



# GASTROINTESTINAL BLEEDING, DESCRIPTION, ETIOLOGY, EPIDEMIOLOGY, CLASSIFICATION, CLINICAL PRESENTATION, TREATMENT AND PROGNOSIS

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## SUMMARY

**Introduction:** Gastrointestinal bleeding can be divided into 2 broad categories: upper and lower bleeding. The anatomical landmark that divides upper and lower bleeds is the ligament of Treitz. Bleeding that begins above the ligament of Treitz usually presents as hematemesis or melena, while bleeding that begins below is frequently shown as hematochezia.

**Objective:** to detail current information related to gastrointestinal bleeding, description, etiology, epidemiology, classification, clinical presentation, treatment and prognosis.

**Methodology:** a total of 32 articles were analyzed in this review, including review and original articles, as well as clinical cases, of which 23 bibliographies were used because the other articles were not relevant to this study. The sources of information were PubMed, Google Scholar and Cochrane; the terms used to search for information in Spanish, Portuguese and English were: gastrointestinal bleeding, intestinal bleeding, ulcer, NSAID, gastro.

**Results:** An *H pylori* eradication regimen should be started if *H pylori* is present in case of peptic ulcer. In upper gastrointestinal bleeding, hospital mortality rates are around 10%. This rate remains stable up to 1 month after hospitalization for gastrointestinal bleeding. Long-term follow-up of individuals with ADH shows that three years after admission, all-cause mortality rates approach 37%. Mortality rates were higher in women



relative to men, which differs from lower gastrointestinal bleeding. Individuals with multiple hospitalizations for gastrointestinal bleeding have higher mortality rates. Long-term prognosis was worse in individuals with malignancies and variceal bleeding. Prognosis is usually worse with advancing age. For lower gastrointestinal bleeding, all-cause in-hospital mortality is low at about 4%.

**Conclusions:** The care of patients with gastrointestinal bleeding requires coordinated and efficient interprofessional cooperation. Upper gastrointestinal bleeding (UGH) is more frequent compared to lower gastrointestinal bleeding (LGE). We have to recognize the importance of the clinical manifestations of each of these and the differential diagnoses of these alterations, in order to have a proper diagnosis and therefore start the correct treatment in a timely manner and improve the prognosis of the affected individual. For treatment, risk stratification is of vital importance as well as an assessment of the appropriate setting for treatment followed by resuscitation and supportive therapy while investigating the underlying cause and attempting to correct it.

**KEYWORDS:** bleeding, gastrointestinal, bleeding, abdominal, gastro, ulcer.

## INTRODUCTION

Gastrointestinal bleeding is divided into 2 major categories: upper and lower bleeding. The anatomical landmark that divides upper and lower bleedings is the ligament of Treitz, also called the suspensory ligament of the duodenum. This peritoneal component suspends the duodenojejunal angle from the retroperitoneum. Bleeding that originates above the ligament of Treitz is usually shown as hematemesis or melena, whereas bleeding that begins below it is more frequently shown as hematochezia. Hematemesis is regurgitation of blood or blood in combination with stomach contents. Melena is dark, black, tarry stools that usually have a characteristic pungent odor caused by the function of digestive enzymes and intestinal bacteria on hemoglobin. Hematochezia is the passage of bright red blood through the rectum(1).

## METHODOLOGY

A total of 32 articles were analyzed in this review, including review and original articles, as well as cases and clinical trials, of which 23 bibliographies were used because the information collected was not sufficiently important to be included in this study. The sources of information were Cochrane, PubMed and Google Scholar; the terms used to search for information in Spanish, Portuguese and English were: gastrointestinal bleeding, intestinal hemorrhage, ulcer, NSAID, gastro.

The choice of bibliography exposes elements related to gastrointestinal bleeding; in addition to this factor, a description, etiology, epidemiology, classification, clinical presentation, treatment and prognosis are presented.

