

CHAPTER 12

Diarrhea

Next to respiratory disease, acute gastroenteritis is the most common illness in families in the United States. Most cases are of viral origin and are self-limiting. In children, 50% are of viral origin, 25% are of bacterial origin, and 25% are of undetermined cause. Diarrhea can be classified according to the pathophysiological pattern (osmotic, secretory, exudative, or motile), cause (infectious or noninfectious), or duration (acute or chronic).

Osmotic or malabsorptive diarrhea occurs when nonabsorbable, water-soluble solutes remain in the bowel and retain water. This can occur through damage to the intestinal microvillus membrane. The result is malabsorption of luminal solutes with osmotic loss of free water into the gut lumen. This is the most common cause of chronic diarrhea in children. Lactose intolerance is an example of this kind of diarrhea. Ingestion of large amounts of sugar substitutes in diet foods, drinks, candies, and chewing gum can cause osmotic diarrhea through a combination of slow absorption and rapid small bowel motility.

Secretory diarrhea occurs when the balance between fluid secretion and absorption across the intestinal mucosa is altered. When there is a change in this balance, produced by physiological causes, diarrhea occurs. The loss of water and electrolytes can be rapid and massive. Traveler's diarrhea and diarrhea caused by *Vibrio cholerae* are examples.

Exudative diarrhea occurs in the presence of mucosal inflammation or ulceration, which results in an outpouring of plasma, serum proteins, blood, and mucus. The consequence is an increase in fecal bulk and fluidity. Many mucosal diseases, such as regional enteritis, ulcerative colitis, and carcinoma, can cause this exudative enteropathy.

Diarrhea from abnormal intestinal motility (either increased or decreased) results in an alteration in contact between the luminal contents and the mucosal surface. Examples include irritable bowel syndrome (IBS) and laxative use.

Infectious agents can be viral, bacterial, or parasitic.

Diagnostic reasoning: Focused history

What does this patient mean by “diarrhea”?

Key Questions

- How frequent are the stools?
- What is the volume of stools?
- Are the stools formed or liquid?
- At what intervals does the diarrhea occur?

Frequency of stools

In the United States, typical bowel frequency ranges from one to three times a day to two or three times per week and varies considerably from person to person. Changes in stool frequency, consistency, or volume can indicate disease.

Stool volume and consistency

Processes involving the small bowel tend to produce large-volume watery stools that are relatively infrequent. Large bowel involvement, usually resulting from a bacterially induced inflammatory process, tends to produce

more-frequent, less-watery, and smaller-volume stools. The Bristol Stool Form Scale can help patients identify stool consistency (see [Chapter 10, Fig. 10.1](#)).

Intervals

A history of acute diarrhea followed by continuous or intermittent episodes of loose stools suggests malabsorption commonly caused by lactase deficiency exacerbated by the ingestion of lactose in milk or milk products. Intermittent diarrhea alternating with constipation can indicate a type of IBS.

Proximal colon symptoms

Proximal colon symptoms include large-volume, less-frequent, more-homogeneous stools, without urgency or tenesmus (painful defecation), and suggest food intolerance or infectious or inflammatory disease.

Distal colon symptoms

Symptoms of small volume, frequency, urgency, tenesmus, incontinence, and mucus suggest proctocolitis, colon cancer, diverticular disease, or IBS.

If this is an infant, is there a risk of dehydration?

Key Questions

- How many wet (urine) diapers has the infant produced in the past 24 hours?
- Does the infant seem thirsty?
- Does the infant have tears when crying?

Wet diapers

Dehydration in infants and young children can occur quickly and with fatal consequences, especially in infants. Diagnosis and treatment must be done in a timely manner. A general rule of thumb to determine signs of dehydration in infants is fewer than six wet diapers over 24 hours or a period longer than 4 hours without urination.

Thirst

Infants demonstrate their thirst with irritability, crying, and eagerness to drink fluid that is offered to them. Test for thirst by offering fluids either in a bottle or on a spoon. The child with mild dehydration will exhibit increased thirst; the moderately dehydrated child will be very thirsty; and, with severe dehydration, the child will continue to be very thirsty. If left untreated, a child can become stuporous and unresponsive and therefore unable to manifest thirst.

Tears

In mild dehydration, tears are present; in moderate dehydration, tears are or are not present; and in severe dehydration, no tears are present.

If this is an adult, is there risk for dehydration?

Key Questions

- How many times have you urinated in the past 24 hours?
- Are you thirsty?
- Do you have a dry mouth or dry eyes?

Dehydration

Symptoms of dehydration in an adult are more related to the rate of fluid loss than to the absolute degree of fluid loss. The degree of dehydration can be estimated by symptoms of thirst, dry mouth, or dry eyes, and by the frequency, volume, and color (concentration) of urination. Patients can also experience weakness.

Is this an acute or chronic problem?

Key Questions

- How long have you had diarrhea?
- Have you had this problem before?

Acute diarrhea in adults

An acute onset of diarrhea in a previously healthy patient without signs or symptoms of other organ involvement is suggestive of an infectious cause. Acute diarrhea in adults is commonly viral in origin. The viral illnesses are self-limited, and an aggressive diagnostic workup is not indicated. Acute diarrhea in adults usually has an abrupt onset and lasts less than 2 weeks. Most of the disorders cause some combination of abdominal pain, diarrhea, nausea, vomiting, fever, and tenesmus.

Acute diarrhea in children

Acute diarrhea in children is characterized by loose or liquid stools. A large quantity of fluid and electrolytes that become pooled in the intestinal lumen is lost as stool is expelled. The number of stools is usually increased, but

this is not an essential manifestation. Severe or protracted diarrhea can lead to metabolic acidosis, dehydration, azotemia, and oliguria. Diarrhea in a neonate or young infant is considered more serious than that in an older child because of lower tolerance to fluid shifts and the greater likelihood of associated infection or congenital anomaly.

Chronic diarrhea in adults

Diarrhea is chronic when it lasts more than 2 weeks. Unless the diarrhea is bloody or the patient has a systemic illness, the most common causes of chronic diarrhea are parasites, medications, IBS, lactose intolerance, and inflammatory bowel disease (IBD).

Chronic diarrhea in children

Chronic diarrhea in children is defined as diarrhea for longer than 3 weeks. The major causes of diarrhea change with age. In an infant, formula protein intolerance is the most common cause. Toddler's diarrhea (irritable colon of infancy), protracted enteritis after a viral infection, and infection with *Giardia lamblia* are the common causes in a toddler. In children and adolescents, malabsorption disorders are the most common causes. The diarrhea is the result of the ingestion of solutes that cannot be digested or absorbed, such as lactose products or excessive intake of sorbitol. Another cause of diarrhea in this age group is IBD (ulcerative colitis and Crohn disease).

