Clinical Manifestations of Gastrointestinal Dysfunction

Anorexia
- A lack of a desire to eat despite physiologic stimuli that would normally produce hunger

Vomiting
- The forceful emptying of the stomach and intestinal contents through the mouth
- Several types of stimuli initiate the vomiting reflex

Nausea
- A subjective experience that is associated with a number of conditions
- The common symptoms of vomiting are hypersalivation and tachycardia

Retching
- Nonproductive vomiting

Projectile vomiting
- Projectile vomiting is spontaneous vomiting that does not follow nausea or retching

Constipation
- Constipation is defined as infrequent or difficult defecation
- Pathophysiology
  - Neurogenic disorders
  - Functional or mechanical conditions
  - Low-residue diet
  - Sedentary lifestyle
  - Excessive use of antacids
  - Changes in bowel habits

Diarrhea
- Increased frequency of bowel movements
- Increased volume, fluidity, weight of the feces
- Major mechanisms of diarrhea:
  - Osmotic diarrhea
  - Secretory diarrhea
  - Motility diarrhea
- Associated with malabsorption syndromes

Abdominal pain
- Abdominal pain is a symptom of a number of gastrointestinal disorders
- Parietal pain and visceral pain
- Referred pain

Clinical Manifestations of Gastrointestinal Dysfunction
Gastrointestinal bleeding
- Upper gastrointestinal bleeding
  - Esophagus, stomach, or duodenum
- Lower gastrointestinal bleeding
  - Bleeding from the jejunum, ileum, colon, or rectum
- Hematemesis
- Hematochezia
- Melena
- Occult bleeding

Disorders of Motility
Dysphagia
- Dysphagia is difficulty swallowing
- Types:
  - Mechanical obstructions
  - Functional obstructions
- Achalasia:
  - Denervation of smooth muscle in the esophagus and lower esophageal sphincter relaxation

Gastroesophageal reflux disease (GERD)
- GERD is the reflux of chyme from the stomach to the esophagus
- If GERD causes inflammation of the esophagus, it is called reflux esophagitis
- A normal functioning lower esophageal sphincter maintains a zone of high pressure to prevent chyme reflux
- Conditions that increase abdominal pressure can contribute to GERD
- Manifestations:
  - Heartburn
  - Regurgitation of chyme
  - Mid-epigastric pain within 1 hour of eating

Hiatal hernia
- Sliding hiatal hernia (A)
- Paraesophageal hiatal hernia (B)
Pyloric obstruction
- The blocking or narrowing of the opening between the stomach and the duodenum
- Can be acquired or congenital
- Manifestations:
  - Epigastric pain and fullness
  - Nausea
  - Vomiting
  - With a prolonged obstruction, malnutrition, dehydration, and extreme debilitation

Intestinal obstruction and paralytic ileus
- An intestinal obstruction is any condition that prevents the flow of chyme through the intestinal lumen or failure of normal intestinal motility in the absence of an obstructing lesion
- An ileus is an obstruction of the intestines
- Simple obstruction
- Functional obstruction

Gastritis
- Inflammatory disorder of the gastric mucosa
- Acute gastritis
- Chronic gastritis

Peptic Ulcer Disease
- A break or ulceration in the protective mucosal lining of the lower esophagus, stomach, or duodenum
- Acute and chronic ulcers
- Superficial
  - Erosions
- Deep
  - True ulcers
- Duodenal ulcers
  - Most common of the peptic ulcers
  - Developmental factors:
    - *Helicobacter pylori* infection
      - Toxins and enzymes that promote inflammation and ulceration
    - Hypersecretion of stomach acid and pepsin
    - Use of NSAIDs
    - High gastrin levels
    - Acid production by cigarette smoking

Gastric Ulcer
• Gastric ulcers tend to develop in the antral region of the stomach, adjacent to the acid-secreting mucosa of the body
• Pathophysiology
  o The primary defect is an increased mucosal permeability to hydrogen ions
  o Gastric secretion tends to be normal or less than normal