## DEVELOPMENT

### Description

Gastrointestinal (GI) bleeding is used to describe any bleeding that occurs within the GI tract from the mouth to the anus. Usually the ligament of Treitz is used as a reference point to differentiate the two types of bleeding. Bleeds proximal to the ligament are upper gastrointestinal bleeds and bleeds distal to the ligament are lower gastrointestinal bleeds. The division into these 2 groups is vitally important because it directs the evaluation and treatment of the affected individual. Gastrointestinal bleeding is sometimes considered a life-threatening emergency that generates high morbidity and mortality, thus requiring hospital admission for urgent diagnosis and treatment(2,3).

## Etiology and Classification

The etiology of gastrointestinal bleeding can be classified according to the site of origin of the bleeding into upper gastrointestinal (GI) bleeding and lower gastrointestinal bleeding. Some causes of upper GI bleeding are:

- Peptic ulcer disease (either secondary to excess gastric acid, H. pylori infection, or excessive use of NSAIDs or physiological stress).
- Esophagitis.
- Gastritis and duodenitis.
- Angiodysplasia.
- Portal hypertensive gastropathy (PHG).
- Mallory-Weiss tears.
- Dieulafoy's lesion (dilated bleeding vessel that erodes through the gastrointestinal epithelium but does not show primary ulceration; may be in any location along the gastrointestinal tract).
- Varices.
- Gastric antral valvular ectasia (GAVE; called watermelon stomach).
- Aortoenteric fistulas.
- Upper gastrointestinal tumors.
- Cameron's lesions (bleeding ulcers that occur in place of a hiatal hernia).
- Foreign body ingestion.
- Postoperative bleeding (post-anastomotic, post-polypectomy, post-sphincterotomy).
- Hemobilia.
- Hemosuccus pancreaticus(4,5).

Some causes of lower gastrointestinal bleeding are:

- Diverticulosis.
- Infectious colitis.
- Ischemic colitis.
- Angiodysplasia.
- Post-surgical (postpolypectomy, post biopsy).
- Anal fissures.
- Rectal varices.
- Inflammatory bowel disease.
- Radiation-induced damage following treatment of abdominal or pelvic cancers.
- Colon cancer.
- Hemorrhoids.



- Dieulafoy's lesion (infrequently outside the stomach, however it can occur throughout the gastrointestinal tract).

Lower gastrointestinal bleeding can be divided into 3 types: massive, moderate and occult bleeding.

1. Massive bleeding usually happens in individuals older than 65 years with multiple medical disorders, this bleeding shows up as hematochezia or bright red blood from the rectum. The affected individual is usually hemodynamically unstable with systolic blood pressure (SBP) equal to or less than 90 mmHg, heart rate (HR) less than or equal to 100/min and paucity in urine manufacture. Commonly in laboratory studies it presents with a hemoglobin equal to or less than 6 g/dL. Massive lower gastrointestinal bleeding is usually caused by diverticulosis and angiodysplasias, presenting mortality rates of up to 21%.
2. Moderate bleeding can occur in any age range and shows up as hematochezia or melena. The affected individual usually presents hemodynamically stable. Several pathologies must be taken into account in the differential diagnosis of these bleedings among which we have: inflammatory, infectious, neoplastic, benign and congenital anorectal alterations.
3. Similarly, occult lower gastrointestinal bleeding may be present in individuals of any age group. Laboratory tests show microcytic hypochromic anemia due to chronic blood loss. Inflammatory, neoplastic and congenital congenital disorders should be present in the differential of these individuals, usually the individual is hemodynamically stable and in good general condition(3,6,7).

### Epidemiology

Upper gastrointestinal bleeding (UGH) is more common than lower gastrointestinal bleeding (LGE). The incidence of UGH is around 67/100,000 inhabitants, while that of LGE is around 36/100,000 inhabitants. The latter is more frequent in males because vascular diseases and diverticulosis are more common in this sex. Lower gastrointestinal bleeding is common, representing 20-30% of all individuals affected by a major gastrointestinal bleeding. The incidence increases with age. Acute colonic bleeding, or lower gastrointestinal bleeding, is defined as bleeding that occurs in the colon, rectum or anus, showing bright red blood, clots, or burgundy or melena-colored stools(1,3,8-12).

