



Gastroesophageal Reflux

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Objectives

1. Describe the epidemiology, pathophysiology, and risk factors for GERD
2. Recognize the typical and atypical clinical presentations of GERD
3. Apply a stepwise diagnostic approach to GERD
4. Discuss how to manage GERD
5. Explain the risks and benefits of long-term PPI therapy
6. Identify complications of chronic GERD

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Case-1

A 45-year-old woman presents with a 6-month history of **burning retrosternal discomfort** occurring after meals and at night. She reports occasional regurgitation but denies dysphagia, odynophagia, weight loss, anorexia, vomiting, or gastrointestinal bleeding. She has tried over-the-counter antacids with minimal relief. Physical examination is unremarkable. What is the **most appropriate next step in management?**

- A) Upper endoscopy
- B) Ambulatory pH monitoring
- C) Empirical trial of a proton-pump inhibitor (PPI) for 2 months
- D) Barium swallow
- E) Esophageal manometry

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Case-2

A 54-year-old man presents with a 6-month history of **heartburn and regurgitation**. He reports new-onset dysphagia and unintentional weight loss of 10 pounds over the past two months. He has no prior history of gastrointestinal disease and has not tried acid suppression therapy. Physical examination reveals no acute findings.

Which of the following is the **most appropriate next step in management?**

- A) Empirical trial of a proton-pump inhibitor
- B) Ambulatory pH monitoring
- C) Esophageal manometry
- D) Esophagogastroduodenoscopy (EGD)
- E) Barium swallow

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Case-3

A 60-year-old White man with a BMI of 32 kg/m² and a 12-year history of chronic **heartburn and regurgitation** presents for routine follow-up. He is a current smoker and has a family history of esophageal adenocarcinoma. He denies dysphagia, weight loss, or gastrointestinal bleeding. Which of the following is the most appropriate next step?

- A) Empirical trial of a proton-pump inhibitor
- B) Ambulatory pH monitoring
- C) Upper endoscopy to screen for Barrett's esophagus
- D) Esophageal manometry
- E) Barium swallow

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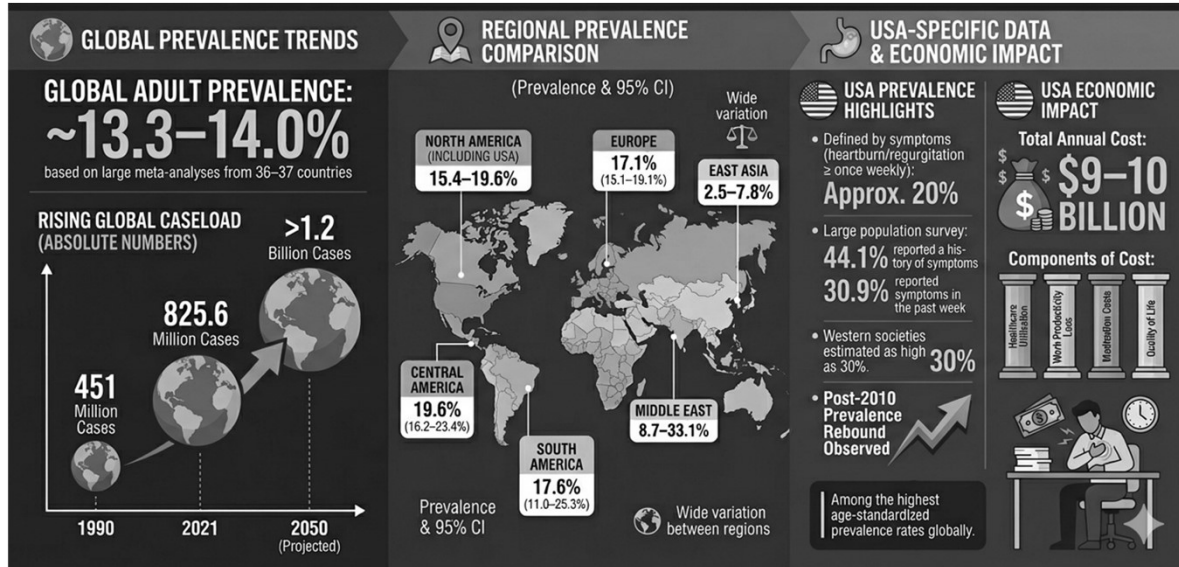
What is Gastroesophageal Reflux Disease (GERD)

GERD is a chronic disease characterized by

- **Symptoms** from regurgitation of gastric contents into the esophagus
- Supported by **objective evidence** of acid regurgitation