Does the presence or absence of blood help me narrow the cause?

Key Questions

- Is there any noticeable blood in the stool or tissue? How much?
- What color is the blood?
- What color are the stools?

Blood in the stools

Bright red blood limited to small spots on the toilet tissue is suggestive that the source of bleeding is from hemorrhoids and not from a diarrheal process higher in the gastrointestinal (GI) tract. Because diarrhea and repeated cleansing of the rectum produce local irritation, minor bleeding from hemorrhoids is not uncommon and must be distinguished from true blood in the stool. Reports of blood in the stool in acute diarrhea are suggestive of a bacterial pathogen, notably *Shigella* species. The blood is red.

In infants and children, blood in the stool is most commonly caused by intolerance of cow's milk or by anal fissures. In a newborn, blood in stools can be a result of hemorrhagic disease of the newborn, thought to be caused by a lack of vitamin K. Premature infants or infants who are of low birth weight are at risk for necrotizing enterocolitis presenting with red or maroon stools (hematochezia), vomiting, and abdominal distention.

In adults and children, chronic bloody diarrhea can indicate IBD, dysentery, colitis, or an invasive organism. Blood that is red usually indicates lower GI tract bleeding, whereas dark or black, tarry stools (melena) typically indicate upper GI tract bleeding. However, bleeding from the small bowel or right colon can also produce melena.

Color of stools

Some patients believe they have blood in their stool based on stool color. Sources of black stools are blood, iron, charcoal, bismuth, licorice, huckleberries, and lead. Sources of red or pink stools include blood, food (beets, cranberries, tomatoes, peppers), food coloring (breakfast cereals, gelatin), and drugs (anticoagulants, salicylates, rifampin, phenazopyridine hydrochloride (pyridium), diazepam syrup, phenolphthalein in alkaline stool). Green-black stools can be caused by grape-flavored drinks and iron. Dark gray stools occur with cocoa and chocolate ingestion. Pale gray or white stools can be caused by cholestasis, obstructive jaundice, malabsorption, excessive milk ingestion, and antacid ingestion. Green stools are produced by bile salts and chlorophyll-containing vegetables, such as spinach.

What does the presence or absence of pain tell me?

Key Questions

- Are you having any pain or gas with the diarrhea?
- Where is the pain?
- What does the pain feel like?
- Is the pain constant or does it come and go? Is it relieved by passage of gas?
- Does the pain awaken you at night?
- Does the pain interfere with your activities (e.g., working, sleeping, eating)?

Occurrence of pain

Diarrhea with abdominal pain and flatulent stools in an afebrile patient is characteristic of a malabsorptive process. Most self-limiting viral diarrheas cause some combination of abdominal pain, diarrhea, nausea, vomiting, fever, and tenesmus.

Abdominal pain is common when diarrhea is caused by infective bacteria in the colon, such as ingestion associated with food poisoning. *Giardia lamblia*, introduced through the ingestion of contaminated water or by the orofecal route, produces crampy abdominal pain and is frequently seen in children and diapered infants in day care where handwashing is not done between diapering.

Location of pain

Generalized abdominal pain is produced by diffuse inflammation of the GI tract, which occurs with IBD, or abdominal cramping from infective diarrhea. The pain from ulcerative colitis may occur over the entire abdomen or may be localized to the lower quadrants. The pain associated with IBS is usually confined to the lower quadrants or to the sigmoid colon. Whereas large intestine pain is felt in the lower abdominal quadrants, small intestine pain is felt in the epigastric and umbilical areas.

Severity of pain

Self-limited diarrhea usually presents with cramping but not severe abdominal pain. Other causes of abdominal pain should be investigated (see [Chapter 3](#)).

Sleep-related pain

Persistent diarrhea that awakens the patient from sleep usually indicates a serious organic disease, such as diabetes enteropathy or human immunodeficiency virus (HIV) enteropathy. The symptoms associated with IBS occur during the waking hours.

What do associated symptoms tell me?

Key Questions

- Do you have any fever? Did you take your temperature?
- Do you have any vomiting?
- What occurred first: the diarrhea or the vomiting?

Fever

Patients often report having a “fever” when they have such symptoms as facial flushing, chills, headache, malaise, muscle aches, or a sensation of warmth. These symptoms are usually not validated by measuring body temperature with a thermometer. Fever is a cardinal manifestation of disease. GI tract and respiratory tract infections are responsible for 80% of febrile illnesses. Generally, low-grade fever occurs with viral causes of diarrhea, although high fevers are more often associated with bacterial causes.

Vomiting

Vomiting is often present early in the course of viral gastroenteritis (especially the Norwalk virus), food poisoning, and food-borne bacterial infection. Vomiting is one of the main causes of dehydration in acute

diarrhea. Small bowel processes commonly associated with viral agents cause delayed gastric emptying and luminal distention, which often induces vomiting before the onset of diarrhea.

Occurrence of vomiting and diarrhea

When diarrhea occurs before the vomiting, suspect a bacterial etiology.

Could this be caused by exposure to others or to contaminated food?

Key Questions

- If a child: Does the child attend day care?
- If a child: Are any of the other children in day care ill?
- If older adult: Do you attend or live in a congregate setting such as assisted living, personal care home, nursing home, or adult day care?
- Have you been around others who have similar symptoms?

Day care attendance

Children who attend day care are at greater risk of acquiring many bacterial infections transmitted through orofecal contamination and diapering.

Adult congregate living

Older adults who attend or live in congregate settings are at greater risk for diarrhea associated with *Clostridium difficile* infection. Outbreaks associated with viral causes of diarrhea have also been reported.

Others with similar symptoms

It is common for foodborne infections to be acquired at social gatherings where food is served; in this case, others at the gathering can become ill with similar symptoms. However, patients do not always know if others became ill, especially when the onset of diarrhea occurs 1 to 2 hours after food ingestion.

Could this be the result of exposure to animals?

Key Questions

- What pets do you have?
- Have you had contact with or have you handled dogs, cats, or turtles?

Exposure to infectious agents through animal contact

Campylobacter jejuni infection can be acquired from infected dogs or cats. Infected turtles are a source of *Salmonella* organisms.

Could this be caused by exposure to contaminated water?

Key Questions

- Have you traveled recently? Where?

Recent travel

Travel outside of the United States carries the potential to acquire enterotoxigenic *Escherichia coli*, or less commonly, *G. lamblia*, *Salmonella* spp., *Shigella* spp., *C. jejuni*, or *Entamoeba histolytica*. Camping exposes individuals to *Giardia* and *Campylobacter* spp. through untreated water. Outbreaks of diarrhea caused by *Cryptosporidium* organisms have been linked to contaminated water in urban areas of the United States. Diarrhea caused by the norovirus has been linked to cruise ship travel.