Gastrointestinal bleeding occurs in about 1.5 to 3.0% of hospitalized individuals with COVID-19 infection. Lower gastrointestinal bleeding associated with COVID-19 infection is usually due to ischemic colitis, associated with thromboembolism and a hypercoagulable state, which is also associated with COVID-19 infection(13).

### Clinical Presentation

Individuals showing gastrointestinal bleeding may present with multiple signs and symptoms, so a complete history is essential, with emphasis on asking whether the bleeding is sporadic or recurrent, asking about the existence of associated symptoms, followed by a detailed review of medications and relevant family history such as colon cancer or inflammatory bowel disease (IBD)(3).

In addition, the affected individual should be asked about the following points:

- Previous gastrointestinal bleeding situations.
- Significant medical history for bleeding such as varicose veins, hemorrhoids, alcohol abuse, tobacco abuse, portal hypertension, ulcers, H. pylori, diverticulitis, inflammatory bowel disease.
- Contributing or confounding medications such as nonsteroidal anti-inflammatory drugs, antiplatelet drugs, bismuth, anticoagulants, iron.
- Comorbid conditions that could alter treatment.
- Symptoms related to bleeding, painless versus painful, previous vomiting or retching, difficulty swallowing, unintentional weight loss, altered bowel habits(1).
- On physical examination look for signs of hemodynamic instability such as:
- Orthostatic hypotension: related to loss of about 15% of total blood volume.
- Tachycardia at rest: also related to loss of less than 15% of total blood volume.
- Supine hypotension: related to loss of about 40% of total blood volume.
- Abdominal pain that may suggest perforation or ischemia.

In addition a rectal examination is important for the analysis of:

- Anorectal mass.
- Anal fissures.
- Hemorrhoids.
- Stool.

All individuals who show lower gastrointestinal bleeding should be classified and evaluated immediately and constantly, because gastrointestinal bleeding can rapidly decompensate the affected individual. The following laboratory tests are indicated in search of the source of the bleeding:

- Complete blood count.
- Hemoglobin/hematocrit.
- International Normalized Ratio (INR).
- Prothrombin time.
- Activated partial thromboplastin time.
- Lactate
- Liver function tests.

In addition, some diagnostic studies are useful, such as:

- Upper gastrointestinal endoscopy: becoming diagnostic and therapeutic. It shows the upper gastrointestinal tract



and provides injection therapy, thermal coagulation or hemostatic clips/bands.

- Lower GI endoscopy/colonoscopy: becoming diagnostic and therapeutic. It shows the lower GI tract and provides injection therapy, thermal coagulation or hemostatic clips/bands.
- Push enteroscopy: gives greater visualization of the small bowel.
- Deep small bowel enteroscopy: provides increased visualization of the small bowel.
- Nuclear scan: scanning of labeled red blood cells. Detects bleeding occurring at a rate of 0.1 to 0.5 ml/min using technetium-99m, detecting active bleeding. Important for angiographic and surgical interventions.
- Computed tomography angiography: identifies vessels with active bleeding.
- Standard angiography: identifies vessels with active bleeding and gives a possible treatment through embolization or intra-arterial vasopressin. It requires a rate of 0.5 to 1.0 ml/min of active bleeding to observe the site.
- Meckel's scan: nuclear medicine scan to look for ectopic gastric mucosa(14-16).

### Treatment

Acute treatment of gastrointestinal bleeding typically involves assessment of the appropriate setting for treatment accompanied by resuscitation and supportive therapy, while the underlying source is sought(17).

Many acute colonic hemorrhages will stop spontaneously, allowing for non-urgent assessment, however in those individuals with severe hematochezia, defined as continuous bleeding within 24 h of hospitalization with a drop in hemoglobin of at least 2 g/dL and/or need for transfusion of at least 2 units of red cell concentrate, require emergency treatment(18).