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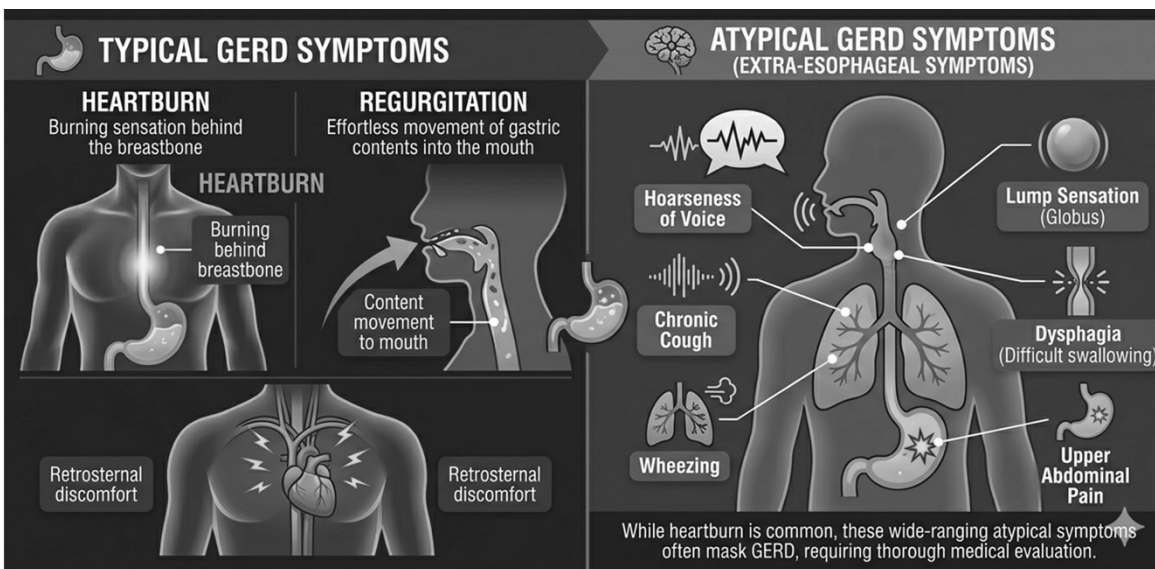
Understanding GERD: Prevalence and Economic Impact



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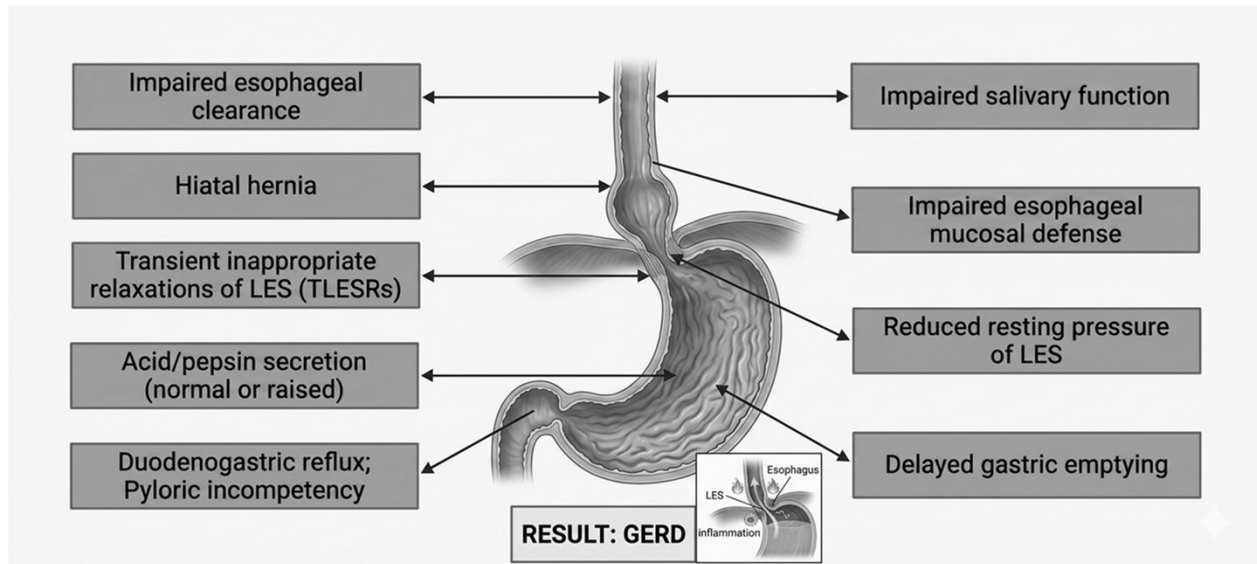
Typical and Atypical Symptoms of GERD



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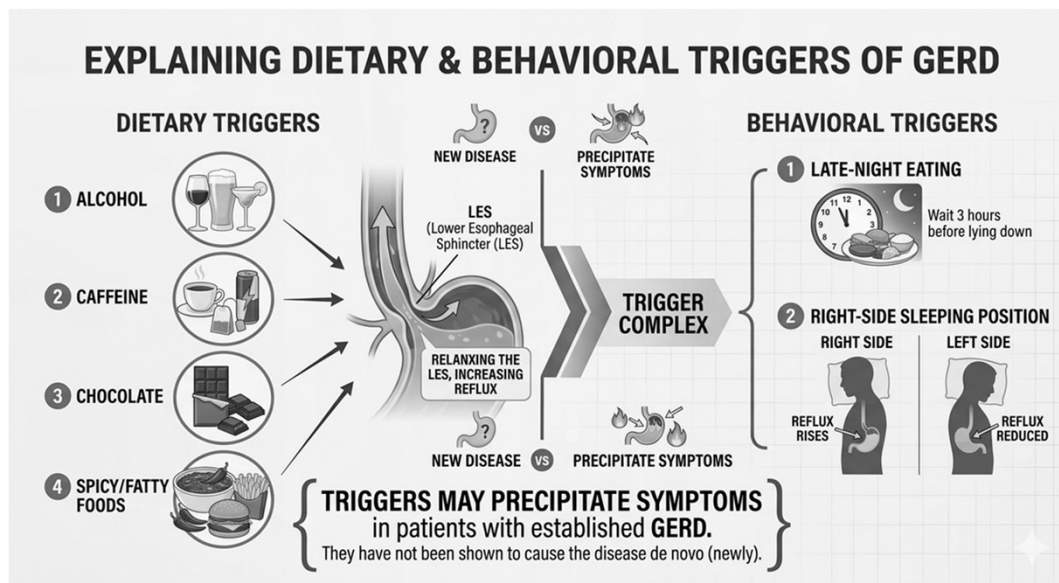
What causes GERD



