.
- Discuss treatment options, including complications that can result if GERD remains untreated.

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The regurgitation or passing of gastric contents into the esophagus, commonly referred to as gastroesophageal reflux, is an involuntary physiologic process that often occurs in healthy infants and children.¹ Episodes usually are brief and typically do not cause symptoms suggestive of esophageal injury or disease. Gastroesophageal reflux disease (GERD), in contrast, causes increasingly frequent symptoms that can vary depending on age and are troublesome to varying degrees.² Treatments ranging from lifestyle modifications to pharmacologic and surgical interventions (as a last resort for refractory symptoms) are recommended to control symptoms and prevent complications in children presenting with GERD.³

EPIDEMIOLOGY

Regurgitation occurs in 60% to 70% of infants ages 3 to 4 months and then decreases drastically, affecting just 5% of infants at age 1 year. Preterm infants are at an increased risk for symptoms of gastroesophageal reflux because of the physiologic immaturity of the lower esophageal sphincter (LES), slower gastric emptying, impaired esophageal peristalsis, and increased milk intake necessary for growth.¹ Reflux usually resolves without any intervention by age 12 to 18 months in 95% of infants.^{4,5} However, infants who regurgitate more than 90 days per year are at an increased risk of continuing to have symptoms until age 9 years.⁴ Between 0.8% and 7.6% of adolescents ages 12 to 17 years still experience GERD symptoms.⁶ A study by

Key points

- GERD in children is a chronic digestive disorder and diagnosis and management can be a challenge.
- Risk factors for GERD in children include asthma, obesity, prematurity, and congenital malformations.
- Regurgitation is the most common typical symptom of pediatric GERD across all age groups.
- Pediatric GERD can be managed with diet and lifestyle. If left untreated, the condition can cause nutritional deficiencies that can impair a child's growth.

Artanti and colleagues to determine the prevalence of GERD in adolescents ages 12 to 18 years used a self-assessment questionnaire consisting of 35 items that assessed the patient's symptoms, location of their pain if applicable, and how their everyday life was affected.⁷ Depending on which cutoff score was used, the estimated prevalence of GERD ranged even higher, between 10.9% and 32.9%.⁷

PATHOPHYSIOLOGY

The LES is located at the gastroesophageal junction and relaxes during swallowing to allow one-way movement of food and liquid into the stomach. Transient LES relaxation, the most common cause of GERD, occurs when LES pressure relaxes independently of swallowing, falling to the level of intragastric pressure.^{3,4} This physiologic process is intended to allow gas to pass upward into the esophagus. Transient LES relaxation occurs with abdominal distension and increases in intra-abdominal pressure that can be caused by medications, coughing, straining, increased respiratory effort, and common infant postprandial postures.^{4,6} Frequent episodes of transient LES relaxation provide multiple opportunities for stomach contents to escape upward into the esophagus and cause GERD symptoms.

Low LES pressure is another frequent contributor to pediatric GERD.³ Maintaining optimal LES pressure is crucial because substances move in a pressure gradient from areas of high to low pressure. The normal pressure of the LES ranges between 5 and 20 mm Hg, or about 4 mm Hg greater than stomach pressure.¹ LES pressure decreases following food intake, but remains slightly higher than that of the lower GI tract to prevent the reflux of stomach contents.³ In patients with GERD, the LES pressure is either abnormally low (2 mm Hg or lower) or the intragastric pressure is significantly high (normally 0–2 mm Hg). Reflux occurs when one of these two pressures is abnormal, resulting in a higher intragastric pressure than LES pressure. Patients who are overweight or obese have chronically low LES pressures and high intragastric pressures, allowing a greater chance for reflux. Lastly, postprandial transient relaxation of the LES, coupled with concurrent abdominal distension (which causes increased intragastric pressure), also may result in reflux.^{1,3} These pressure abnormalities

create an opportunity for gastric contents to move upward in the GI tract.³ Delayed gastric emptying in infants and children also can contribute to GERD. The rate at which gastric contents are emptied depends on the quantity, osmolality, and calorie content of what was ingested.⁴