Stress Ulcer
• A stress ulcer is a peptic ulcer that is related to severe illness, neural injury, or systemic trauma
  o Ischemic ulcers
    ▪ Within hours of trauma, burns, hemorrhage, sepsis
  o Cushing ulcers
    ▪ Ulcers that develop as a result of a head/brain injury

Dumping Syndrome
• Dumping syndrome is the rapid emptying of chyme from a surgically created residual stomach into the small intestine
• Dumping syndrome is a clinical complication of partial gastrectomy or pyloroplasty surgery
• Developmental factors:
  o Loss of gastric capacity
  o Loss of emptying control
  o Loss of feedback control by the duodenum when it is removed
• Late dumping syndrome

Malabsorption Syndromes
Maldigestion
• Failure of the chemical processes of digestion

Malabsorption
• Failure of the intestinal mucosa to absorb digested nutrients
• Maldigestion and malabsorption frequently occur together

Malabsorption Syndromes
Pancreatic insufficiency
- Insufficient pancreatic enzyme production
  - Lipase, amylase, trypsin, or chymotrypsin
- Causes:
  - Pancreatitis
  - Pancreatic carcinoma
  - Pancreatic resection
  - Cystic fibrosis
- Fat maldigestion is the main problem, so the patient will exhibit fatty stools and weight loss

Lactase deficiency
- Inability to break down lactose into monosaccharides and therefore prevent lactose digestion and monosaccharide absorption
- Fermentation of lactose by bacteria causes gas (cramping pain, flatulence, etc.) and osmotic diarrhea

Bile salt deficiency
- Conjugated bile salts needed to emulsify and absorb fats
- Conjugated bile salts are synthesized from cholesterol in the liver
- Can result from liver disease and bile obstructions
- Poor intestinal absorption of lipids causes fatty stools, diarrhea, and loss of fat-soluble vitamins (A, D, E, K)

Fat-soluble vitamin deficiencies:
- Vitamin A
  - Night blindness
- Vitamin D
  - Decreased calcium absorption
  - Bone pain
  - Osteoporosis
  - Fractures
- Vitamin K
  - Prolonged prothrombin time
  - Purpura
  - Petechiae
- Vitamin E
  - Uncertain

Inflammatory Bowel Diseases
- Chronic, relapsing inflammatory bowel disorders of unknown origin
  - Genetics
  - Alterations of epithelial barrier functions
  - Immune reactions to intestinal flora
  - Abnormal T cell responses
Ulcerative Colitis
- Chronic inflammatory disease that causes ulceration of the colonic mucosa
  - Sigmoid colon and rectum
- Suggested causes:
  - Infectious
  - Immunologic (anticolon antibodies)
  - Dietary
  - Genetic (supported by family studies and identical twin studies)
- Symptoms:
  - Diarrhea (10 to 20/day)
  - Bloody stools
  - Cramping
- Treatment:
  - Broad-spectrum antibiotics and steroids
  - Immunosuppressive agents
  - Surgery
- An increased colon cancer risk demonstrated

Crohn Disease
- Granulomatous colitis, ileocolitis, or regional enteritis
- Idiopathic inflammatory disorder; affects any part of the digestive tract, from mouth to anus
- Difficult to differentiate from ulcerative colitis
  - Similar risk factors and theories of causation as ulcerative colitis
- Causes “skip lesions”
- Ulcerations can produce longitudinal and transverse inflammatory fissures that extend into the lymphatics
- Anemia may result from malabsorption of vitamin B$_{12}$ and folic acid
- Treatment similar to ulcerative colitis

Diverticular Disease of the Colon
- Diverticula
  - Herniations of mucosa through the muscle layers of the colon wall, especially the sigmoid colon
- Diverticulosis
  - Asymptomatic diverticular disease
- Diverticulitis
  - The inflammatory stage of diverticulosis

Appendicitis
- Inflammation of the vermiform appendix
- Possible causes:
  - Obstruction, ischemia, increased intraluminal pressure, infection, ulceration, etc.
- Epigastric and RLQ pain
  - Rebound tenderness
- The most serious complication is peritonitis