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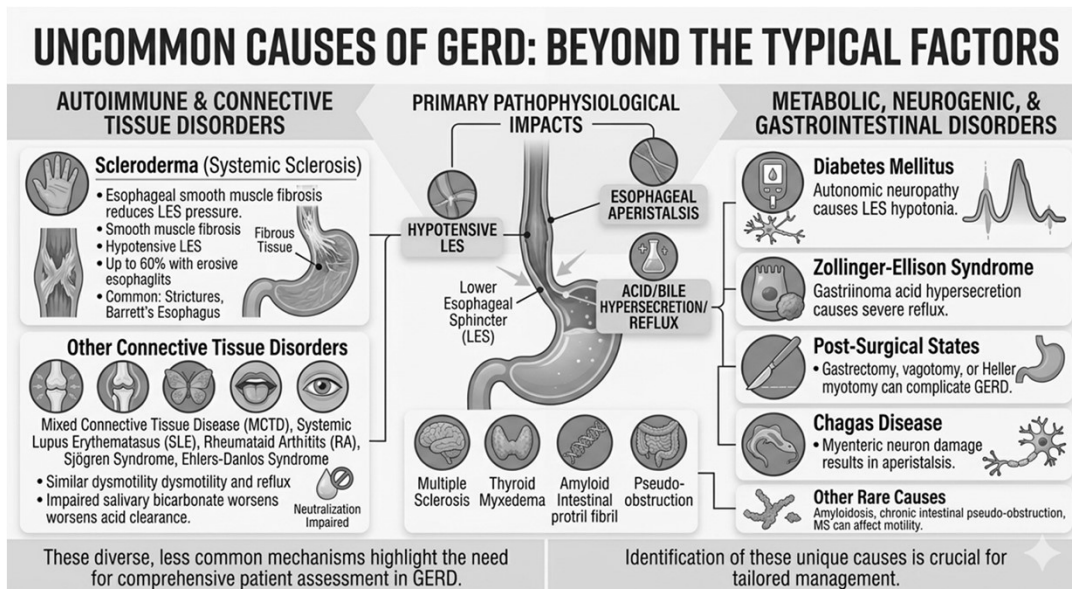
Dietary and Behavioral Factors Causing GERD



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Uncommon and Rare Causes of GERD



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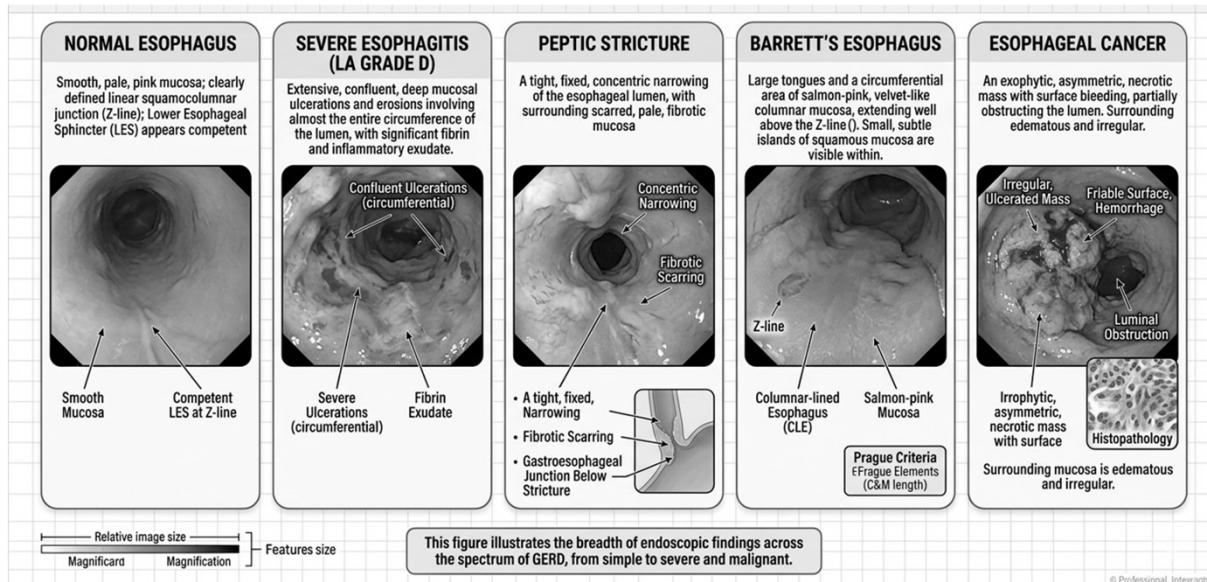
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Diagnosing GERD

- Endoscopy:
 - Inflammation or esophagitis
 - Barrett's esophagus
 - Peptic stricture
- Esophageal pH monitoring test
 - High acid levels in distal esophagus