The size of the angle of His, located between the esophagus and the great curvature of the stomach, is another factor related to the pathophysiology of GERD in infants and children. The angle of His functions like a valve, allowing one-way movement of food and liquid into the stomach. This angle may be larger in infants, enabling retrograde flow from the stomach, which can worsen GERD symptoms.⁶ Right-sided sleeping positions also can increase this angle, which augments esophageal acid exposure and reduces esophageal clearance.⁶

RISK FACTORS

Although symptoms of reflux are common in healthy infants and children, certain risk factors make some patients more susceptible to GERD.

Obesity Over the past few decades, obesity and attendant reflux has increased markedly in all age groups globally. Obesity is associated with increased transient LES relaxations and higher intra-abdominal pressure.¹ Obesity also contributes to a state of chronic low-grade esophageal inflammation by increasing intra-abdominal pressure, which can worsen GERD symptoms.¹

Asthma Children with asthma have an increased risk of developing GERD. Although the relationship between asthma and GERD is poorly understood, it generally is attributed to the fact that the vagus nerve innervates the esophagus and bronchial tree. The inflammation that occurs in children with asthma also can elicit symptoms of GERD. One recent study investigated children with both asthma and obesity and how that influences the increased prevalence of GERD symptoms; however, there is not enough evidence to make a direct correlation.⁸ These two common pediatric disorders, obesity and asthma, can be significant potential risk factors in the development of GERD.

Prematurity Preterm infants have a greater risk for GERD, which is attributed to the immaturity of their esophageal anatomy, impaired peristalsis, and slower gastric emptying.¹

Congenital abdominal malformations Children with specific congenital abdominal malformations such as congenital diaphragmatic hernia, esophageal atresia, omphalocele, gastroschisis, or intestinal malrotation also can be at an increased risk for GERD. Although why these conditions cause symptoms of GERD is not entirely understood, they may cause increased intra-abdominal pressure, leading to reflux.⁹

CLINICAL PRESENTATION

In children, symptoms of GERD vary with age (**Figure 1**).¹ Diagnosing GERD in infants is challenging because they usually present with nonspecific symptoms, such as regurgitation, vomiting, choking, and irritability, that are similar to those of