**Irritable Bowel Syndrome**
- A functional gastrointestinal disorder with no specific structural or biochemical alterations as a cause of disease
- Characterized by recurrent abdominal pain and discomfort associated with altered bowel habits that present as diarrhea or constipation or both
- Associated with anxiety, depression, and chronic fatigue syndrome
- Cause unknown but mechanisms proposed:
  - Visceral hypersensitivity
  - Abnormal intestinal motility and secretion
  - Intestinal infection
  - Overgrowth of small intestinal flora
  - Food allergy/intolerance
  - Psychosocial factors
- Manifestations:
  - Can be diarrhea-predominant or constipation-predominant
  - Alternating diarrhea/constipation, gas, bloating, and nausea
- Symptoms are usually relieved with defecation and do not interfere with sleep

**Vascular Insufficiency**
- Blood supply to the stomach and intestine
  - Celiac axis
  - Superior and inferior mesenteric arteries
  - Two of three must be compromised to cause ischemia
- Mesenteric venous thrombosis
- Acute occlusion of mesenteric artery blood flow
- Chronic mesenteric arterial insufficiency

**Obesity**
- An increase in body fat mass
  - Body mass index greater than 30
- A major cause of morbidity, death, and increased health care costs
- Risk factor for many diseases and conditions
- Hypothalamus
- Hormones that control appetite and weight:
  - Insulin
  - Ghrelin

**Obesity**
- Peptide YY
- Leptin
- Adiponectin
- Resistin
- Leptin resistance
- Hyperleptinemia

**Anorexia Nervosa and Bulimia Nervosa**

- **Characteristics:**
  - Abnormal eating behavior
  - Weight regulation
  - Disturbed attitudes toward body weight, body shape, and size
- **Anorexia nervosa**
  - A person has poor body image disorder and refuses to eat
  - Anorexic patients can lose 25% to 30% of their ideal body weight as a result of fat and muscle depletion
  - Can lead to starvation-induced cardiac failure
  - In women and girls, anorexia is characterized by the absence of three consecutive menstrual periods
  - Binge eating/purging anorexia nervosa
- **Bulimia nervosa**
  - Body weight remains near normal but with aspirations for weight loss
  - Findings
    - Recurrent episodes of binge eating
    - Self-induced vomiting
    - Two binge-eating episodes per week for at least 3 months
    - Fasting to oppose the effect of binge eating, or excessive exercise
  - Continual vomiting of acidic chyme can cause:
    - Pitted teeth
    - Pharyngeal and esophageal inflammation
    - Tracheoesophageal fistulas
  - Overuse of laxative can cause rectal bleeding

**Malnutrition and Starvation**

- **Starvation**
  - Decreased caloric intake leading to weight loss
  - Cachexia
  - Short-term starvation
    - Glycogenolysis
    - Gluconeogenesis
  - Long-term starvation
    - Marasmus
    - Kwashiorkor

**Liver Disorders**
**Portal Hypertension**
- Abnormally high blood pressure in the portal venous system caused by resistance to portal blood flow
  - Prehepatic
  - Intrahepatic
  - Posthepatic
- Consequences:
  - Varices:
    - Lower esophagus
    - Stomach
    - Rectum
  - Splenomegaly
  - Ascites
  - Hepatic encephalopathy

**Hepatic Encephalopathy**
- A neurologic syndrome of impaired cognitive function, flapping tremor, and EEG changes
- The condition develops rapidly during fulminant hepatitis or slowly during chronic liver disease
- Cells in the nervous system are vulnerable to neurotoxins absorbed from the GI tract that, because of liver dysfunction circulate to the brain

**Jaundice (Icterus)**
- Obstructive jaundice
  - Extrahepatic obstruction
  - Intrahepatic obstruction
- Hemolytic jaundice
  - Prehepatic jaundice
  - Excessive hemolysis of red blood cells or absorption of a hematoma

**Viral Hepatitis**
- Systemic viral disease that primarily affects the liver
  - Hepatitis A
    - Formally known as infectious hepatitis
  - Hepatitis B
    - Formally known as serum hepatitis
  - Hepatitis C, D, E, and G