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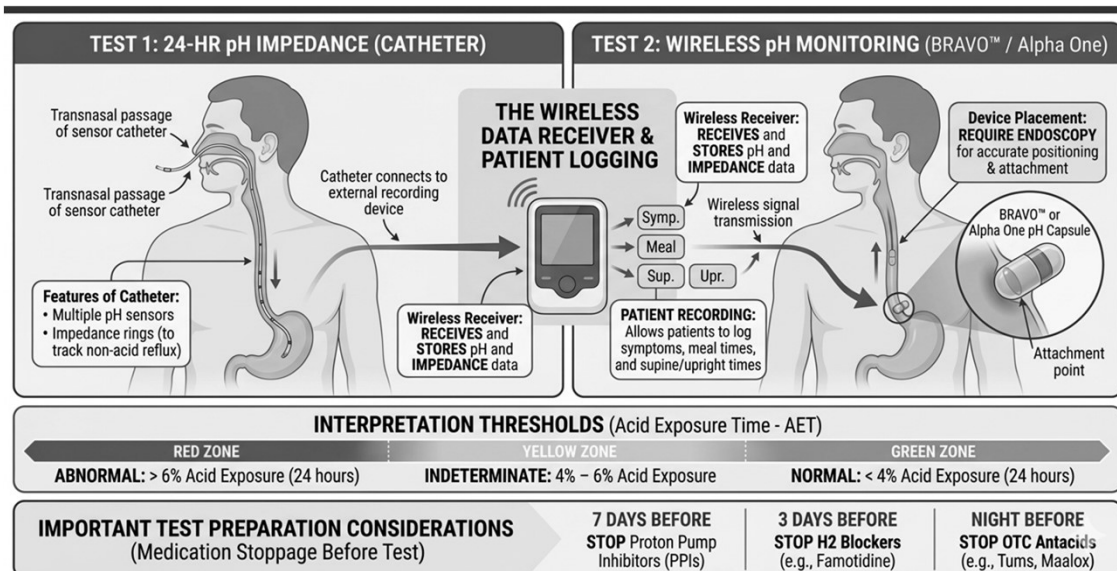
The Endoscopic Spectrum of GERD



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Diagnosing GERD: Objective Tests for Acid Reflux



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When to consider objective testing for GERD

- Symptoms uncontrolled by empiric treatment
- Atypical symptoms
- When considering surgery to treat GERD
- Alarm symptoms
 - Dysphagia
 - Unintentional weight loss
 - Symptoms of upper GI bleeding

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Management of GERD

Goals of therapy

- Control symptoms
- Prevent or treat complications
 - **Peptic stricture** → Dysphagia
 - **Barrett's esophagus** → Esophageal adenocarcinoma
 - **Esophageal ulcer** → Odynophagia and GI bleeding

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Controlling Symptoms of GERD

- Lifestyle measures
- Medications
- Surgery

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Lifestyle Measures to Control GERD

LIFESTYLE MEASURES TO CONTROL GERD SYMPTOMS



MEASURES WITH STRONGEST EVIDENCE

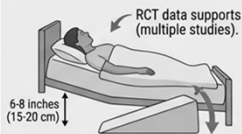
DATA-BACKED

Weight Loss



- **DO:** Reduce BMI. Dose-dependent symptom improvement.
- **40% reduction** in symptoms with with ≥ 3.5 BMI reduction (in women).
- **DO:** Avoid weight gain.
- Interventions decreased prevalence 37% \rightarrow 15%.

Head-of-Bed Elevation



- **DO:** Elevate bed head end. Reduces nocturnal reflux episodes.
- **DO:** Use a wedge pillow. RCT data supports (multiple studies).

Avoid Late Meals



- **DON'T:** Eat large meals especially at bedtime.
- **DON'T:** Eat within 3 hrs of bedtime.
- **DO:** Avoid short dinner-to-bed intervals.

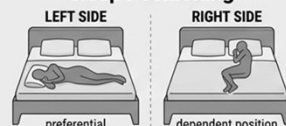
Smoking Cessation



- **DO:** Stop smoking.
- 44% symptom improvement after 1 year.
- Validated data supports.

OTHER IMPORTANT LIFESTYLE CHANGES

Sleep Positioning

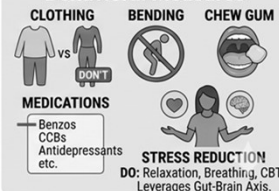


- **DO:** Sleep in left lateral position. Positional pillows help.
- **DON'T:** Sleep on right side.

Dietary Modifications



Behavioral Measures



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Proton Pump Inhibitors

- Highly effective in healing esophagitis: 84% heal within 3 months compared to 52% for H2-blockers (e.g. Famotidine)
- Duration
 - **Short-term PPI (4-8 weeks):** Uncomplicated GERD
 - **Long-term PPI:**
 - Barrett's esophagus
 - Severe esophagitis
 - Complicated GERD
 - **On-demand PPI:** episodic heartburn and GERD symptoms without inflammation

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Proton Pump Inhibitors

- **Administration:** 30-45 mins before 1st meal of the day or before the evening meal if taking BID
- **Duration:** At least 4-8 weeks for patients without alarm symptoms
- **Discontinuation:** If symptoms improve, decrease the dose and ultimately discontinue
- Any PPI will do- no one is superior to another

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








Long-Term Risks of PPI Use

DEFINITIVE RISK: SMALL INCREASE IN ENTERIC INFECTIONS

Non-*C. difficile* Enteric Infections

- **DO:** Be aware of a small definitive risk.
- **Odds Ratio (OR):** 1.33 (1.01–1.75)
- Absolute risk is **VERY SMALL** (0.03–0.2% per patient/year)
- Includes bacterial gastroenteritis, bacterial overgrowth

OBSERVATIONAL ASSOCIATIONS: RISKS ARE NOT SIGNIFICANTLY INCREASED

 <p>Clostridium difficile Infection OR: 2.26 (0.70–7.34) Non-significant association</p>	 <p>Chronic Kidney Disease OR: 1.17 (0.94–1.45) Non-significant association</p>	 <p>Dementia OR: 1.20 (0.81–1.78) Non-significant association</p>
 <p>Bone Fracture OR: 1.02 (0.87–1.19) Non-significant association</p>	 <p>Myocardial Infarction Not Significantly Increased</p>	 <p>SBP in Cirrhotics Reported in observational studies; not significant</p>
 <p>Micronutrient Deficiencies Not Significantly Increased</p>	 <p>Reported in observational studies; not significant</p>	 <p>GI Malignancies Reported in observational studies; not significant</p>

Current evidence does not support significant increases in most widely studied associations.
Close patient monitoring remains important.