### Risk Stratification

Specific risk calculators attempt to support in identifying likely beneficiaries of ICU level of care; generally stratified according to mortality risk. The AIMS65 score and the Rockall score calculate the mortality rate of upper gastrointestinal bleeding. There are two separate Rockall scores; the first is calculated pre-endoscopy and identifies pre-endoscopy mortality, while the second calculates post-endoscopy and calculates overall mortality and the risks of rebleeding. The Oakland score is a risk calculator that tries to support the calculation of the probability of a safe discharge in lower gastrointestinal bleeding(1,19,20).

### Intensive Care Unit

Individuals with hemodynamic instability, ongoing bleeding, or those at significant risk for morbidity and mortality should be monitored in an intensive care unit to allow more effective monitoring of vital signs and to be prepared for possible more emergent therapeutic intervention.

### General Medical Ward

Most other individuals with gastrointestinal bleeding can be followed up on a general medical ward. However, continuous telemetry monitoring would be beneficial for early identification in case of hemodynamic compromise.

### Outpatient

Generally patients with gastrointestinal bleeding require hospitalization, however there are cases such as some young healthy individuals with self-limited and asymptomatic bleeding who can be discharged and safely evaluated with outpatient monitoring.

### Indications and Care

- Nothing by mouth.
- Supplemental oxygen if hypoxia may be through a nasal cannula, however, individuals with ongoing hematemesis or altered mental status may require intubation. Non-invasive positive pressure ventilation (NIPPV) should be avoided because of the risk of aspiration due to vomiting.
- Adequate intravenous access: at least 2 large-bore peripheral intravenous lines or a central catheter.
- Resuscitation with intravenous fluids, preferably normal saline or lactated Ringer's solution.
- Blood group and cross-matching.

### Transfusions

- Transfusion of red blood cells, when there is a hemoglobin lower than 7 g/dL, including in individuals with coronary artery disease.
- Platelet transfusion, when platelet count is less than 50,000/microL.
- Prothrombin complex concentrate, when the INR is greater than 2.

### Medications

- Proton pump inhibitor (PPI): used empirically for upper gastrointestinal bleeding. May be maintained or discontinued upon clarification of the source of bleeding.
- Antibiotics: used prophylactically in individuals with cirrhosis to prevent translocation, mainly by endoscopy.
- Prokinetic agents: generally used for better observation at the time of endoscopy.
- Anticoagulant and antiplatelet agents: should be discontinued if possible in acute bleeding. Reversal of agents should be considered on an individual basis and depending on the significance of the bleeding and the risks of reversal.
- Vasoactive drugs: somatostatin and its analog octreotide have been used to manage variceal bleeding by inhibiting vasodilator hormone release.



### Additional

Nasogastric lavage may be considered if necessary to remove fresh blood or clots and improve endoscopic performance.

Consideration should be given to placing a Blakemore or Minnesota tube in individuals with hemodynamic instability or massive gastrointestinal bleeding with known varices, it should be done after securing the airway. This implies a significant risk of complications such as gastric perforation, esophageal perforation or arrhythmias(1,21,22).

Patients with massive hemorrhage or hemodynamic instability who present bleeding that is not amenable to other types of management should be promptly referred to the surgical team.

In case of diverticular bleeding, colonoscopy with bipolar probe coagulation, epinephrine injection or metal clips can be used.

If angiodysplasia is the origin of the lower gastrointestinal bleeding, thermal therapy such as argon plasma coagulation or electrocoagulation is performed.

### Differential Diagnosis

Not many diagnoses resemble gastrointestinal bleeding. Sometimes hemoptysis can be confused with hematemesis or vice versa. Ingestion of bismuth-containing products or iron supplements may cause the stool to have a melanic appearance. Some foods with dyes can change the emesis or stool color to red, purple or maroon. Some of the differentials to consider in gastrointestinal bleeding are:

#### Upper Gastrointestinal Bleeding

- Peptic ulcer.
- Esophagitis.
- Gastritis.
- Duodenitis.
- Portal hypertensive gastropathy.
- Angiodysplasia.
- Varicose veins.
- Dieulafoy's lesion.
- Cameron's lesion.
- Aortoenteric fistulas.
- Gastric antral valvular ectasia.
- Mallory-Weiss tears.
- Hemobilia.
- Foreign body ingestion.
- Upper gastrointestinal tumors.
- Hemosuccus pancreaticus(2).

