CHAPTER 3

TREATMENT ALGORITHMS FOR GASTROINTESTINAL DISORDERS

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Abstract

Gastrointestinal treatment algorithms focus on resolving symptoms, healing mucosal damage, and managing underlying etiology. The algorithm for gastroesophageal reflux disease (GERD) is a stepwise approach, commencing with lifestyle modifications and proceeding to an 8-week trial of proton pump inhibitors (PPIs). Failure of this trial, or the presence of alarm features, triggers endoscopic evaluation. Peptic ulcer disease (PUD) management is bifurcated by cause: *H. pylori*-positive ulcers are treated with an eradication algorithm (e.g., bismuth quadruple therapy), while NSAID-induced ulcers require PPI therapy and cessation of the offending agent. The algorithm for inflammatory bowel disease (IBD) is stratified by disease type (Crohn's vs. Ulcerative Colitis) and severity, utilizing a "step-up" or "top-down" approach with 5-ASAs, corticosteroids, immunomodulators, and biologics to induce and maintain remission. Celiac disease management is a singular algorithm centered on a strict, lifelong gluten-free diet and nutritional monitoring. Hepatitis algorithms are virus-specific: Hepatitis A is managed supportively; chronic Hepatitis B treatment is guided by viral load and liver inflammation, using nucleos(t)ide analogs for long-term suppression; and Hepatitis C is managed with a curative, pangenotypic direct-acting antiviral (DAA) regimen.

Keywords: *Gastrointestinal Algorithms, GERD, Peptic Ulcer Disease, Inflammatory Bowel Disease, Celiac Disease, Hepatitis*

Learning Objectives

After completion of the chapter, the learners should be able to:

- Identify the first-line triple and quadruple therapy regimens for H. pylori eradication in peptic ulcer disease.
- Explain the "step-up" versus "top-down" therapeutic algorithms for managing Inflammatory Bowel Disease (IBD).
- Select the appropriate treatment algorithm (lifestyle, H2RA, or PPI) for a patient with GERD based on symptom severity and frequency.
- Differentiate the diagnostic and management algorithms for Crohn's disease versus ulcerative colitis.
- Justify the decision to initiate or defer antiviral therapy for a patient with chronic Hepatitis C based on genotype and liver function

GASTROESOPHAGEAL REFLUX DISEASE (GERD)

GERD is a highly prevalent condition characterized by symptoms or mucosal complications resulting from the reflux of gastric contents into the esophagus. The treatment algorithm is stepwise, focusing on symptom control and prevention of complications like esophagitis and Barrett's esophagus.

Pathophysiology

GERD is a condition of chronic mucosal damage produced by the abnormal reflux of gastric contents into the esophagus. This is fundamentally a failure of the anti-reflux barrier. The pathophysiology is centered on the lower esophageal sphincter (LES), a high-pressure zone that should remain closed except during swallowing. In GERD, this barrier fails, often due to transient LES relaxations (T-LES-Rs), where the sphincter relaxes inappropriately, unconnected to swallowing. Other contributing factors include a chronically hypotensive (weak) LES, the presence of a hiatal hernia (which displaces the LES from the supportive diaphragm), delayed gastric emptying, and impaired esophageal acid clearance. This repeated acid and pepsin exposure damages the squamous epithelium of the esophagus, causing inflammation (esophagitis) and leading to

the classic symptoms of heartburn and regurgitation.

Diagnosis and Classification

Diagnosis is most often made clinically based on a classic symptom presentation (heartburn, regurgitation). An 8-week empiric trial of a proton pump inhibitor (PPI) is a common diagnostic and therapeutic first step. Endoscopy (EGD) is not required for diagnosis but is a key part of the algorithm if alarm features are present (dysphagia, odynophagia, weight loss, anemia, gastrointestinal bleeding) or if patients fail to respond to PPI therapy. Ambulatory 24-hour pH monitoring is the gold standard for diagnosis in patients with refractory, atypical, or extraesophageal symptoms.