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Short Term Side Effects of PPIs

Most Common Adverse Reactions

Mild and resolve with discontinuation, may be PPI preparation specific

- Headache
- Abdominal pain
- Nausea or vomiting
- Diarrhea or Constipation
- Flatulence

Rebound Acid Hypersecretion

- Upon PPI discontinuation
- Due to PPI-induced hyperplasia of gastric enterochromaffin-like cells that release gastrin
- Can be mitigated by gradual tapering of PPI dose

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Other Side Effects of PPIs

- Acute interstitial Nephritis
- Hypomagnesemia
- Fundic gland polyps

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Other Side Effects of PPIs

- **Acute interstitial Nephritis**
 - Can occur at any time and at any dose
 - Suspect if unexplained rise in serum creatinine, particularly if nonoliguric
 - Stop PPI immediately
- Hypomagnesemia
- Fundic gland polyps

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Other Side Effects of PPIs

- Acute interstitial Nephritis
- **Hypomagnesemia**
 - Risk factors:
 - high dose PPI
 - concomitant diuretics
 - low dietary magnesium
 - Females
 - Diabetics
 - CKD
- Fundic gland polyps

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Other Side Effects of PPIs

- Acute interstitial Nephritis
- Hypomagnesemia
- **Fundic gland polyps**
 - More likely with longer duration of PPI use
 - Very low risk of dysplasia (1%) compared to FGPs associated with Familial Adenomatous Polyposis (25-46% dysplasia)
 - Routine endoscopic surveillance not recommended
 - Solitary polyps and large FGPs should be resected

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Potassium Competitive Acid Blockers

- **Vonoprozán-** available in USA
- **Administration:** Before or After meals
- **Efficacy in healing inflammation:** More than 80%
- **Duration:** At least 4-8 weeks for patients without alarm symptoms
- **Discontinuation:** If symptoms improve, can discontinue
- **Risks:** Similar to PPIs

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Histamine-2 Receptor Antagonists

- **Famotidine-** available in the USA
- **Administration:** before or after meals
- **Efficacy in healing inflammation:** Less effective
- **Duration:** As needed for patients without alarm symptoms
- **Risks:** Tachyphylaxis

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Antacids, Alginates and Mucosal Protectants

- Provide short-term symptomatic relief
- Useful for nocturnal or post-meal symptoms
- Used as adjuncts to PPIs in those with erosive esophagitis
- **Antacids:** Calcium carbonate
- **Alginates:** Reflux Gourmet™, Gaviscon Advance™
- **Mucosal protectant:** Sucralfate (tablet or Suspension)

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Baclofen

- **Mechanism:** Reduces the frequency of transient lower esophageal sphincter relaxation
- **Application:** Adjunct in regurgitation predominant GERD or Belching
- **Side effects:** Dizziness, fatigue, sleepiness

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Surgery For Reflux

- When:
 - Refractory symptoms despite optimum medical therapy
 - Patient's desire to avoid long term medications
 - Large hiatal hernias
- What
 - Fundoplication
 - Transoral Incisionless Fundoplication (TIF)
 - Magnetic sphincter augmentation
 - Roux-en Y gastric bypass

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Surgery For Reflux

- When not to recommend surgery:
 - Patient well controlled on medical therapy
 - To prevent esophageal cancer in those with Barrett's esophagus

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Anti-Reflux Interventions: Key Features and Candidate Selection

<p>NISSEN (360° total fundoplication)</p> <p>IDEAL CANDIDATE Normal esophageal motility; severe GERD (LA C/D); large hiatal hernia</p>	<p>TOUPET (270° posterior)</p> <p>IDEAL CANDIDATE Impaired esophageal motility or borderline peristaltic reserve; concern for postoperative dysphagia</p>
<p>DOR</p> <p>IDEAL CANDIDATE Primarily after Heller myotomy for achalasia; rarely used as primary GERD procedure</p>	<p>MSA (LINX device)</p> <p>IDEAL CANDIDATE Non-obese; regurgitation-predominant; small hiatal hernia (≤3 cm); no prior gastric surgery</p>
<p>TIF 2.0 (endoscopic)</p> <p>IDEAL CANDIDATE No/small hiatal hernia (≤2 cm); BMI < 35; troublesome regurgitation; patients declining surgery</p>	<p>RYGB</p> <p>IDEAL CANDIDATE Obese patients (BMI ≥35) with GERD; failed fundoplication in obese; concurrent metabolic disease</p>

These features help determine the most suitable intervention for each patient, based on comprehensive selection criteria. Close patient monitoring remains important.