Could sexual activities explain the diarrhea?

Key Questions

- Do your sexual practices include anal sex?

Suspect *Shigella* infection in patients who engage in anal sex, particularly homosexual men. Accompanying pain, tenesmus, and the passage of mucus indicate the presence of proctitis.

Could this be the result of an immune problem?

Key Questions

- Have you been diagnosed with an immune system problem?
- Do you have frequent colds or other illnesses?
- Are you receiving chemotherapy?

Immunocompromised host

Immunoglobulin A (IgA) and immunoglobulin G (IgG) deficiencies are frequent causes of chronic diarrhea in children. Patients with a compromised immune system from acquired immunodeficiency syndrome (AIDS) or chemotherapy often develop enteropathy.

Could this be caused by medications?

Key Questions

- Have you taken any antibiotics recently? Which one(s)?
- What prescription medications are you taking?
- What over-the-counter medications or preparations are you currently using?

Recent treatment with antibiotics

Pseudomembranous enterocolitis caused by *C. difficile* has been reported in individuals who have been recently treated with antibiotics, most commonly ampicillin, clindamycin, or cephalosporins. Pseudomembranous enterocolitis is a serious disorder that can lead to paralytic ileus. More often, antibiotics disturb the normal flora of the gut, leading to diarrhea.

Medications

Diarrhea can be caused by antacids that contain magnesium, and medications such as antibiotics, methyldopa, digitalis, β -blockers, systemic antiinflammatory agents, colchicine, quinidine, phenothiazine, high-dose salicylates, laxatives, and acetylcholinesterase inhibitors.

Could this be related to a surgical procedure?

Key Questions

- Have you had recent surgery?

Recent gastrointestinal surgery

Gastrointestinal surgery can result in dumping syndrome after the ingestion of meals. Inadequate mixing and digestion take place in the stomach, resulting in rapid transit and diarrhea. Anatomical derangement from surgery can also cause stagnant loops of bowel. This stagnation leads to bacterial overgrowth and results in diarrhea. Extensive bowel resection can produce short bowel syndrome, which results in diarrhea from malabsorption.

Is this diet related?

Key Questions

- How much fruit juice or soda do you drink in a day?
- Do you drink milk or eat milk products?
- Do you eat wheat products?
- What have you eaten in the past 3 days?

Excessive intake of high-carbohydrate fluids

The ingestion of large amounts of apple juice or nonabsorbable fillers, such as sorbitol, can lead to malabsorptive diarrhea. Bacterial contamination of nonpasteurized apple juice can cause diarrhea.

Lactose intolerance

The ingestion of specific disaccharides, such as lactose, produces a malabsorptive osmotic diarrhea in people with lactose intolerance.

Cow's milk protein or soy protein hypersensitivity

The symptoms of diarrhea, vomiting, colic, occult blood in stool, grossly bloody stools, and white blood cells within the stool may be caused by protein hypersensitivity if they begin within 2 to 3 weeks after starting either cow's milk or soy formulas.

Celiac sprue (gluten enteropathy)

Gluten enteropathy is manifested by increasing stool frequency, looseness, paleness, and bulkiness of stool that occurs within 3 to 6 months of dietary intake of wheat, rye, barley, or oat products. Patients have a hypersensitivity reaction to the protein in these grains. A gluten-free diet will alleviate symptoms.

Starvation stools

The history of this condition includes diarrhea that persists for 2 to 3 weeks. Stools are loose because the liquid low-fiber diet used to ease the symptoms of acute diarrhea is continued for too long. Health care providers can neglect to tell patients or parents to resume a regular diet when acute diarrhea begins to resolve. New guidelines recommend feeding soon after rehydration has been achieved.

Could this be caused by food preparation problems?

Key Questions

- Have you recently eaten raw or undercooked poultry, seafood, or beef?
- Have you recently ingested unpasteurized milk?
- Do you prepare poultry or beef on the same surface as other foods?
- Is anyone else you know ill with similar symptoms?

Dietary exposure to infectious agents

Undercooked poultry is a potential cause of Salmonella or *C. jejuni* diarrhea. Undercooked beef and unpasteurized milk are food sources that contain *E. coli* O157:H7. Raw shellfish is a potential source of Norwalk virus. Food can be contaminated through

bacteria that remain on incompletely cleaned food preparation surfaces.

Other ill people

Food poisoning should be considered if diarrhea develops in two or more individuals after ingestion of the same food. Such multiple occurrences suggest ingestion of infected food or toxic substances (e.g., lead, mercury).

Is there any family predisposition that can point to a cause?

Key Questions

- Have you or anyone in your family been diagnosed with cystic fibrosis?
- Does anyone in your family have a history of chronic diarrhea, ulcerative colitis, or IBD?

Family history of cystic fibrosis

Cystic fibrosis (CF) is the most common genetic disease in the white population. It has an autosomal recessive mode of inheritance. The condition leads to fat malabsorption and produces fatty, foul-smelling diarrhea.

Family history of diarrheal illnesses

Inflammatory bowel disease is genetically linked.

Diagnostic reasoning: Focused physical examination

Inspect general appearance

Observe the patient's general appearance. Diarrhea should be considered a symptom in all instances, and principal attention should be directed to determine and correct the cause.

Assess hydration status

Assessment of hydration status is the most important aspect of physical examination in the child. Dehydration in otherwise healthy adults is uncommon unless the diarrhea is very severe (Table 12.1). Hydration is also an important consideration in older adults, chronically ill people, and individuals who cannot replace fluid losses with oral intake. In the presence of hypernatremia, the state of dehydration might be greater than suggested by physical examination because extracellular fluid volume tends to be preserved, at the expense of intracellular volume.

Table 12.1**Determining Hydration Status^a**

SIGNS OR SYMPTOMS	MILD DEHYDRATION	MODERATE DEHYDRATION	SEVERE DEHYDRATION
Estimated fluid deficit (% of body weight)	<5	>6–9	10
Estimated fluid deficit (mL/kg)	30–50	60–90	>100
Thirst	Increased	Marked increase	Very marked increase
Blood pressure	Normal	Postural drop only	Low or not measurable peripherally
Pulse (peripheral)	Normal	Rapid	Rapid, thready
Heart rate	Mildly elevated	Elevated	Greatly elevated
Mucous membranes	Thick saliva	Dry	Very dry
Eyes	Normal	Sunken	Deeply sunken
Tears when crying	Present	Absent	Absent
Skin turgor	Normal	Tenting	None
Fontanel	Normal	Sunken	Very sunken
Urine output	Mildly decreased	Decreased	Markedly decreased or absent
Affect/sensorium	Normal	Restlessness/irritability	Lethargy/coma

^aPercent body weight loss = $([\text{Normal weight} - \text{Present weight}] \div \text{Normal weight}) \times 100$.