Differential Diagnosis

The differential for GERD symptoms is broad. It is critical to first exclude cardiac chest pain. Other considerations include peptic ulcer disease, non-ulcer dyspepsia, eosinophilic esophagitis (especially in patients with refractory symptoms and dysphagia), motility disorders like achalasia, and pill esophagitis.

Treatment Algorithm

The algorithm for GERD proceeds in a stepwise fashion.
- **Step 1: Lifestyle and Dietary Modification:** All patients are advised to lose weight (if overweight), elevate the head of the bed, and avoid late-night meals. Trigger food avoidance (e.g., caffeine, alcohol, fatty foods) is recommended if a clear association with symptoms exists.
- **Step 2: Empiric PPI Trial:** For patients with typical GERD symptoms, a standard-dose PPI once daily for 8 weeks is the first-line pharmacological algorithm.
- **Step 3: Management of Response:**
  - **Successful Response:** The algorithm dictates stepping down to the lowest effective dose, which may include low-dose PPI, an H2-receptor antagonist (H2RA), or on-demand therapy.

- o **No Response/Partial Response:** The algorithm requires optimization (e.g., ensuring correct timing before a meal) or escalating to twice-daily PPI dosing. Failure of this step defines refractory GERD.
- **Step 4: Refractory GERD:** These patients require referral for upper endoscopy to rule out other etiologies. If endoscopy is unrevealing, ambulatory pH monitoring (on or off therapy) is used to confirm the diagnosis and correlate symptoms with reflux events. Surgical options, such as laparoscopic Nissen fundoplication or magnetic sphincter augmentation (LINX), are considered for confirmed refractory GERD.

Table 3.1: Stepwise Management Algorithm for GERD

Step	Intervention	Rationale / Goal
Step 1	Lifestyle Modifications + PRN Antacids/H2RAs	For intermittent, mild symptoms.
Step 2	Scheduled H2RA or Daily PPI (4-8 wks)	For persistent or frequent symptoms.
Step 3	Optimize PPI (e.g., BID dosing)	For refractory symptoms.
Step 4	Refer for EGD / pH testing	Investigate for complications or alternative diagnoses.

Monitoring and Follow-Up

Initial monitoring is based on symptom response to an empiric 8-week trial of a proton pump inhibitor (PPI). If symptoms resolve, the diagnosis is confirmed. If symptoms are refractory, adherence and PPI timing (30-60 min before the first meal) must be reassessed. The primary diagnostic tool for refractory or "alarm" symptoms (dysphagia, weight loss, bleeding) is an upper endoscopy (EGD) to rule out complications. For patients on long-term PPIs, monitoring involves periodic assessment for the lowest effective dose. While routine monitoring for micronutrient deficiencies (e.g., B12, magnesium) is controversial, it should be considered in high-risk patients. For patients diagnosed with Barrett's esophagus (a

precancerous complication), long-term monitoring involves a surveillance EGD with biopsies every 3-5 years.

Long-Term Management / Secondary Prevention

The goal of long-term management is to control symptoms and prevent complications. This begins with foundational lifestyle modifications. For many, this is a chronic, relapsing condition requiring maintenance therapy. The standard of care is the lowest effective dose of a PPI, taken daily or on-demand. For patients who wish to avoid long-term medication or who have refractory symptoms (especially volume regurgitation), anti-reflux surgery (e.g., Nissen fundoplication) or a magnetic sphincter augmentation procedure (LINX) are options. Secondary prevention is focused on the management of Barrett's esophagus, where long-term PPIs are mandatory to reduce the risk of progression to esophageal adenocarcinoma.