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Anti-Reflux Interventions: Key Advantages and Disadvantages

SURGICAL & ENDOSCOPIC OPTIONS FOR GERD: PROS AND CONS (SIMPLE SUMMARY)

<p>NISSEN FUNDOPLICATION (360°, total wrap)</p> <ul style="list-style-type: none"> Best reflux control (gold standard) Strong LES pressure increase Excellent long-term durability (>20 years) Highest risk of dysphagia (~40% early) Gas-bloat common (~30%) Inability to belch or vomit 	<p>TOUPET FUNDOPLICATION (270°, posterior partial wrap)</p> <ul style="list-style-type: none"> Reflux control similar to Nissen Much less dysphagia (~10% early) Preserves esophageal motility Little to no gas-bloat Possibly higher long-term GERD recurrence (debated) 	<p>DOR FUNDOPLICATION (180°, anterior partial wrap)</p> <ul style="list-style-type: none"> Less dysphagia than Nissen Effective reflux control after Heller myotomy Weaker reflux barrier than Nissen or Toupet Limited data as primary GERD surgery 	<p>LINX (Magnetic sphincter augmentation)</p> <ul style="list-style-type: none"> Minimally invasive Shorter surgery time Preserves ability to belch and vomit (~96%) Reversible MRI restrictions (>1.5T) Small erosion risk (~0.3%) Device removal risk (~4%) Dysphagia can be higher than fundoplication 	<p>TIF 2.0 (Endoscopic fundoplication)</p> <ul style="list-style-type: none"> Incisionless, outpatient procedure High short-term symptom control Many patients reduce or stop PPIs Not for severe esophagitis or large hernias Long-term durability uncertain Most patients resume low-dose PPIs 	<p>ROUX-EN-Y GASTRIC BYPASS (RYGB)</p> <ul style="list-style-type: none"> Treats both obesity and GERD Major reduction in reflux symptoms High PPI discontinuation rates Major anatomical change Nutritional deficiencies Technically complex Reflux can recur; new GERD possible
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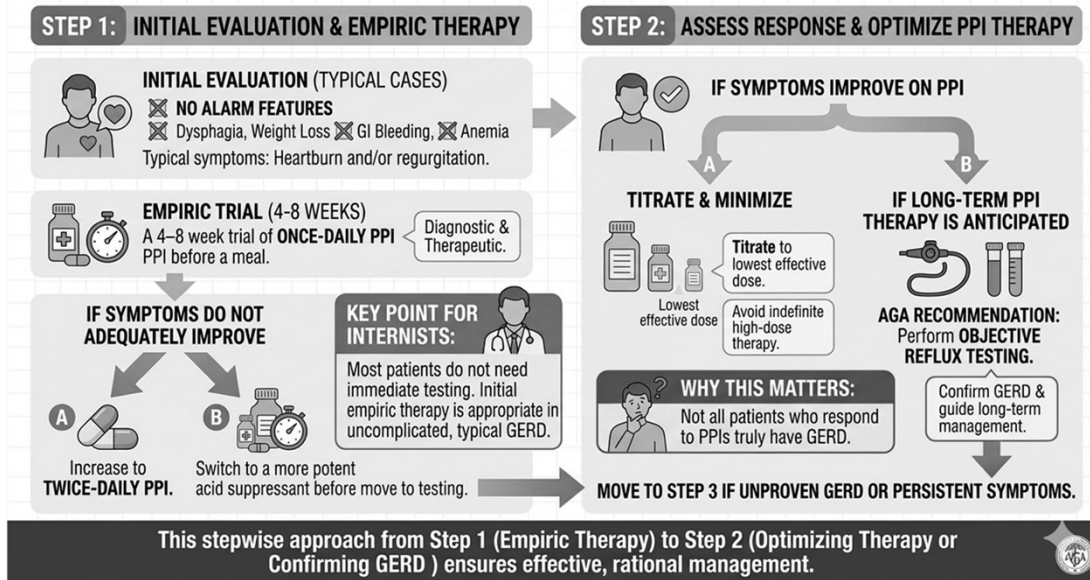
✓ Key Advantages ✗ Key Disadvantages

👤 Optimal anti-reflux intervention depends on comprehensive patient selection (confirmed GERD, motility assessment, BMI, hernia size).

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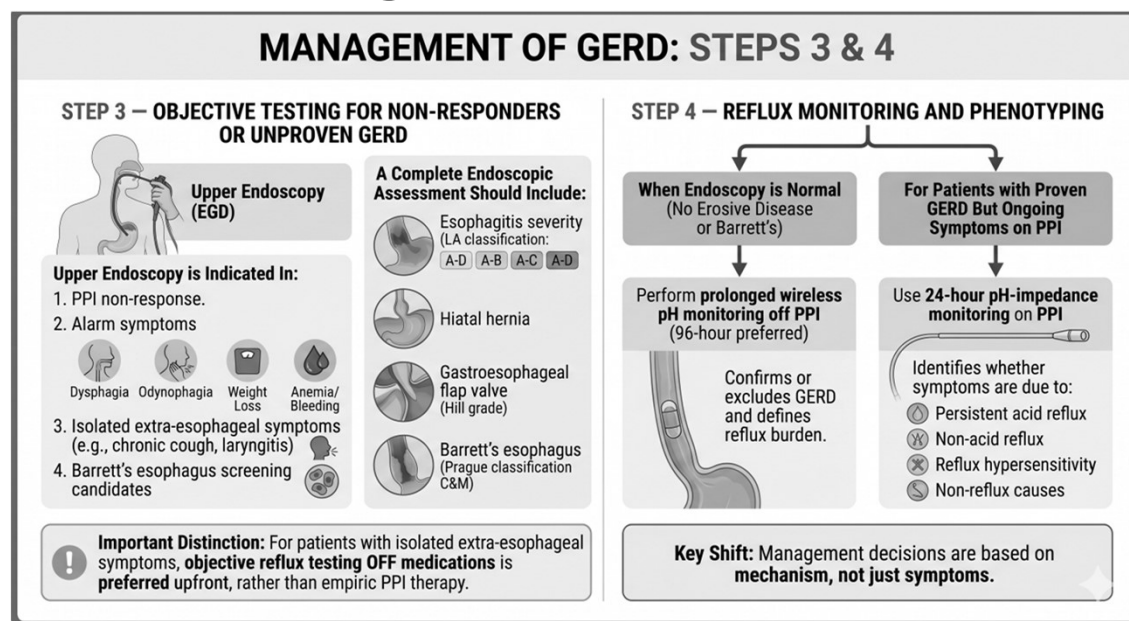
Management of GERD