Indicators of hydration status

Mucous membranes

The earliest clinical sign of dehydration is dryness of mucous membranes. Hyperventilation with mouth breathing can dry the mucous membranes of the mouth in the absence of dehydration. Recent vomiting makes the mucous membranes appear moist. The patient may also have halitosis.

Tissue turgor

Turgor reflects the amount of fluid in the interstitial spaces and is best assessed on the thigh, chest, and abdomen. Abdominal testing alone can be misleading because distention can mask the loss of turgor. Obese children often do not appear to have loss of skin turgor because of the elasticity of their skin.

Fontanel

The fontanel, if still open, is best assessed with the child in an upright position. The normal fontanel can feel tense in the infant who is supine. In a crying child, physiological bulging occurs only during expiration; this bulging disappears when the child relaxes or inspires. The fontanel will be sunken in a dehydrated state.

Peripheral perfusion

Blanching of the nail bed (using the sternum in the infant) with pressure and quick refill of capillary blood in less than 2 seconds is a normal finding. In dehydration, it takes longer for the blood to reappear in the tissue.

Measure urine output and specific gravity

In a mildly dehydrated child, the output decreases with a slight increase in specific gravity. In a moderately dehydrated child, the urinary output is decreased, and the specific gravity is increased. In a severely dehydrated child, the urinary output is decreased to oliguria, and the specific gravity is markedly increased, up to 1.030. Specific gravity is also the best indicator for dehydration in the older adult population.

Measure temperature

An elevated temperature increases insensible water loss and can lead to more rapid dehydration. The presence of a fever in a patient with acute diarrhea indicates viral or bacterial infection. Fever in a patient with chronic diarrhea points to inflammatory causes.

The generally accepted normal basal body temperature is 37°C (98.6°F) determined orally or 0.6°C (1°F) or higher determined rectally. Fever is generally accepted as any oral temperature above 37.8°C (100°F).

Weigh patient and note persistent or involuntary weight loss

Lactose intolerance, CF, intestinal malabsorption, infectious diarrhea, and IBD can cause weight loss. Patients with these conditions have adequate or even increased food intake, but they cannot absorb sufficient nutrients to sustain normal nutrition. In children, this can cause failure to thrive and interruption of growth. In adults, colonic neoplasm can cause partial obstruction and diarrhea, and weight loss can be evident.

Observe abdominal contour

Abdominal distention can be associated with an ileus, as in enteritis, or with gaseous dilation resulting from malabsorption. A scaphoid abdomen can be seen in children with severe dehydration.

Auscultate the abdomen

The major objective is to detect the presence of bowel sounds anywhere in the abdomen. Listen in all four quadrants. The absence of bowel sounds is established only after 5 minutes of continuous listening. Bowel sounds that are high pitched are heard with peristaltic rushes found in enteritis and secretory diarrhea. Bowel sounds are diminished or absent with necrotizing enterocolitis.

Palpate the abdomen for tenderness

Peritonitis can cause diarrhea as a result of inflammation and local enteric irritation. Signs of peritoneal irritation include a rigid abdomen, rebound tenderness (Blumberg sign), and abnormal findings on the following tests: iliopsoas muscle test, obturator muscle test, and heel jar test (Markle sign) (see [Chapter 3](#)). Tenderness is uncommon in self-limiting diarrhea. Localized

right-lower-quadrant tenderness in a “sick” patient with acute diarrhea can indicate appendicitis, Crohn disease, right-sided diverticulitis, or carcinoma. Localized left-lower-quadrant tenderness suggests diverticulitis, fecal impaction, colon cancer, and various causes of proctocolitis. Localized pain in chronic diarrhea can also occur with IBS.

Perform a digital rectal examination

Assess for fissures, hemorrhoids, and lacerations and feel for impacted stool. Impacted stool can be felt as a puttylike mass that fills the rectum and extends upward. Also obtain a stool sample for occult blood testing and laboratory studies. Observe stool on finger for color and the presence of blood.

Palpate lymph nodes

Evidence of systemic disease should be assessed. Chronic diarrhea in patients who have lymphadenopathy is associated with lymphoma and AIDS.

Laboratory and diagnostic studies

Laboratory or diagnostic studies are not necessary if the patient appears to have a viral or toxigenic bacterial infection because the disease is usually mild and self-limiting. Reserve stool cultures and examine for ova and parasites in patients who appear relatively ill, patients with signs of invasive or persistent diarrhea, and those who have a history of suspected parasite infection.

Fecal leukocytes

Fecal leukocyte detection is an easy and inexpensive test that is 75% specific for bacterial diarrhea. Leukocytes are found in inflammatory diarrheal disease and are present in bacterial infections that invade the intestinal wall (*E. coli*, *Shigella* spp., and *Salmonella* spp.). Leukocytes are also present in diarrhea from ulcerative colitis, Crohn disease, and antibiotic use. Leukocytes are not seen in viral gastroenteritis, parasitic diarrhea, *Salmonella* carrier states, or enterotoxigenic bacterial diarrheas. Obtain a small fleck of mucus or stool. Do not allow the specimen to dry. Place the specimen on a slide, add 2 drops of Löffler alkaline methylene blue stain, and wait 2 minutes. Microscopic white and red blood cells indicate the presence of *Shigella*, enterohemorrhagic *E. coli*, enteropathogenic *E. coli*, *Campylobacter* spp., *C. difficile*, or other inflammatory or invasive diarrhea.

Fecal occult blood testing

Fecal occult blood testing (FOBT) is used to test for occult blood in the stool. Red blood cells often appear in diarrhea caused by enteropathic bacteria or protozoa. A 3-day series of stool samples is used to screen for colon cancer. Ingestion of red meats during the testing period can produce a false abnormal finding.

Fecal immunochemical test

Also called immunochemical FOBT (iFOBT), fecal immunochemical test (FIT) uses antibodies to human hemoglobin to detect a specific portion of a human blood protein in the stool. Immunochemical FOBTs are more specific for lower GI tract bleeding, as they target the globin portion of hemoglobin, which does not survive passage through the upper GI tract. Vitamins or foods do not affect the fecal immunochemical test, and some forms require only one or two stool specimens.