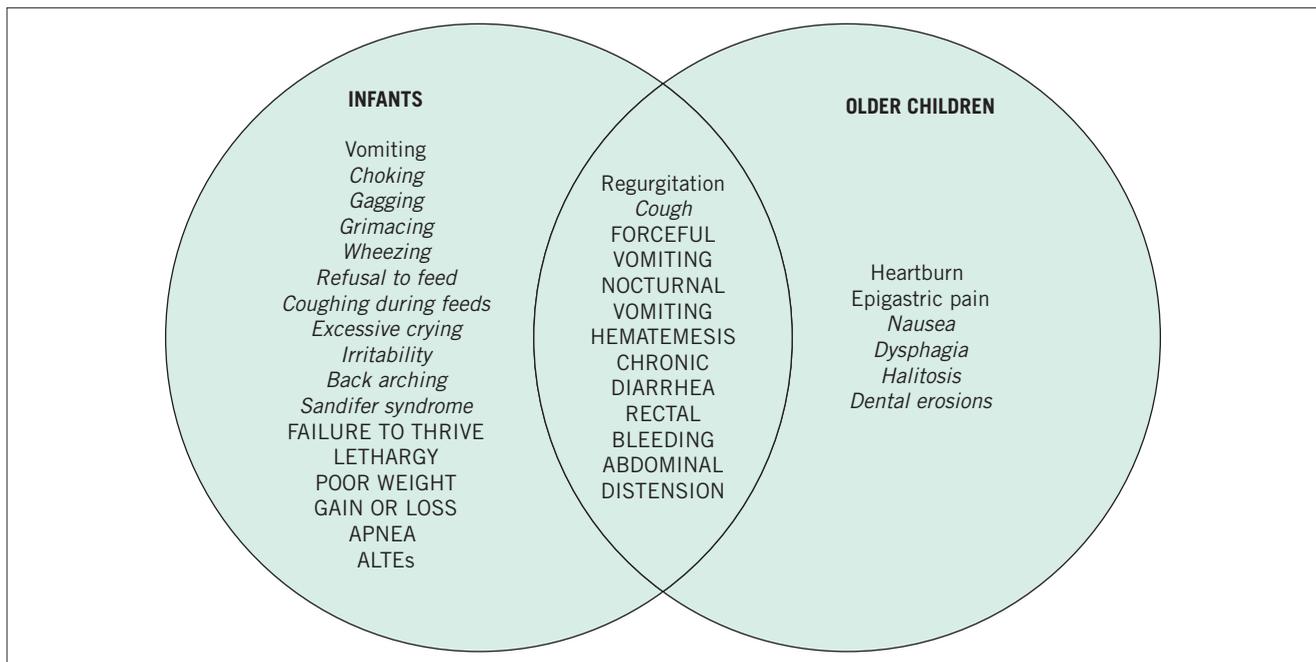


FIGURE 1. Typical, atypical, and alarm symptoms of GERD

Typical symptoms are in roman; atypical in italics, and alarm in all capitals.

other diseases or conditions.⁸ In contrast, older children usually present with symptoms similar to adults, although they also can present with atypical symptoms. Children under age 12 years often provide an unreliable history, making accurate diagnosis even more challenging.⁶ Regardless of the patient's age or presenting symptoms, obtain a thorough history and physical examination to distinguish gastroesophageal reflux from GERD, while paying special attention to alarm symptoms that suggest conditions other than GERD.^{4,10}

Typical presentation The most common presenting symptom of GERD, regardless of age, is regurgitation.¹ Reflux in infants can also present with vomiting.⁴ However, these symptoms are experienced by most infants, making the diagnosis of infantile GERD difficult.¹⁰ In healthy infants, regurgitation occurs after eating, and usually is effortless, painless, and nonbilious.^{1,4} Along with regurgitation, children with GERD usually present with heartburn and pain in the chest or upper abdomen.¹⁰

Atypical presentation Be suspicious of infantile GERD when regurgitation and vomiting in infants is associated with choking, gagging, grimacing, wheezing, refusal to feed, coughing during feeds, excessive crying, or irritability.^{1,4,6} Infant irritability is considered normal to an extent, so each infant must be individually assessed. If an infant presents with irritability and back arching, consider this comparable to heartburn or chest pain.⁴ Infants with Sandifer syndrome, a rare dystonic movement disorder that causes abnormal neck posturing and back arching, will have comorbid GERD.¹¹ Older children may present with nausea, dysphagia, cough, halitosis, or dental erosions.¹

Alarm symptoms Red-flag symptoms can indicate a more severe condition than GERD.¹⁰ Alarm symptoms in infants are failure to thrive, lethargy, and poor weight gain or weight loss.^{4,10} Regurgitation that begins after age 6 months or increases after age 12 months also is concerning.^{2,10} Additionally, some evidence has shown that apnea and apparent life-threatening events (ALTEs) are related to GERD.^{4,5} ALTEs are brief episodes that consist of one or more of the following: apnea, color change, marked change in muscle tone, choking, or gagging.⁵ Other red-flag symptoms that should cause clinicians to broaden the differential diagnosis are forceful, nocturnal, or bilious vomiting; hematemesis; chronic diarrhea; rectal bleeding; abdominal distension; dysuria; recurrent pneumonia; or seizures.^{2,4,10}

DIFFERENTIAL DIAGNOSES

Symptomatology involving postprandial regurgitation, vomiting, poor feeding, and abdominal pain also occur in patients with pyloric stenosis, duodenal atresia, hiatal hernia, intussusception, eosinophilic esophagitis, peptic ulcer disease, gastroparesis, gastritis, self-induced vomiting, celiac disease, food allergies such as cow's milk protein intolerance and lactose intolerance, increased intracranial pressure, aspiration pneumonia, or intestinal malrotation.^{1,9} However, certain symptoms and patient ages help differentiate GERD from these other diseases.