#### Lower Gastrointestinal Bleeding

- Inflammatory bowel disease.
- Colon cancer.
- Hemorrhoids.
- Dieulafoy's lesion.
- Diverticulosis.
- Angiodysplasia.
- Anal fissures.
- Radiation induced colitis.

- Rectal varices.
- Infectious colitis.
- Ischemic colitis.

### Prognosis

There are limited studies on the prognosis following gastrointestinal bleeding.

In upper gastrointestinal bleeding, in-hospital mortality rates are around 10% according to several studies. This rate remains stable up to 1 month after hospitalization for GI bleeding. Long-term follow-up of individuals with ADH shows that 3 years after admission, all-cause mortality rates approached 37%.

Mortality rates were higher in females compared with males when adjusted for age, which differed for lower gastrointestinal bleeding. Individuals with multiple hospitalizations for gastrointestinal bleeding showed higher mortality rates. Long-term prognosis was worse in individuals with malignant neoplasms and variceal bleeding, as well as worse with advancing years(1).

In lower gastrointestinal bleeding, in-hospital mortality from all origins is less than 4%. The greatest risk of death corresponds to increasing age, comorbid conditions and intestinal ischemia. Some negative prognostic factors are secondary bleeding, hypovolemia, pre-existing coagulopathies, need for transfusion and male sex. There is a high late and early mortality due to upper gastrointestinal bleeding, with a poor long-term prognosis following bleeding due to malignant neoplasms and varices(17,23).

### Complications

When gastrointestinal bleeding is not managed in time or adequately, it can have important consequences. In addition, the following complications may occur in individuals with upper or lower gastrointestinal bleeding:

- Infection.
- Shock.
- Respiratory distress.
- Myocardial infarction.
- Death.

Eradication of H pylori should be performed if it is present along with peptic ulcer, this reduces the risk of recurrent ulcer bleeding, it is also advisable to avoid non-steroidal anti-inflammatory drugs (NSAIDs) and use COX-2 inhibitors that present less risk of ulcer bleeding. If it is not possible to avoid NSAIDs, it is indicated to use the lowest dose and duration. Proton pump inhibitors (PPIs) or misoprostol therapy is recommended in combination with NSAIDs. Increased physical activity prevents progression of diverticular disease, just as aspirin and NSAIDs increase the risk of diverticulitis and diverticular bleeding.

### CONCLUSIONS

The care of patients with gastrointestinal bleeding requires coordinated and efficient interprofessional cooperation. Upper gastrointestinal bleeding (UGH) is more common compared to



lower gastrointestinal bleeding (LGE). We have to recognize the importance of the clinical manifestations of each of these and the differential diagnoses of these alterations, in order to have a proper diagnosis and therefore start the correct treatment in a timely manner and improve the prognosis of the affected individual. For treatment, risk stratification is of vital importance as well as an assessment of the appropriate setting for treatment followed by resuscitation and supportive therapy while investigating the underlying cause and attempting to correct it.