Patient Counseling Points

1. **PPI Timing:** This is a critical counseling point. PPIs are proton-pump *inhibitors*, not acid *blockers*. They must be taken 30-60 minutes *before* the first meal of the day to inhibit the actively secreting pumps.
2. **Lifestyle & Diet:** Counsel on weight loss (if overweight), smoking cessation, and avoiding meals 2-3 hours before lying down. Common trigger foods include caffeine, chocolate, alcohol, and spicy/fatty foods.
3. **Alarm Symptoms:** The patient must be taught to report "red flag" symptoms immediately: dysphagia (difficulty swallowing), odynophagia (painful swallowing), unintentional weight loss, or signs of bleeding (anemia, black stools).
4. **Risks vs. Benefits:** Discuss that while long-term PPI use is generally safe, it is associated with a small increased risk of C. difficile colitis and community-acquired pneumonia. The goal is always to use the lowest effective dose.
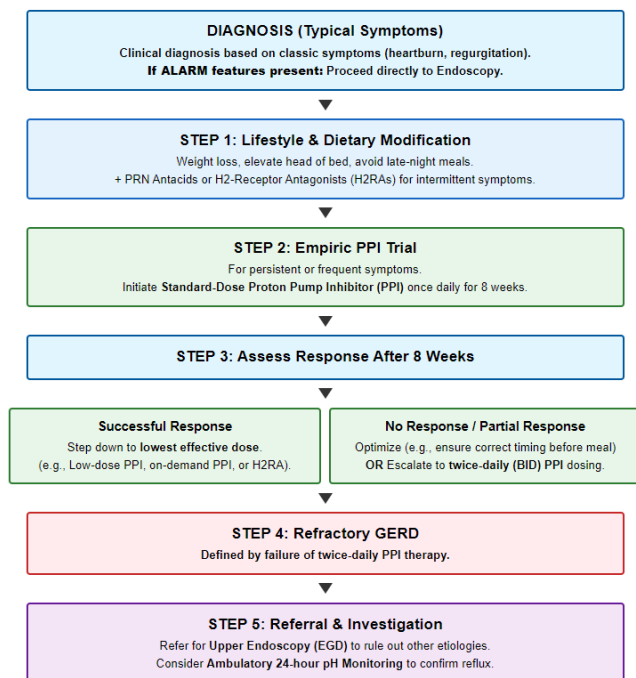
DIAGNOSIS (Typical Symptoms)
Clinical diagnosis based on classic symptoms (heartburn, regurgitation).
If ALARM features present: Proceed directly to Endoscopy.

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STEP 1: Lifestyle & Dietary Modification
Weight loss, elevate head of bed, avoid late-night meals.
+ PRN Antacids or H2-Receptor Antagonists (H2RAs) for intermittent symptoms.

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STEP 2: Empiric PPI Trial
For persistent or frequent symptoms.
Initiate **Standard-Dose Proton Pump Inhibitor (PPI)** once daily for 8 weeks.

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STEP 3: Assess Response After 8 Weeks

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Successful Response	**No Response / Partial Response**
Step down to **lowest effective dose**. (e.g., Low-dose PPI, on-demand PPI, or H2RA).	Optimize (e.g., ensure correct timing before meal) OR Escalate to **twice-daily (BID) PPI** dosing.

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STEP 4: Refractory GERD
Defined by failure of twice-daily PPI therapy.

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STEP 5: Referral & Investigation
Refer for **Upper Endoscopy (EGD)** to rule out other etiologies.
Consider **Ambulatory 24-hour pH Monitoring** to confirm reflux.

Figure 3.1: Gastroesophageal Reflux Disease (GERD)

3.1.4 Common Pitfalls in Management

A critical pitfall is misattributing cardiac chest pain to GERD, delaying cardiovascular workup. Another is the indefinite continuation of high-dose PPIs without attempting to step down therapy, leading to potential long-term risks (e.g., *C. difficile* infection, micronutrient malabsorption). Failing to investigate "alarm features" with prompt endoscopy is a major error that can delay a cancer diagnosis. Finally, overlooking eosinophilic esophagitis as a cause of refractory symptoms is a common diagnostic omission.

Case Study

A 48-year-old male (Mr. Chen) presents with a 3-month history of burning, substernal chest pain ("heartburn") and a sour taste in his mouth (regurgitation). Symptoms are worse

after large meals and when he lies down at night. He has no "alarm features" (no dysphagia, weight loss, or bleeding).

Discussion

This is a classic clinical presentation of **Gastroesophageal Reflux Disease (GERD)**. Because there are no alarm features, the management algorithm does not begin with an EGD (endoscopy). Instead, the standard of care is an empiric trial of the most effective medication.