Fecal fat

A 72-hour fecal fat analysis is done by instructing the patient to have a daily dietary intake of 100 g of fat for 3 days before and during a 72-hour period of stool collection. In children, a fat retention coefficient is determined. An abnormal result is greater than 6 g/day in the stool on an 80- to 100-g/day diet of fat and indicates a malabsorption syndrome.

D-xylose absorption test

The d-xylose absorption test is used to determine whether diarrhea is caused by malabsorption or maldigestion. Blood is taken before the patient ingests the d-xylose. The patient is then asked to drink a fluid containing 25 g of d-xylose. Repeat venipuncture to obtain blood is performed in 2 hours for adults and 1 hour for children. Urine is collected approximately 5 hours after ingestion of the fluid. Blood and urine levels are subsequently evaluated. An abnormal result is found if less than 4.5 g of the d-xylose is excreted in a 5-hour urine collection, and blood levels are less than 25 to 40 mg/dL in adults (30 mg/dL in children). The abnormal result indicates the diarrhea is caused by malabsorption.

Stool pH

The pH of the stool specimen is determined by using litmus strips. A pH value of 5.5 indicates lactose or other carbohydrate malabsorption. Normal stool pH is neutral or weakly alkaline.

Wet mount

Wet mounts are useful to assess for trophozoites, cysts, ova, and certain helminth larvae. Obtain a sample of feces on a wooden applicator stick, mix with 1 drop of saline, and add iodine contrast to view and examine under a microscope. *V. cholerae* can be identified by using dark-field microscopy. The characteristic darting motility of vibrios can be recognized in fresh wet preparations.

C. difficile toxin assay

This assay detects *C. difficile* toxin in the stool, which is diagnostic of clostridial enterocolitis. The clostridial bacterium releases a toxin that causes necrosis of the colonic epithelium.

Stool culture

Stool culture is used to detect common bacteria such as *Enterococcus* spp., *E. coli*, *Proteus* spp., *Pseudomonas* spp., *Staphylococcus aureus*, *Candida albicans*, *Bacteroides* spp., and *Clostridia* spp. Special enriching techniques or media are necessary to look for some agents. Pathogenic bacteria are *Salmonella* spp., *Shigella* spp., *Campylobacter* spp., *Yersinia* spp., *E. coli*, *Staphylococcus* spp., and *C. difficile*.

Stool for ova and parasites

Stool can be tested for the presence of ova and parasites. Fresh stool is required to preserve the trophozoites of some parasites. Common parasites are *Ascaris lumbricoides* (hookworm) and *Strongyloides* spp. (tapeworm).

Giardia antigen test

Giardia antigen test is a solid phase immunoassay used for the detection of Giardia-specific antigen 65. Only one stool specimen is required, and the test result is available within 1 day.

Indirect hemagglutinin assay

The indirect hemagglutinin assay (IHA) detects antibodies to *E. histolytica*. An abnormal finding is a titer greater than 1:128.

Tissue transglutaminase antibody

Tissue transglutaminase antibody (tTG) IgA is the primary test ordered to screen for celiac disease. Elevated tissue transglutaminase immune globulin A (TTG IgA) antibody is sensitive and specific for celiac disease.

Molecular testing

Molecular testing can be used to test for a variety of pathogens in the stool (see Differential Diagnosis table). The tests are both sensitive and specific.

Complete blood count with differential

A complete blood count with differential should be obtained in severely ill or dehydrated patients to screen for infection. Infection is indicated with increased leukocytes. Microcytic hypochromic anemia (mean corpuscular hemoglobin concentration [MCHC] <30 g/dL; mean corpuscular volume [MCV] >85 fL) can indicate the presence of chronic disease. Most bloody diarrhea produces an elevated platelet count as an acute-phase reactant in an inflammatory process. In hemolytic uremic syndrome (HUS), the platelet count can be normal or low.

Peripheral blood smear

A peripheral blood smear is an examination of the cellular contents of the blood under a microscope using a variety of stains. Hemoglobin can be estimated by the depth of staining present. This quantitative analysis assists in characterizing a number of conditions, including hemolytic anemia associated with HUS. In HUS, the peripheral smear shows characteristic schistocytes.

Blood urea nitrogen and creatinine

The blood urea nitrogen and creatinine tests are indicated in severely ill or dehydrated patients to ascertain adequate kidney functioning. Dehydration is a cause of prerenal failure. HUS will cause impaired renal function.

Endoscopic studies

Further endoscopic diagnostic studies such as flexible sigmoidoscopy or colonoscopy should be considered when the cause of diarrhea is not determined or when the diarrhea lasts for longer than 1 month. Duodenal biopsy is indicated in patients with a high likelihood of celiac disease.

Differential diagnosis

Acute diarrhea

Viral gastroenteritis

Viral gastroenteritis presents with an explosive onset of diarrhea, vomiting, low-grade fever, anorexia, and myalgia. Symptoms last for 1 week or less. Norwalk virus is a major causative agent and is usually seen in school-age children and in adults. Rotavirus is the most common cause of diarrhea in children ages 6 to 24 months and is usually seen in the winter.

Shigella

Infection with *Shigella* organisms presents with acute diarrhea that contains mucus and blood. The patient has up to 7 days of watery diarrhea; then toxins are produced that result in ulceration, mucosal irritability, and frequent bowel movements. Stools are yellow or green and contain undigested food, mucus, and blood. Leukocytes and red blood cells are seen in the stools. It is the second most common cause of diarrhea in children ages 6 to 10 years old and is common in day-care settings. Symptoms of upper respiratory tract infection can also be present.

Cryptosporidium

This is one cell parasite found in the small intestine producing watery diarrhea that may last up to 2 weeks. In immunocompromised patients, the condition could be life threatening. The parasite is found in water supplies, swimming pools, and lakes.

Giardia

Similar to *Cryptosporidium*, *Giardia* is a parasite that is found in areas of poor sanitation and in lakes and streams. Symptoms are abdominal bloating, cramps, and bouts of watery diarrhea. *Giardia* can be transmitted in food and person to person.

Food poisoning with staphylococci or bacillus aureus

Food poisoning from staphylococci or *Bacillus aureus* causes explosive diarrhea 2 to 6 hours after eating. High attack rates are seen among people who have eaten contaminated food (improperly stored meats or custard-filled pastries). Cramping and vomiting in addition to diarrhea are present. There usually is no fever. The diarrhea lasts 18 to 24 hours, and the person recovers quickly. However, the condition could be life threatening in older adults and in those with other serious illness.

Food poisoning with clostridium perfringens

Infection with *C. perfringens* causes severe diarrhea 8 to 20 hours after eating. The patient reports crampy abdominal pain and diarrhea. The stool is watery and nonbloody. Nausea, vomiting, and fever can be present but are less common. The diarrhea usually lasts for less than 3 days.