**Hepatitis A**
- Hepatitis A can be found in the feces, bile, and sera of infected individuals
- Usually transmitted by the fecal-oral route
- Risk factors:
  - Crowded, unsanitary conditions
  - Food and water contamination
Hepatitis B
- Transmitted through contact with infected blood, body fluids, or contaminated needles
- Maternal transmission can occur if the mother is infected during the third trimester
- The hepatitis B vaccine prevents transmission and development of hepatitis B

Hepatitis C
- Hepatitis C is responsible for most cases of post-transfusion hepatitis
- Also implicated in infections related to IV drug use
- 50% to 80% of hepatitis C cases result in chronic hepatitis

Hepatitis
- Hepatitis D
  - Depends on hepatitis B for replication
- Hepatitis E
  - Fecal-oral transmission
  - Developing countries
- Hepatitis G
  - Recently discovered
  - Parentally and sexually transmitted
- Sequence:
  - Incubation phase
  - Prodromal (preicteric) phase
  - Icteric phase
  - Recovery phase
- Chronic active hepatitis
- Fulminant hepatitis
  - Results from impairment or necrosis of hepatocytes

Cirrhosis
- Irreversible inflammatory disease that disrupts liver function and even structure
- Decreased hepatic function caused by nodular and fibrotic tissue synthesis (fibrosis)
- Biliary channels become obstructed and cause portal hypertension
- Because of the hypertension, blood can be shunted away from the liver, and a hypoxic necrosis develops
- Alcoholic
  - The oxidation of alcohol damages hepatocytes
- Biliary (bile canaliculi)
  - Cirrhosis begins in the bile canaliculi and ducts
  - Primary biliary cirrhosis (autoimmune)
  - Secondary biliary cirrhosis (obstruction)

Disorders of the Gallbladder
Obstruction or inflammation (cholecystitis) is the most common cause of gallbladder problems.

Cholelithiasis—gallstone formation

- **Types:**
  - Cholesterol (most common)
  - Pigmented (cirrhosis)

- **Risks:**
  - Obesity
  - Middle age
  - Female
  - Native American ancestry
  - Gallbladder, pancreas, or ileal disease

Gallstones

- Obstruction or inflammation (cholecystitis) is the most common cause of gallbladder problems.
- Cholesterol stones form in bile that is supersaturated with cholesterol.
- **Theories:**
  - Enzyme defect increases cholesterol synthesis.
  - Decreased secretion of bile acids to emulsify fats.
  - Decreased resorption of bile acids from ileum.
  - Gallbladder smooth muscle hypomotility and stasis.
  - Genetic predisposition.
  - Combination of any or all of the above.

Disorders of the Pancreas

- **Pancreatitis**
  - Inflammation of the pancreas.
  - Associated with several other clinical disorders.
  - **Caused by an injury or damage to pancreatic cells and ducts, causing a leakage of pancreatic enzymes into the pancreatic tissue.**

- These enzymes cause autodigestion of pancreatic tissue and leak into the bloodstream to cause injury to blood vessels and other organs.

  - **Manifestations and evaluation:**
    - Epigastric pain radiating to the back.
    - Fever and leukocytosis.
    - Hypotension and hypovolemia.
      - Enzymes increase vascular permeability.
      - Characterized by an increase in a patient’s serum amylase level.
  - Chronic pancreatitis.
    - Related to chronic alcohol abuse.

Cancer of the Gastrointestinal Tract
- Esophagus
- Stomach
- Colon and rectum
- Liver
- Gallbladder
- Pancreas

**Transverse colon (15%)**
- Pain, obstruction, change in bowel habits, anemia

**Ascending colon (25%)**
- Pain, mass, change in bowel habits, anemia

**Descending colon (15%)**
- Pain, change in bowel habits, bright red blood in stool, obstruction

**Rectum (45%)**
- Blood in stool, change in bowel habits, rectal discomfort

Typical location of carcinomas