Pyloric stenosis typically presents in newborns up to about age 6 months with an olive-shaped abdominal mass, which can be identified on imaging. Duodenal atresia presents in newborns with bilious vomiting on the first day

of life. Intussusception presents with intermittent abdominal pain, in which a child may be seen pulling his or her knees to the chest, bilious vomiting, and “currant jelly” stools in babies ages 6 to 36 months. Eosinophilic esophagitis can present in patients of any age, most commonly those with a history of food allergies, asthma, or atopic dermatitis. Additionally, patients with eosinophilic esophagitis will have upper endoscopy biopsy findings of eosinophil inflammation, stacked circular rings, or strictures, which help rule out pediatric GERD. Peptic ulcer disease presents in children of any age with a gnawing pain; symptoms may be relieved or worsened by food intake depending on the location of ulceration in the child’s GI tract. Children with celiac disease and food allergies, such as cow’s milk protein or lactose intolerance, only exhibit symptoms when ingesting particular foods and will also have symptoms of diarrhea, unlike children with GERD. For children presenting with atypical and alarm symptoms, clinicians should exclude asthma, congenital airway anomalies, metabolic acidosis, and any inborn error of metabolism as reasons for the child’s GERD-like symptoms.²

DIAGNOSTIC WORKUP

GERD remains a challenge to diagnose in children. Although diagnostic studies and imaging can help rule out other pathology, no gold standard exists for diagnosing pediatric GERD.² The workup varies depending on the child’s age and reported symptoms. The most important factors for making the diagnosis are the history and physical examination. Studies and imaging may be warranted, however, especially if the patient has alarm symptoms (Figure 2).

Esophageal pH monitoring Esophageal pH is considered a safe, sensitive, specific technique for identifying GERD. In a patient without GERD, the pH of the esophageal lumen is normally between 3 and 7 as detected by the probe. To detect GERD, the esophageal lumen pH is monitored for 24 hours. GERD can be diagnosed based on a number of criteria: the number of times the pH falls below 4, how long the pH remains below 4, and the percentage of the 24-hour period in which the pH is below 4, also known as the reflux index.^{1,4} In infants, the reflux index is considered abnormal if it is greater than 11%; in older children, a reflux index greater than 7% is considered abnormal.⁴ Monitoring pH can indicate the severity of GERD, and also can help assess the efficacy of acid suppression therapy.¹

Multichannel intraluminal impedance (MII) This diagnostic method measures reflux by detecting changes in electrical resistance as a gas, liquid, or solid moves between two electrodes.^{1,4} MII is considered the most sensitive diagnostic method for diagnosing GERD.¹ Combined with pH monitoring, MII provides increased diagnostic value because it can detect reflux regardless of pH. MII also can differentiate between a normal swallow and abnormal reflux, determine the height of reflux, and determine if the reflux is gas, liquid, or both.⁴

Upper GI barium contrast study This test should not be used to diagnose GERD in infants or children because it lacks sensitivity and specificity.¹ However, it may help clinicians rule out anatomic malformations such as a hiatal hernia, pyloric stenosis, Schatzki ring, or other abnormalities that can cause GERD-like symptoms.² Barium swallow studies also can identify aspiration of reflux.⁴

Ultrasound Because interpretation of results is highly user-dependent, ultrasound is not considered useful in diagnosing GERD. Additionally, esophageal wall thickness does not directly correlate to esophagitis.²

Esophageal manometry This test can be used to rule out other conditions, such as rumination syndrome and esophageal achalasia, that may present similarly to GERD.¹