## BIBLIOGRAPHY

1. DiGregorio AM, Alvey H. *Gastrointestinal Bleeding*. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2024 Jan 21]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK537291/>
2. Suba M, Ayana SM, Mtabho CM, Kibiki GS. The aetiology, management and clinical outcome of upper gastrointestinal bleeding among patients admitted at the Kilimanjaro Christian Medical Centre in Moshi, Tanzania. *Tanzan J Health Res*. 2010 Oct;12(4):302-5.
2. Amin SK, Antunes C. *Lower Gastrointestinal Bleeding*. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2024 Jan 21]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK448126/>
3. Lee YT, Walmsley RS, Leong RWL, Sung JY. Dieulafoy's lesion. *Gastrointest Endosc*. 2003 Aug;58(2):236-43.
4. Weston AP. Hiatal hernia with cameron ulcers and erosions. *Gastrointest Endosc Clin N Am*. 1996 Oct;6(4):671-9.
5. Jung K, Moon W. Role of endoscopy in acute gastrointestinal bleeding in real clinical practice: An evidence-based review. *World J Gastrointest Endosc*. 2019 Feb 16;11(2):68-83.
6. Mizuki A, Tatemichi M, Nagata H. Management of Diverticular Hemorrhage: Catching That Culprit Diverticulum Red-Handed! *Inflamm Intest Dis*. 2018 Dec;3(2):100-6.
7. Lanas A, Perez-Aisa MA, Feu F, Ponce J, Saperas E, Santolaria S, et al. A Nationwide Study of Mortality Associated with Hospital Admission Due to Severe Gastrointestinal Events and Those Associated with Nonsteroidal Antiinflammatory Drug Use. *Am J Gastroenterol*. 2005 Aug;100(8):1685-93.
8. Strate LL, Gralnek IM. ACG Clinical Guideline: Management of Patients With Acute Lower Gastrointestinal Bleeding. *Am J Gastroenterol*. 2016 May;111(5):755.
9. Wuerth BA, Rockey DC. Changing Epidemiology of Upper Gastrointestinal Hemorrhage in the Last Decade: A Nationwide Analysis. *Dig Dis Sci*. 2018 May;63(5):1286-93.
10. Ghassemi KA, Jensen DM. Lower GI bleeding: epidemiology and management. *Curr Gastroenterol Rep*. 2013 Jul;15(7):333.
11. Laine L, Yang H, Chang SC, Datto C. Trends for incidence of hospitalization and death due to GI complications in the United States from 2001 to 2009. *Am J Gastroenterol*. 2012 Aug;107(8):1190-5; quiz 1196.
12. Cappell MS, Friedel DM. *Gastrointestinal Bleeding in COVID-19-Infected Patients*. *Gastroenterol Clin North Am*. 2023 Mar;52(1):77-102.
13. Walker TG. *Acute gastrointestinal hemorrhage*. *Tech Vasc Interv Radiol*. 2009 Jun;12(2):80-91.
14. Funaki B. *Endovascular intervention for the treatment of acute arterial gastrointestinal hemorrhage*. *Gastroenterol Clin North Am*. 2002 Sep;31(3):701-13.
15. Dusold R, Burke K, Carpentier W, Dyck WP. The accuracy of technetium-99m-labeled red cell scintigraphy in localizing gastrointestinal bleeding. *Am J Gastroenterol*. 1994 Mar;89(3):345-8.
16. DiGregorio AM, Alvey H. *Gastrointestinal Bleeding*. StatPearls Internet Treasure Isl FL StatPearls Publ [Internet]. 2023 Jun 5; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537291/>
17. Strate LL, Orav EJ, Syngal S. Early predictors of severity in acute lower intestinal tract bleeding. *Arch Intern Med*. 2003 Apr 14;163(7):838-43.
18. Oakland K, Jairath V, Uberoi R, Guy R, Ayaru L, Mortensen N, et al. Derivation and validation of a novel risk score for safe discharge after acute lower gastrointestinal bleeding: a modelling study. *Lancet Gastroenterol Hepatol*. 2017 Sep;2(9):635-43.
19. Stewart BT, Groen RS, Kamara TB, Kwon S, Kingham TP, Kushner AL. Rectal bleeding and endoscopy need in Sierra Leone: results of a nationwide, community-based survey. *Lancet Lond Engl*. 2015 Apr 27;385 Suppl 2:S4.
20. Duggan JM. Gastrointestinal hemorrhage: should we transfuse less? *Dig Dis Sci*. 2009 Aug;54(8):1662-6.
21. Qaseem A, Humphrey LL, Fitterman N, Starkey M, Shekelle P, Clinical Guidelines Committee of the American College of Physicians. Treatment of anemia in patients with heart disease: a clinical practice guideline from the American College of Physicians. *Ann Intern Med*. 2013 Dec 3;159(11):770-9.
22. Roberts SE, Button LA, Williams JG. Prognosis following upper gastrointestinal bleeding. *PloS One*. 2012;7(12):e49507.

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