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Management of GERD



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Management of GERD

MANAGEMENT OF GERD: STEPS 5 & 6

STEP 5 – PHENOTYPE-DRIVEN ADJUNCTIVE THERAPY



When symptoms persist despite optimized PPIs, adjunctive therapies should match the dominant symptom pattern:

-  Post-prandial or breakthrough symptoms → Alginate antacids 
-  Nocturnal symptoms → Bedtime H2-receptor antagonists 
-  Regurgitation- or belch-predominant symptoms → Baclofen 
-  Coexistent gastroparesis → Prokinetics 

Internist takeaway: Not all persistent symptoms mean “more acid.” Target the physiology.

STEP 6 – FUNCTIONAL ESOPHAGEAL DISORDERS

Patients with:




- Normal endoscopy 
- Physiologic acid exposure 

Symptoms triggered by reflux events or unrelated to reflux.

Often have:

Functional heartburn, or Reflux hypersensitivity.

Recommended approach:

-  Neuromodulators (e.g., low-dose antidepressants)
-  Behavioral therapies (CBT, hypnotherapy, diaphragmatic breathing)
-  Gradual PPI de-escalation, as tolerated





Key concept: These patients do not benefit from escalating acid suppression.

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GERD Management in Special Populations

1. PATIENTS WITH EXTRAESOPHAGEAL SYMPTOMS (Chronic cough, laryngitis, asthma)

WHAT TO DO	WHY
 Do NOT start with empiric PPI therapy  Order objective reflux testing OFF acid-suppressive therapy first	 PPI response rates are low  Most have non-reflux causes  Avoids unnecessary long-term PPI use and diagnostic delay



Practical takeaway: If the main complaint is cough or throat symptoms without classic heartburn, test first—do not trial PPIs.

2. OBESE PATIENTS (BMI ≥35)

WHAT TO DO	WHY
 PREFERRED PROCEDURE: RYGB	 RYGB improves both obesity and GERD
 AVOID SLEEVE	 Sleeve gastrectomy often worsens reflux

Practical takeaway: In patients with severe obesity and GERD, bariatric surgery choice matters—RYGB treats reflux; sleeve may aggravate it.

3. SEVERE EROSIVE ESOPHAGITIS (LA Grade C or D)

WHAT TO DO	WHAT TO DO
 Indefinite maintenance PPI or anti-reflux surgery	 Repeat endoscopy in 8–12 weeks after starting treatment

WHY	WHY
 High relapse risk if PPIs are stopped	 Repeat EGD ensures healing and rules out Barrett's esophagus

Practical takeaway: These patients need lifelong reflux control and documented mucosal healing.

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When Should You Refer GERD Patients to a Gastroenterologist?

URGENT REFERRAL: ALARM SYMPTOMS	NON-RESPONDERS & UNCERTAINTY	SCREENING & CONFIRMATION	SPECIAL SITUATIONS & COMPLICATIONS
<ul style="list-style-type: none"> DYSPHAGIA ODYNOPHAGIA WEIGHT LOSS GI BLEEDING IRON-DEFICIENCY ANEMIA PERSISTENT VOMITING <p>NEEDS PROMPT UPPER ENDOSCOPY</p>	<p>REFRACTORY SYMPTOMS</p> <ul style="list-style-type: none"> Persistent symptoms despite optimized PPI Correct timing & adherence BID PPI for ~8 weeks Recurrence after stopping PPI <p>DIAGNOSTIC UNCERTAINTY</p> <ul style="list-style-type: none"> Need to confirm or exclude GERD Requires specialized testing: <ul style="list-style-type: none"> Upper Endoscopy Ambulatory pH/pH-Impedance monitoring 	<p>BARRETT'S ESOPHAGUS SCREENING</p> <ul style="list-style-type: none"> Patients meeting guideline risk thresholds (e.g., chronic GERD with multiple additional risk factors) <p>OBJECTIVE CONFIRMATION</p> <ul style="list-style-type: none"> Before long-term PPI use For patients started on chronic PPIs without proven GERD <p>Prove GERD with Endoscopy & Reflux Testing first</p>	<p>ISOLATED EXTRAESOPHAGEAL SYMPTOMS</p> <ul style="list-style-type: none"> Chronic cough, laryngitis, asthma with suspected reflux Requires UPFRONT OBJECTIVE REFLUX TESTING (not empiric PPI trial) <p>CONSIDERING ANTI-REFLUX PROCEDURES</p> <ul style="list-style-type: none"> Evaluation for: <ul style="list-style-type: none"> Fundoplication LINX Endoscopic therapy Requires specialized testing (Endoscopy, Manometry, Reflux Monitoring) <p>COMPLICATED GERD</p> <ul style="list-style-type: none"> Needs specialized management LA Grade C/D esophagitis Peptic strictures Barrett's esophagus Requires healing confirmation, surveillance, endoscopic therapy

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Screening for Barrett's Esophagus

WHO SHOULD BE SCREENED FOR BARRETT'S ESOPHAGUS?