Trial of proton pump inhibitors (PPIs) Because GERD symptoms in infants are nonspecific, empiric trials of PPIs to diagnose GERD are not recommended.¹ However, in older children with GERD symptoms, an empiric trial of PPIs can aid in diagnosis and can also be used as therapy.⁵ Patients usually are given a 4- to 8-week trial of a PPI to see if their symptoms resolve. However, because reflux can resolve on its own, a lack of symptom improvement does not necessarily indicate that the patient does not have GERD.⁶

Scintigraphy This test detects and quantifies gastric emptying, which can be slower in children with GERD.² It also can detect reflux into the esophagus as well as pulmonary aspiration.^{2,4} Consider scintigraphy in patients whose GERD does not respond to treatment, and in whom other diagnoses such as delayed gastric emptying are being considered.¹⁰

Esophagogastroduodenoscopy with or without biopsy Evidence is insufficient to support the use of esophagogastroduodenoscopy (EGD) with or without biopsy to make a diagnosis of pediatric GERD. However, if a patient is experiencing any red-flag symptoms, EGD may be warranted to evaluate the mucosa of the GI tract. Biopsy of the mucosa may reveal esophagitis of the mucosa, but esophagitis is not always present in patients with GERD.² Erosions, exudates, ulcers, strictures, and hiatal hernias can sometimes be seen on EGD and are associated with GERD, but do not provide a definitive diagnosis.⁴ Some histologic findings associated with GERD are basal cell hyperplasia, increased papillary length, neutrophilic infiltration, erosions, and ulcerations, but these are not specific for GERD and cannot provide a definitive diagnosis.^{4,6}

Pediatric gastroenterologist referral Consider referring infants to a pediatric gastroenterologist if nutritional management fails or the infant exhibits any of the following alarm symptoms: bilious emesis, GI bleeding, new onset of vomiting after age 6 months, failure to thrive, diarrhea, fever, hepatosplenomegaly, abdominal tenderness or distension, or neurologic changes.^{2,5} Diagnostic investigations are not recommended at the primary care level if the infant does not present with any alarm symptoms.² Refer older