Salmonella

Infection with *Salmonella* organisms causes severe diarrhea and fever. It is seen more often in patients with AIDS, sickle cell disease, or reticuloendothelial dysfunction. The incubation period is 3 to 40 days with an insidious or abrupt onset. The patient has fever, anorexia, and weight loss. GI symptoms occur first followed by fever, abdominal cramps, and vomiting. Stools are green, loose, and slimy and have the odor of spoiled eggs. Rarely is blood present.

Campylobacter

Campylobacter infection causes fever, headache, and myalgia for 12 to 24 hours; then diarrhea develops. Roughly two-thirds of patients have watery diarrhea, and one-third have bloody dysentery. The incubation period is 2 to 5 days. The patient has abdominal cramping, pain, and fever, and the diarrhea contains mucus and blood. The condition can mimic appendicitis because of mesenteric lymphadenitis. Toxic megacolon and colonic hemorrhages can occur, especially if antimotility agents have been used.

Vibrio cholerae

V. cholerae infection causes severe watery diarrhea without a preceding illness. It usually occurs in epidemics. The onset is acute, usually 8 to 18 hours after the ingestion of contaminated seafood, water, or food prepared in contaminated water. Diarrhea resolves in 3 to 5 days. The essential element in cholera is the speed at which fluid is lost. This quick loss of fluid and dehydration can lead to death within hours. Red and white blood cells are not seen on stool examination.

Enterotoxigenic E. Coli

E. coli causes moderate amounts of nonbloody diarrhea. This develops acutely 8 to 18 hours after the ingestion of contaminated food or water and typically lasts for 24 to 48 hours. The patient experiences cramping and abdominal pain with the diarrhea. The organism (gram-negative rod) is transmitted via the orofecal route. It is spread through contaminated water or incompletely cooked food that was rinsed in contaminated water, or through incompletely cooked beef, especially ground hamburger meat. Enterotoxigenic *E. coli* is the leading cause of traveler's diarrhea. The diagnosis can be confirmed with fecal leukocytes or stool culture.

Entamoeba histolytica

A patient with diarrhea caused by this parasite presents with large amounts of bloody diarrhea, abdominal cramping, and vomiting that develop acutely 12 to 24 hours after the ingestion of contaminated food or water. The diagnosis is confirmed through molecular testing or an IHA. Antibodies to *E. histolytica* are formed; a positive titer is greater than 1:128.

Antibiotic-induced diarrhea

This condition produces a mild, watery diarrhea and is caused by taking antibiotics, especially ampicillin, tetracycline, lincomycin, clindamycin, and chloramphenicol. The patient often reports crampy abdominal pain. Diagnosis is made through history and clinical findings.

Pseudomembranous colitis

Pseudomembranous colitis is caused most often by *C. difficile*. This diarrhea is induced by antibiotics, most commonly ampicillin, clindamycin, or cephalosporins. An acute inflammatory bowel disorder occurs, with symptoms that range from transient, mild diarrhea to active colitis with bloody diarrhea, abdominal pain, fever, and leukocytosis. Symptoms usually begin during a course of antibiotic therapy but can begin 1 to 10 days after treatment is completed. The diagnosis is established with sigmoidoscopy or colonoscopy. The diagnosis is confirmed with *C. difficile* toxin assay, stool culture, or molecular testing.

Necrotizing enterocolitis

Necrotizing enterocolitis is an inflammatory bowel condition that occurs in newborns. The patient is usually a premature or low-birth-weight infant who presents with feeding intolerance; vomiting; abdominal distention; lethargy; and loose, bloody stools containing mucus. It is the most common cause of death in the second week of life for low-birth-weight infants. Radiography shows pneumatosis intestinalis, indicating air within the subserosal bowel wall, which is the radiologic hallmark used to confirm the diagnosis.

Hemorrhagic disease of the newborn

Hemorrhagic disease of the newborn is caused by a deficiency in coagulation factors dependent on vitamin K. Most newborns do not have adequate levels of vitamin K, but bleeding problems develop in only a few. GI bleeding occurs 2 to 3 days postnatally. Laboratory studies typically show markedly elevated prothrombin time and partial thromboplastin time and depressed levels of vitamin K-dependent factors. The routine use of prophylactic vitamin K prevents most cases.

Hemolytic uremic syndrome

Hemolytic uremic syndrome is seen in children and is usually preceded by a GI illness. The leading bacterial cause of HUS in the United States is now *E. coli* O157:H7. The patient presents with a history of bloody diarrhea, fever, and irritability. Initially, laboratory blood values are essentially normal except that the platelet count is normal or low. The stool culture result is negative. A peripheral blood smear reveals schistocytes, confirming the diagnosis. Molecular testing confirms the pathogen. Fragmented red blood cells are often seen on the peripheral smear before complications of renal involvement occur. The child may have a sudden onset of acute renal failure. Renal function test results will be altered.

Chronic diarrhea

Irritable bowel syndrome

Irritable bowel syndrome is commonly seen in young and middle-aged women with a history of intermittent diarrhea. The patient may report abdominal pain in the left lower quadrant, although it can occur anywhere. The pain seldom occurs at night, does not awaken the patient, and is commonly present in the morning. The patient can have rectal urgency or abdominal distention. There is no weight loss, the patient is afebrile, and the colon can be tender on palpation. IBS is a diagnosis of exclusion, and sigmoidoscopy or proctoscopy is used to rule out other disorders. The Rome IV criteria to diagnose IBS include abdominal pain associated with defecation or a change in bowel habits present at least 1 day per week on average during the preceding month.

Ulcerative colitis

Ulcerative colitis is an IBD that causes proctitis with rectal bleeding, tenesmus, and the passage of mucus. Abdominal cramping is common, but abdominal pain and tenderness are not common. The greater the extent of colon involvement, the greater the likelihood that the patient will have diarrhea.

Crohn disease

Crohn disease is an IBD that presents with abdominal cramping, tenderness, rectal bleeding, and diarrhea. The disease can produce chronic, bloody diarrhea and cause failure to thrive in children. The patient may have a fever. Weight loss is common because of malabsorption or a reduced intake of food used to minimize postprandial symptoms. Diagnosis is made through colonoscopy and biopsy.