CORE PRINCIPLE: SCREEN WHEN RISK ACCUMULATES, NOT BASED ON REFLUX SYMPTOMS ALONE.

Screening is best reserved for patients with multiple established risk factors, where likelihood of BE and EAC is meaningfully higher.

CONSIDER SCREENING

ENDOSCOPY IN PATIENTS WITH CHRONIC GERD PLUS ADDITIONAL RISK FACTORS, ESPECIALLY WHEN SEVERAL ARE PRESENT.

Screening is not recommended for everyone with GERD.

CONSISTENTLY RECOGNIZED RISK FACTORS

- Male sex
- Age >50 years
- White / non-Hispanic white race
- Chronic GERD (≥5 YEARS OF SYMPTOMS OR WEEKLY HEARTBURN OR REGURGITATION)
- Obesity, especially central (abdominal) obesity
- Current or prior tobacco use
- First-degree family history (First-degree family history of Barrett's esophagus or esophageal adenocarcinoma)

HOW RISK FACTORS ADD UP: VISUALIZING ACCUMULATING RISK

GERD ALONE (~3% BE Prevalence)

ADDING RISK FACTORS (Risk increases by ~1.2% per additional factor)

GERD + FIRST-DEGREE FAMILY HISTORY (~23% Highest Prevalence)

CLINICAL IMPLICATION: RISK FACTORS ARE ADDITIVE, AND SCREENING YIELD RISES SHARPLY AS THEY ACCUMULATE.

general medical authority

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Case-1

A 45-year-old woman presents with a 6-month history of **burning retrosternal discomfort** occurring after meals and at night. She reports occasional regurgitation but denies dysphagia, odynophagia, weight loss, anorexia, vomiting, or gastrointestinal bleeding. She has tried over-the-counter antacids with minimal relief. Physical examination is unremarkable. What is the most appropriate next step in management?

- A) Upper endoscopy
- B) Ambulatory pH monitoring
- C) Empirical trial of a proton-pump inhibitor (PPI) for 2 months**
- D) Barium swallow
- E) Esophageal manometry

Answer: **Empirical trial of a proton-pump inhibitor (PPI) for 2 months.**

Rationale: In the absence of alarm symptoms (such as dysphagia, odynophagia, weight loss, anorexia, vomiting, or gastrointestinal bleeding), an empirical course of PPI therapy is a reasonable initial diagnostic and therapeutic approach for patients with typical GERD symptoms. This strategy is supported by evidence showing that a short course of high-dose PPI has a pooled sensitivity of 79% for GERD diagnosis in patients with typical symptoms and no alarm features. Upper endoscopy is reserved for patients with alarm symptoms or those at risk for Barrett's esophagus.

Fass R., *New England Journal of Medicine* Volume 387 • Number 13 • September 29, 2022; Pages: 1207-1216

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Case-2

A 54-year-old man presents with a 6-month history of heartburn and regurgitation. He reports new-onset dysphagia and unintentional weight loss of 10 pounds over the past two months. He has no prior history of gastrointestinal disease and has not tried acid suppression therapy. Physical examination reveals no acute findings.

Which of the following is the most appropriate next step in management?

- A) Empirical trial of a proton-pump inhibitor
- B) Ambulatory pH monitoring
- C) Esophageal manometry
- D) Esophagogastroduodenoscopy (EGD)**
- E) Barium swallow

Answer: **Esophagogastroduodenoscopy (EGD).**

Rationale: Upper endoscopy is indicated in patients with GERD symptoms who present with alarm features such as dysphagia or weight loss, as these may signal underlying complications including malignancy or strictures. EGD allows direct visualization and biopsy of the esophageal mucosa to evaluate for erosive esophagitis, Barrett's esophagus, or other pathology.

Fass R., *New England Journal of Medicine* Volume 387 • Number 13 • September 29, 2022; Pages: 1207-1216

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Case-3

A 60-year-old White man with a BMI of 32 and a 12-year history of chronic heartburn and regurgitation presents for routine follow-up. He is a current smoker and has a family history of esophageal adenocarcinoma. He denies dysphagia, weight loss, or gastrointestinal bleeding. Which of the following is the most appropriate next step?

- A) Empirical trial of a proton-pump inhibitor
- B) Ambulatory pH monitoring
- C) **Upper endoscopy to screen for Barrett's esophagus**
- D) Esophageal manometry
- E) Barium swallow

Answer: Upper endoscopy to screen for Barrett's esophagus is indicated in patients with chronic (≥ 5 years) GERD symptoms and three or more of the following risk factors: male sex, age >50 years, White race, tobacco smoking, obesity, or a family history of Barrett's esophagus or esophageal adenocarcinoma. This approach is justified because these factors are associated with increased risk for Barrett's esophagus and esophageal adenocarcinoma, and targeted screening may allow for earlier detection and management of premalignant changes

Fass R., *New England Journal of Medicine* Volume 387 • Number 13 • September 29, 2022; Pages: 1207-1216

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Summary: Take Home Points

- Optimize PPI timing, dose, and adherence
- Many PPI nonresponders lack true GERD
- Use objective testing before long-term PPI therapy
- Titrate PPIs to the lowest effective dose
- Match adjunctive therapy to symptom phenotype
 - Alginates for postprandial breakthrough
 - Famotidine for nocturnal symptoms
 - Baclofen for regurgitation or belch-predominant symptoms.
- Confirm reflux before surgical referral
- Procedure choice depends on anatomy and BMI

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