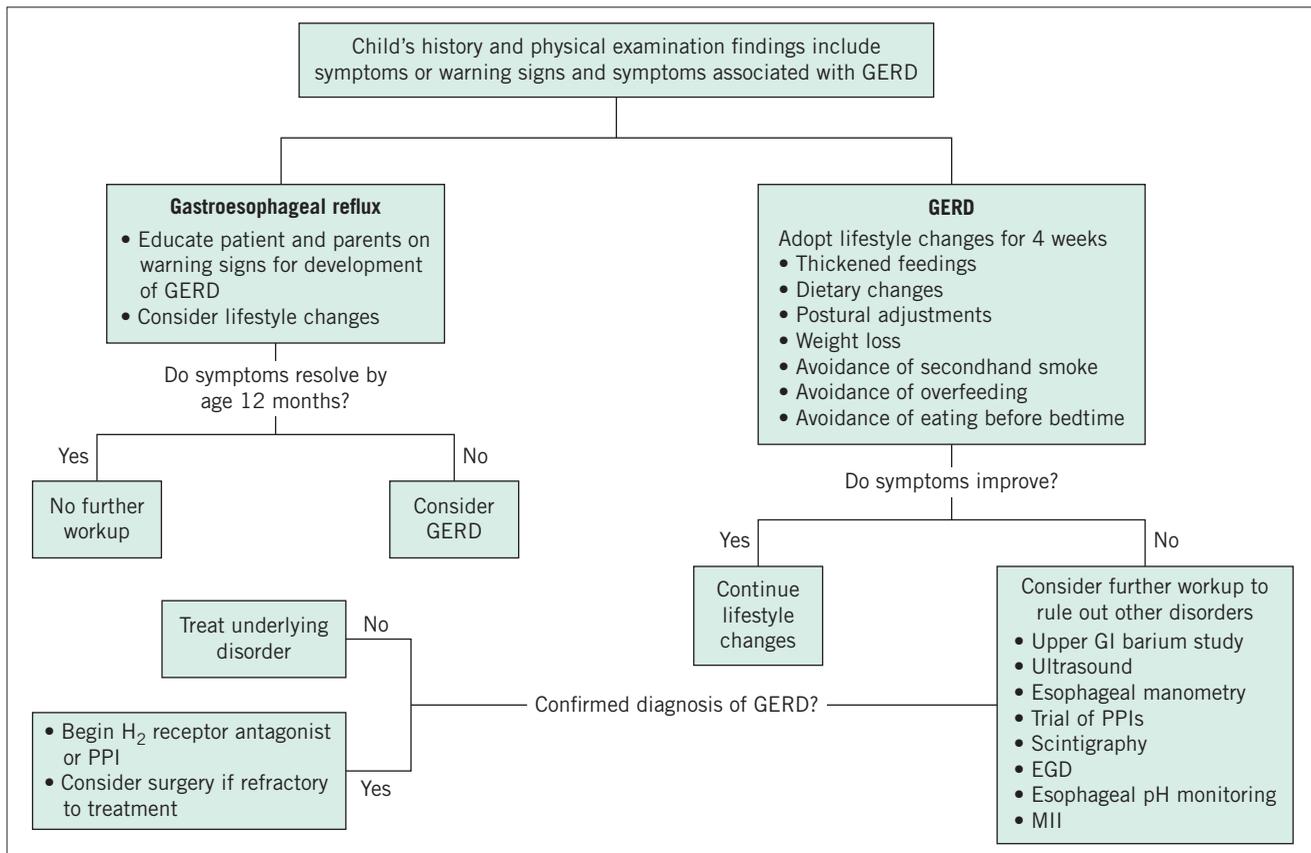


FIGURE 2. Recommended workup for suspected pediatric GERD

Child's history and physical examination findings include symptoms or warning signs and symptoms associated with GERD

children if their symptoms require ongoing treatment with a PPI or they do not respond to empiric therapy.⁵

TREATMENT

Most children with GERD can be managed conservatively with nonpharmacologic methods and reassurance, because reflux is typically benign in children. In patients under age 12 months, most cases of GERD will resolve spontaneously. In older children and those with neurodevelopmental disorders, spontaneous resolution is much less likely, but conservative management remains the first recommended step in management.^{1,5} For patients whose symptoms do not improve with conservative management, pharmacologic intervention may be indicated. Overall, the goals of treatment, whether conservative or pharmacologic, are to help relieve dyspepsia, prevent esophageal injury caused by reflux of gastric acid, and promote healing of the esophagus.¹

Nonpharmacologic Use of thickened formula, positional changes, maintaining a healthful weight in accordance with weight-for-age growth charts and percentiles, and lifestyle modifications can help manage symptoms nonpharmacologically in infants. Many studies found that formula thickeners reduced regurgitation, though it was

unclear whether they improved other GERD symptoms. It also is unclear if adjusting feeding volumes and intervals for infants is beneficial, but reducing feeding volumes and increasing feeding frequency should be encouraged. These changes alone may improve a patient's symptoms and will help avoid overfeeding.¹⁰ Additionally, mothers should not stop breastfeeding solely because of regurgitation or GERD, because formula feeding may increase risk for reflux.² In formula-fed patients who continue to experience GERD symptoms despite trying other conservative interventions, a 2-week trial of hydrolyzed protein formula or amino acid–based formula is recommended because cow's milk allergy often is indistinguishable from GERD.¹⁰

Positional changes also may help improve symptoms of GERD in children. Although keeping an infant in a specific position can be challenging, the left lateral decubitus position was found to reduce the number of reflux episodes and transient LES relaxation occurrences significantly compared with the right lateral decubitus position.¹⁰ Additionally, keeping an infant upright for 30 minutes following feeding can help reduce regurgitation.¹ Head elevation can reduce reflux in infants and children, but infants should sleep in the supine position to reduce their risk of sudden infant death syndrome.¹⁰