Treatment Algorithm

1. **Diagnosis:** Clinical diagnosis of GERD.
2. **Algorithm Step 1 (Lifestyle):** You counsel Mr. Chen on lifestyle modifications: avoid late-night meals, elevate the head of his bed, and reduce trigger foods (he identifies coffee and spicy food).
3. **Algorithm Step 2 (Empiric Trial):** You initiate the first-line pharmacological algorithm:
   - **Proton Pump Inhibitor (PPI) Trial:** Start **Omeprazole 20 mg once daily**, taken 30 minutes *before* breakfast.
4. **Follow-up:** The plan is to continue this for a full 8-week course.
5. **Algorithm Step 3 (Management):** You schedule a follow-up call in 4 weeks. If his symptoms are resolved, the diagnosis is confirmed. After 8 weeks, the algorithm dictates "stepping down" to the lowest effective dose (e.g., omeprazole 20 mg as-needed or switching to an H2RA like famotidine).

Outcome

Mr. Chen is started on an 8-week trial of Omeprazole 20 mg daily. He is to report back if symptoms do not improve, which would trigger the next step in the algorithm (e.g., optimizing the dose or referring for EGD).

PEGTIC ULCER DISEASE

PUD refers to defects in the gastric or duodenal mucosa that extend through the muscularis mucosae. The treatment algorithm is critically dependent on identifying and eradicating the underlying cause, most commonly *Helicobacter pylori* infection or NSAID use.

Pathophysiology

The pathophysiology is a fundamental imbalance between aggressive factors (gastric acid, pepsin) and protective factors (mucus layer, bicarbonate, mucosal blood flow, prostaglandins). Over 90% of PUD is caused by one of two etiologies:

Helicobacter pylori Infection

This spiral-shaped bacterium colonizes the gastric mucus. It survives the acidic environment by producing urease, which creates a neutral ammonia cloud. It induces a chronic inflammatory response (gastritis) and releases toxins (e.g., CagA, VacA) that disrupt the mucosal barrier, making it susceptible to acid damage.

NSAID Use

Nonsteroidal anti-inflammatory drugs (e.g., ibuprofen, naproxen, aspirin) inhibit cyclooxygenase (COX-1 and COX-2) enzymes. COX-1 is crucial for gastro-protection, as it synthesizes prostaglandins that maintain the mucosal barrier, stimulate bicarbonate secretion, and preserve mucosal blood flow. Blocking prostaglandins renders the stomach vulnerable to its own acid.

Diagnosis

The gold standard for diagnosis is upper endoscopy (EGD), which allows for direct visualization, localization, and biopsy of the ulcer. Biopsy is mandatory for gastric ulcers to rule out malignancy. Concurrently, all patients should be tested for *H. pylori* infection. This can be done via endoscopic biopsy (rapid urease test, histology) or non-invasively (urea breath test, stool antigen test). Serology is less useful as it cannot distinguish active from past infection.

Differential Diagnosis

The differential for epigastric pain includes GERD, functional dyspepsia, gastritis, pancreatitis, biliary colic, and gastric cancer. A sudden onset of severe, diffuse abdominal pain in a patient with PUD should raise suspicion for perforation, a surgical emergency.

Treatment Algorithm

The PUD algorithm is bifurcated based on etiology.