EVIDENCE-BASED PRACTICE

The Utility of Symptoms in Diagnosing Irritable Bowel Syndrome

A systematic review was conducted on the accuracy of symptoms in diagnosing irritable bowel syndrome (IBS). In six studies evaluating 1077 patients, symptoms of lower abdominal pain, mucus per rectum, incomplete evacuation, loose or frequent stools associated with pain, pain relieved by defecation, and patient-reported abdominal distention were reviewed. Each of these symptoms had limited accuracy in diagnosing IBS. Lower abdominal pain had the highest sensitivity (90%) but poor specificity (32%); patient-reported visible abdominal distention had the highest specificity (77%) but low sensitivity (39%).

Reference: Ford et al, 2008

Carbohydrate malabsorption and lactose intolerance

Malabsorption or lactose intolerance causes the patient to experience diarrhea, bloating, and increased flatus. The ingestion of specific disaccharides, such as lactose or sorbitol, exacerbates the episodes of diarrhea. A trial of elimination of offending foods often confirms the clinical diagnosis.

Fat malabsorption

Fat malabsorption is seen with patients who have CF or vitamin A, D, or K deficiency. Patients with CF have foul, pale, bulky diarrhea that is greasy, oily, and consistent with steatorrhea. The diarrhea usually precedes lung involvement. Laboratory testing for fat malabsorption includes a 72-hour fecal fat analysis.

Toddler's diarrhea

Toddler's diarrhea is described as the occurrence of abnormal amounts of formless stools with mucus in children ages 1 to 3 years. Symptoms rarely persist beyond age 4 to 5 years. The diarrhea is chronic and nonspecific, with three or four stools per day, some containing mucus. Physical examination and growth are within normal limits for the child's age. This is a diagnosis of exclusion, and other causes of chronic diarrhea must first be ruled out.

Celiac sprue or protein hypersensitivity

This diarrhea causes increasing stool frequency and loose, pale, and bulky stool, 3 to 6 months after dietary intake of wheat, rye, and other grains. Patients have a hypersensitivity reaction to the protein in wheat, rye, barley, and oats. Children appear lethargic, irritable, and anorexic. Serologic testing for antibodies is useful in excluding the diagnosis in individuals at low risk. Those at moderate to high risk should have both serologic testing and small bowel biopsy to confirm diagnosis.

Giardia spp.

Infection with *Giardia* spp. is the leading parasitic cause of chronic diarrhea in children in the United States and can be contracted through travel both inside and outside of the country. Patients experience watery, foul-smelling diarrhea, abdominal pain, distention, and gas.

Cryptosporidium spp. and isospora belli

Cryptosporidium spp. and *Isospora belli* are parasites that produce recurrent episodes of nonbloody diarrhea with varying amounts of water. The volume can be massive. The organisms are transmitted via the fecal-oral route and are spread through the ingestion of contaminated water or direct orofecal contact.

Postgastrectomy dumping syndrome

This syndrome occurs after GI surgery. The condition can occur whenever the pyloric mechanism is disrupted by pyloroplasty, gastroduodenostomy, or gastrojejunostomy. The diarrhea occurs after meals because of increased transit of food through the colon. Patients can experience associated symptoms, including diaphoresis and tachycardia.

Diabetic enteropathy

Diabetic enteropathy occurs in patients with diabetes. Patients can experience nocturnal diarrhea, postprandial vomiting, and fatty stools from malabsorption. The condition is a diagnosis of exclusion in people with diabetes.

HIV enteropathy

HIV enteropathy has an insidious onset and is recurrent. Patients have large amounts of nonbloody diarrhea and mild to moderate nausea and vomiting. It is caused by direct infection of mucosa and neuronal cells in the GI system. Patients will demonstrate other HIV-related symptoms and lymphadenopathy.

Medication-induced diarrhea

Diarrhea can occur as a result of taking prescription or over-the-counter drugs; the most common ones are antacids that contain magnesium, antibiotics, methyldopa, digitalis, β -blockers, systemic antiinflammatory agents, colchicine, quinidine, phenothiazine, high doses of salicylates, and laxatives.



DIFFERENTIAL DIAGNOSIS OF *Common Causes of Acute Diarrhea*

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
Viral gastroenteritis (e.g., Norwalk or rotavirus viral agents)	Abrupt onset 6–12 hr after exposure; nonbloody, watery diarrhea; lasts <1 wk; nausea or vomiting, fever, abdominal pain, tenesmus	In children, can see severe dehydration; hyperactive bowel sounds, diffuse pain on abdominal palpation	Molecular testing
<i>Shigella</i> (gram-negative rod; fecal–oral transmission; common in day-care setting)	Acute onset 12–24 hr after exposure; lasts 3–7 days; large amounts of bloody diarrhea with abdominal cramping and vomiting	Lower abdominal tenderness, hyperactive bowel sounds, no peritoneal irritation	Fecal leukocytes, positive stool culture; molecular testing
<i>Staphylococcus aureus</i> food poisoning (gram-positive cocci; from improperly stored meats or custard-filled pies)	Acute onset 2–6 hr after ingestion; lasts 18–24 hr; large amounts of watery, nonbloody diarrhea; cramping and vomiting	Hyperactive bowel sounds	Fecal leukocytes, negative stool culture; molecular testing
<i>Clostridium perfringens</i> food poisoning (gram-positive rod; from contaminated food)	Acute onset 8–20 hr after ingestion; lasts 12–24 hr; large amounts of watery, nonbloody diarrhea; abdominal pain and cramping	Hyperactive bowel sounds, diffuse pain on abdominal palpation	Fecal leukocytes, negative anaerobic culture of stool; molecular testing
<i>Salmonella</i> food poisoning (gram-negative bacilli; ingestion of contaminated food, poultry, eggs)	Acute onset 12–24 hr after ingestion; lasts 2–5 days; moderate to large amounts of nonbloody diarrhea; abdominal cramping and vomiting	Fever of 38.3°–38.9°C (101°–102°F) common; hyperactive bowel sounds, diffuse abdominal pain	Fecal leukocytes, positive stool culture, WBC count normal; molecular testing
<i>Campylobacter jejuni</i> (gram-negative rod; fecal–oral transmission; household pet)	Acute onset 3–5 days after exposure; lasts 3–7 days; moderate amounts of bloody diarrhea	Fever, lower quadrant abdominal pain	Fecal leukocytes, positive stool culture; molecular testing
<i>Vibrio cholerae</i> (gram-negative rod; fecal–oral transmission; ingestion of contaminated)	Acute onset 8–24 hr after ingestion of contaminated food; lasts 3–5 days; large amounts of nonbloody, watery,	Cyanotic, scaphoid abdomen, poor skin turgor, thready peripheral	Fecal leukocytes, negative stool culture; molecular testing