Maintaining a healthful weight also is an important component of nonpharmacologic treatment. Because obesity is linked with an increased prevalence of GERD, counsel patients and caregivers on maintaining a healthful weight and lifestyle. Weight reduction counseling is mandatory for patients who are overweight or obese.¹⁰ However, weight loss management must be individualized based on the patient's age and the recommended amount of weight loss. Lifestyle modifications such as avoiding secondhand smoke, avoiding overfeeding, and not eating too close to bedtime are important in conservative management. Additionally, patients should avoid spicy and greasy foods, caffeine, peppermint, and chocolate, which have been shown to exacerbate GERD.¹ Educating patients and caregivers about GERD and its complications can motivate them to continue nonpharmacologic interventions. The effects of prebiotics, probiotics, and herbal supplements on GERD are still being studied and no recommendations exist for these interventions.¹⁰

Pharmacologic Patients whose symptoms are refractory to nonpharmacologic treatment should be treated with pharmacologic therapy. H₂-receptor antagonists and PPIs are commonly used to treat GERD in children. Although PPIs are the treatment of choice for pediatric GERD, controversy exists about their efficacy in infants because trials did not show better symptom reduction than placebo.² Infantile GERD symptoms are nonspecific, and therefore whether PPIs are effective in managing these patients' symptoms is uncertain.¹⁰ Antacids also may be used, although they have limited effectiveness in infants and are only beneficial for symptomatic relief in children.¹ Most of these medications are available in a variety of forms, including liquid, and may be given to infants.

H₂-receptor antagonists have a rapid onset of action and reduce the amount of gastric acid and pepsin being secreted by parietal cells in the stomach. These drugs competitively inhibit histamine from binding to the H₂-receptors on parietal cells, resulting in less gastric acid and pepsin secretion from the cells. Although patients may develop tolerance to these drugs after about 2 weeks, H₂-receptor antagonists have been shown to be effective in GERD management.¹ Common adverse reactions include somnolence, dizziness, headache, abdominal pain, and diarrhea. Although H₂-receptor antagonists have been used to treat pediatric GERD for many years, the FDA recently issued a warning statement about ranitidine, a commonly used H₂-receptor antagonist that was found to contain N-nitrosodimethylamine (NDMA), a substance linked to the development of cancer. Whether the level of NDMA in ranitidine is harmful to patients is unclear (studies are ongoing), so patients and caregivers have been advised to avoid ranitidine, and retailers have voluntarily removed these products from their shelves. Clinicians who prescribe this drug are obligated to discuss the potential risk of developing cancer with the patient's parents or guardians, and directly with adolescent patients.¹²

PPIs also reduce gastric acid production. In children, they have been shown to be safe and more effective than H₂-receptor antagonists. The PPI mechanism of action involves inactivating the enzyme hydrogen potassium adenosine triphosphatase, also known as a proton pump. This proton pump creates a gradient between the inside of a parietal cell and the gastric lumen. Inactivating the proton pump prevents gastric acid secretion into the gastric lumen, which results in effective management of GERD.¹³ Because of enhanced drug metabolism in infants and young children, a higher dose of PPI per kilogram is required to achieve optimal gastric acid suppression.¹ Some common adverse reactions include somnolence, dizziness, headache, rash, nausea, abdominal pain, diarrhea, and constipation. Tolerance does not occur with PPIs as it does with H₂-receptor antagonists. Although PPIs are safe for children, prolonged use carries the risk of enteric infection, candida infections, *Clostridium difficile* (*Clostridioides difficile*, *C. diff*), diarrhea, pneumonia, gastritis, colitis, cell hyperplasia, carcinoid formation, vitamin B12 deficiency, osteoporosis, and hypomagnesemia.^{1,5,13}

Lastly, antacids may be used for short-term symptomatic relief of heartburn in children, although they do not treat GERD. Antacids reduce the acidity of gastric acid, which typically reduces heartburn, although antacids have been found to have low efficacy. Some common antacids include aluminum hydroxide, calcium carbonate, and magnesium hydroxide.¹