- **Algorithm 1:** *H. pylori*-**Positive PUD:** The primary goal is eradication. First-line therapy is guided by local clarithromycin resistance rates and patient allergies.
  - **High Clarithromycin Resistance (>15%):** Bismuth quadruple therapy (Bismuth, PPI, tetracycline, metronidazole) for 14 days is the preferred algorithm.
  - **Low Clarithromycin Resistance (<15%):** Clarithromycin-based triple therapy (PPI, clarithromycin, amoxicillin or metronidazole) for 14 days is an option. Following therapy, a PPI is continued for 4-8 weeks to ensure ulcer healing. Eradication *must* be confirmed ≥ 4 weeks after therapy completion, typically with a urea breath test or stool antigen test.
- **Algorithm 2: NSAID-Induced PUD:** The primary algorithm is cessation of the offending NSAID. If this is not possible, the NSAID should be reduced to the lowest effective dose and co-prescribed with a PPI. In either case, standard-dose PPI therapy is initiated and continued for 4-8 weeks to promote healing.
- **Algorithm 3: Bleeding Ulcer:** This is a medical emergency. The algorithm involves hemodynamic resuscitation, IV PPI infusion, and urgent upper endoscopy for hemostatic therapy (e.g., clipping, thermal coagulation).
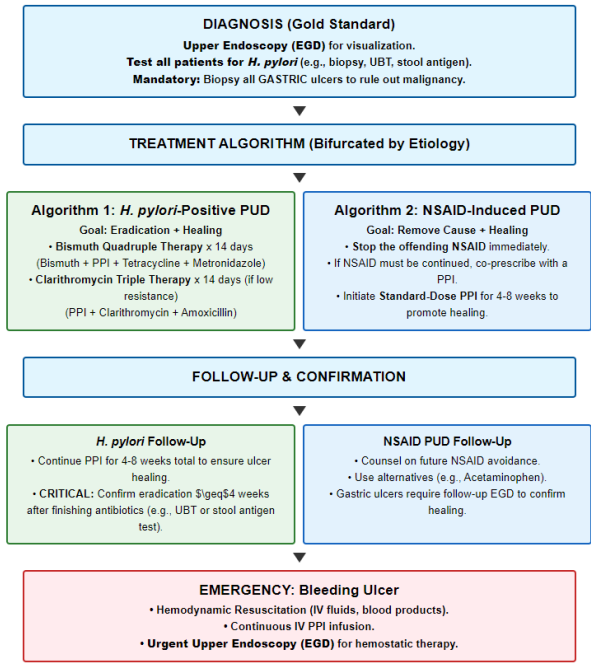
DIAGNOSIS (Gold Standard)
Upper Endoscopy (EGD) for visualization.
Test all patients for *H. pylori* (e.g., biopsy, UBT, stool antigen).
Mandatory: Biopsy all GASTRIC ulcers to rule out malignancy.

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TREATMENT ALGORITHM (Bifurcated by Etiology)

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Algorithm 1: *H. pylori*-Positive PUD
Goal: Eradication + Healing
• **Bismuth Quadruple Therapy** x 14 days
(Bismuth + PPI + Tetracycline + Metronidazole)
• **Clarithromycin Triple Therapy** x 14 days (if low resistance)
(PPI + Clarithromycin + Amoxicillin)

Algorithm 2: NSAID-Induced PUD
Goal: Remove Cause + Healing
• **Stop the offending NSAID** immediately.
• If NSAID must be continued, co-prescribe with a PPI.
• Initiate **Standard-Dose PPI** for 4-8 weeks to promote healing.

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FOLLOW-UP & CONFIRMATION

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***H. pylori* Follow-Up**
• Continue PPI for 4-8 weeks total to ensure ulcer healing.
• **CRITICAL:** Confirm eradication ≥ 4 weeks after finishing antibiotics (e.g., UBT or stool antigen test).

NSAID PUD Follow-Up
• Counsel on future NSAID avoidance.
• Use alternatives (e.g., Acetaminophen).
• Gastric ulcers require follow-up EGD to confirm healing.

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EMERGENCY: Bleeding Ulcer
• Hemodynamic Resuscitation (IV fluids, blood products).
• Continuous IV PPI infusion.
• **Urgent Upper Endoscopy (EGD)** for hemostatic therapy.

Figure 3.2: Peptic Ulcer Disease (PUD)

Table 3.2: Algorithm for Peptic Ulcer Disease Treatment

Etiology	Diagnostic Test(s)	Treatment Algorithm
H. pylori	Urea Breath Test, Stool Antigen, Biopsy	Triple/Quadruple Therapy (e.g., PPI + Clarithro + Amox) for 14 days + PPI for 4-8 wks.
NSAID-Induced	History of NSAID use; negative *H. pylori* test.	Stop NSAID. Treat with PPI for 8 wks.
Refractory	Ulcer non-healing after 8-12 wks of PPI.	Evaluate for non-adherence, *H. pylori* resistance, or Zollinger-Ellison Syndrome.