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
water, seafood, or food)	painless diarrhea; can be mild or fulminate	pulses, voice faint	
Enterotoxigenic <i>Escherichia coli</i> (gram-negative rod; fecal-oral transmission; ingestion of contaminated water or food)	Acute onset 8–18 hr after ingestion of contaminated food/water; lasts 24–48 hr; moderate amounts of nonbloody diarrhea; pain, cramping, abdominal pain; adults in United States generally do not develop illness from enterotoxigenic <i>E. coli</i>	No fever; dehydration is major complication	Fecal leukocytes, positive stool culture; molecular testing
<i>Entamoeba histolytica</i> parasite (cysts in food and water, from feces)	Acute onset 12–24 hr after ingestion of contaminated food or water; large amounts of bloody diarrhea; abdominal cramping and vomiting	Right lower quadrant abdominal pain; in small number of cases hepatic abscess forms	IHA: antibodies to <i>E. histolytica</i> ; positive titer is >1:128; molecular testing
Antibiotic-induced diarrhea (begins after taking antibiotics)	Mild, watery diarrhea; crampy abdominal pain	Diffuse abdominal pain on palpation, fever absent	Usually not needed
Pseudomembranous colitis (antibiotic-induced <i>Clostridium difficile</i>)	Induced by antibiotics, most commonly ampicillin, clindamycin, or cephalosporins; symptoms range from transient mild diarrhea to active colitis with bloody diarrhea, abdominal pain, fever	Lower quadrant tenderness, fever	CBC: leukocytes; sigmoidoscopy/colonoscopy; <i>C. difficile</i> toxin assay or stool culture; <i>C. difficile</i> toxin; molecular testing
Hemolytic uremic syndrome (HUS) (primary cause of HUS in United States is <i>E. coli</i> O157:H7)	Children age <4 yr with history of gastroenteritis; history of bloody diarrhea, fever, and irritability	Fever, irritability; can have oliguria or anuria	CBC, platelet count, renal function tests, peripheral blood smear; negative stool culture; molecular testing
Necrotizing enterocolitis			

	Premature or low-birth-weight infant who presents with feeding intolerance	Vomiting, abdominal distention, lethargy, loose stools with blood and mucous	Refer
Hemorrhagic disease of the newborn	GI bleeding 2–3 days postnatal; history of lack of vitamin K injection; history of mother on anticonvulsants prenatally	Bruising, ecchymoses, mild to moderate bleeding	Laboratory studies typically show markedly elevated PT and PTT with depressed levels of vitamin K–dependent factors

CBC, complete blood count; *IHA*, indirect hemagglutinin assay; *PT*, prothrombin time; *PTT*, partial thromboplastin time; *WBC*, white blood cell.

**DIFFERENTIAL DIAGNOSIS OF *Common Causes of Chronic Diarrhea***

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
Irritable bowel syndrome (IBS)	<p>IBS-D: loose stools >25% of the time and hard stools <25% of the time</p> <p>IBS-M: both hard and soft stools >25 of the time</p> <p>Mucus with stool; seldom occurs at night or awakens patient; commonly present in morning; can have rectal urgency; episodes often triggered by stress or ingestion of food; affects women three times as often as men</p>	Tender colon on palpation; can have abdominal distention; no weight loss; afebrile	Diagnosis of exclusion; sigmoidoscopy, proctoscopy
Ulcerative colitis (distal colon is most severely affected and rectum is involved)	History of severe diarrhea with gross blood in stools, no growth retardation; few reports of pain; age of onset second and third decades with small peak during adolescence; positive family history	Overt rectal bleeding; initially no fever, weight loss, or pain on palpation of abdomen; moderate colitis: weight loss, fever, abdominal tenderness	CBC shows leukocytosis or anemia, ESR elevated; stool cultures to rule out other causes of diarrhea; colonoscopy
Crohn disease (associated with uveitis, erythema nodosum)	History of chronic bloody diarrhea with abdominal cramping, tenderness, and rectal bleeding; in children a history of growth retardation, weight loss, moderate diarrhea, abdominal pain, and anorexia	Weight loss; rare gross rectal bleeding; fistulas common	Colonoscopy with biopsies
Carbohydrate malabsorption	Bloating, flatus, diarrhea exacerbated by ingestion of certain disaccharides (e.g., lactose, milk, milk	Diffuse abdominal pain	Trial elimination of offending foods

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
	products); can follow viral gastroenteritis		
Fat malabsorption	Greasy, fatty, malodorous stools; associated with deficiencies of vitamins K, A, and D; cystic fibrosis	Rectal prolapse, poor weight gain, abdominal distention	72-hr fecal fat, sweat test
Toddler's diarrhea	Three or four stools/day; some contain mucus; rare past age 4–5 yr	Physical examination and growth normal	Clinical diagnosis
Celiac sprue or protein hypersensitivity (reaction to protein in wheat, rye, barley, and oats)	Increased stool frequency, looseness, paleness, and bulkiness of stool within 3–6 mo of dietary onset; children are lethargic, irritable, and anorectic; peak frequency 9–18 mo	Failure to thrive, abdominal distention, irritability, muscle wasting	IgA anti tTG antibodies Clinical findings, improvement on gluten-free diet, CBC, anemia, folate deficiency, radiography, biopsy
<i>Giardia</i> spp. parasite (primary cause of chronic diarrhea in children)	Watery, foul diarrhea; common in day care, among travelers	Low-grade fever, weight loss; chronic form: fatigue, growth retardation, steatorrhea	<i>Giardia</i> antigen test; molecular testing
<i>Cryptosporidium</i> spp. or <i>Isospora belli</i> protozoan parasites (fecal–oral transmission; ingestion of contaminated water or direct oral–anal contact)	Recurrent episodes; variable amounts watery, nonbloody diarrhea; amounts can be massive	Weight loss, severe right upper quadrant abdominal pain with biliary tract involvement	Stool for O&P Antigen Test; molecular testing
Postgastrectomy dumping syndrome			

	After GI surgery, diarrhea occurs after meals because of increased transit of food through colon	Diaphoresis and tachycardia	Upper GI series
Diabetic enteropathy	Nocturnal diarrhea, postprandial vomiting, fatty stools from malabsorption	Findings associated with diabetes	Diagnosis of exclusion in diabetic people
HIV enteropathy (direct infection of mucosa and neuronal cells in GI system)	Insidious onset, recurrent large amounts of nonbloody diarrhea, mild to moderate nausea or vomiting	Findings associated with HIV infection	Testing for HIV
Medication-induced diarrhea	Mild to moderately severe nonwatery, nonbloody diarrhea	No specific findings related to diarrhea	Usually none needed

CBC, complete blood count; *ESR*, erythrocyte sedimentation rate; *GI*, gastrointestinal; *HIV*, human immunodeficiency virus; *O&P*, ova and parasites.