SURGICAL INTERVENTIONS

Surgical procedures to correct confirmed GERD in children are proposed after pharmacologic management fails. Nissen fundoplication is the most common antireflux procedure performed and can be done using a laparoscopic technique. The procedure increases the length of the esophagus and creates a tighter angle of His by wrapping the fundus of the stomach around the esophagus, which strengthens the LES.² Surgical correction with this technique has been proven to reduce refractory GERD symptoms in children and reduce overall morbidity. A study by Koivusalo and Pakarinen of 279 children who had had Nissen fundoplication found that almost 90% of patients had symptomatic control and a reduced rate of esophagitis.¹⁴ The surgery failed in 15% of patients, and was attributed to either another underlying disorder, esophageal atresia, or hiatal hernia repairs.

An alternative surgical intervention is a total esophago-gastric disconnection, known as a Bianchi procedure. This procedure is less common and reserved for patients in whom fundoplication has failed.² Another alternative is an endoscopic full-thickness plication; however, because of the size of the equipment needed, it cannot be used in infants and toddlers. Other interventions include transpyloric/jejunal feeding and radiofrequency ablation, both of which are less invasive but equally effective. These procedures can be used in all age groups; Nissen fundoplication,

Bianchi procedures, and full-thickness plication are reserved for children over age 1 year.¹⁰

Despite the success of surgical intervention for GERD symptoms, complications can develop, including postoperative dysphagia, dumping syndrome, persistent retching, wrap failure, and gas bloat syndrome.^{5,10} Other complications include infection at the surgical site, bowel perforation, inability to vomit, and injury to the vagus nerve. Children and parents should be educated about these potential complications before surgery so they can fully consider benefits and risks before undergoing any surgical procedure.¹

COMPLICATIONS OF GERD

Complications of GERD in children can vary according to the child's age. Regurgitation may affect the caloric and nutrient intake needed for development, which can ultimately result in failure to thrive.¹ If GERD symptoms are left untreated at a young age, children can be affected into adolescence, not only in terms of nutritional deficiencies and growth, but in more pathologic ways as well. Severe and longstanding reflux of acidic gastric contents into the esophagus can result in the development of ulcers, complicated by hematemesis and iron-deficiency anemia due to longstanding peptic ulcer disease. Chronic peptic esophagitis can lead to erosion, as well as esophageal dysplasia, development of strictures, and eventually Barrett esophagus, a risk factor for esophageal cancer into adulthood.

If GERD in children is left untreated, the development of poor sleep hygiene secondary to nocturnal symptoms when lying flat can affect their school performance. Severe GERD symptoms and repeated regurgitation of acidic gastric contents may affect a child's oral health as well. This can result in dental caries, erosion, and mucosal lesions. Unrelieved respiratory symptoms of pediatric GERD can lead to complications such as laryngitis, bronchitis, sinusitis, aspiration pneumonia, and respiratory arrest. If symptoms are severe and remain untreated, these respiratory complications can contribute to cardiac dysfunction, because respiratory arrest may lead to cardiac arrest. GERD in children can cause stress and anxiety in the child and caregivers, and should be considered a complication of the disease if the stress and anxiety disrupt the quality of life.¹

CONCLUSION

Special considerations are necessary when managing GERD in children. Although physiologic symptoms of gastroesophageal reflux are common during the first few months of infancy, troublesome symptoms can continue to manifest and lead to complications throughout childhood. Differentiating between gastroesophageal reflux and GERD often can be based on history and physical examination alone; however, esophageal pH monitoring and MII can help confirm a diagnosis. Lifestyle modifications and conservative therapies such as thickened feedings, dietary restrictions, postural adjustments, and avoiding overfeeding should be

undertaken first in children with frequent, persistent symptoms. For moderate to severe GERD that is resistant to conservative management, consider pharmacotherapy. H₂-receptor antagonists and PPIs are safe and effective treatments for children. For patients whose GERD is refractory to lifestyle and medical therapy, surgical interventions can be considered to relieve symptoms and reduce complications. **JAAPA**

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