

CHAPTER 3

Abdominal pain

Abdominal pain is a subjective feeling of discomfort in the abdomen that can be caused by a variety of problems. The goal of initial clinical assessment is to distinguish acute life-threatening conditions from chronic/recurrent or acute mild, self-limiting conditions. Assessment is complicated by the dynamic rather than static nature of acute abdominal pain, which can produce a changing clinical picture, often over a short period of time. In addition, both children and older adults tend to deviate from the usual and anticipated clinical pattern of abdominal pain. The following three processes can produce abdominal pain: (1) tension in the gastrointestinal (GI) tract wall from muscle contraction or distention, (2) ischemia, and (3) inflammation of the peritoneum. Pain can also be referred from within or outside the abdomen.

Colic is a type of tension pain. It is associated with forceful peristaltic contractions and is the most characteristic type of pain arising from the viscera. Colicky pain can be produced by an irritant substance, from infection with a virus or bacteria, or by the body's attempt to force its luminal contents through an obstruction. Another type of tension pain is caused by acute stretching of the capsule of an organ, such as the liver, spleen, or kidney. The patient with this visceral pain is restless, moves about, and has difficulty getting comfortable.

Ischemia produces an intense, continuous pain. The most common cause of intestinal ischemic pain is strangulation of the bowel from obstruction.

Inflammation of the peritoneum usually begins at the serosa covering the affected and inflamed organ, causing visceral peritonitis. The pain is a poorly localized aching. As the inflammatory process spreads to the adjacent parietal peritoneum, it produces localized parietal peritonitis. The pain of parietal peritonitis is more severe and is perceived in the area of the abdomen corresponding to the inflammation. A patient with parietal pain usually lies still and does not want to move.

Pain can be referred from within the abdomen or from other parts of the body ([Box 3.1](#)).

Box 3.1

Some Causes of Pain Perceived in Anatomical Regions

Right upper quadrant

- Duodenal ulcer
- Hepatitis
- Hepatomegaly
- Pneumonia
- Cholecystitis

Right lower quadrant

- Appendicitis
- Salpingitis
- Ovarian cyst
- Ruptured ectopic pregnancy
- Renal or ureteral stone
- Strangulated hernia
- Meckel diverticulitis

- Regional ileitis
- Perforated cecum

Periumbilical

- Intestinal obstruction
- Acute pancreatitis
- Early appendicitis
- Mesenteric thrombosis
- Aortic aneurysm
- Diverticulitis

Left upper quadrant

- Ruptured spleen
- Gastric ulcer
- Aortic aneurysm
- Perforated colon
- Pneumonia

Left lower quadrant

- Sigmoid diverticulitis
- Salpingitis
- Ovarian cyst
- Ruptured ectopic pregnancy
- Renal or ureteral stone
- Strangulated hernia
- Perforated colon
- Regional ileitis
- Ulcerative colitis

Modified from Judge R, Zuidema G, Fitzgerald F: *Clinical diagnosis*, ed. 5, Boston, 1988, Little Brown.

Referral of pain occurs because tissues supplied by the same or adjacent neural segments have the same common pathways inside the central nervous system. Thus, stimulation of these neural segments produces the sensation of pain. For example, nerves that supply the appendix are derived from the same source as those that supply the small intestine, resulting in the onset of appendicitis pain in the epigastric area.

Abdominal pain in adults can be classified as acute, chronic, or recurrent. The term “acute abdomen” refers to any acute condition within the abdomen that requires immediate attention because surgical intervention may be required. Acute abdominal pain refers to a relatively sudden onset of pain that is severe or increasing in severity and has been present for a short duration. Chronic pain is characterized by its persistent duration or recurrence. Recurrent episodes of pain can be either acute or chronic in nature.

In adults, acute pain requiring immediate surgical intervention is commonly caused by appendicitis, perforated peptic ulcer, intestinal obstruction, peritonitis, perforated diverticulitis, ectopic pregnancy, or dissection of aortic aneurysm. Other common causes of acute pain include cholelithiasis, gastroenteritis, peptic gastroduodenal syndrome, pancreatitis, pelvic inflammatory disease (PID), or urinary tract infection (UTI). Chronic or recurrent pain can be caused by GI disorders, such as Crohn disease, irritable bowel syndrome (IBS), diverticulitis, or esophagitis; pelvic disorders, such as dysmenorrhea or uterine fibroids; genitourinary disorders, such as recurrent UTI or chronic prostatitis; or conditions outside the abdomen, such as costochondritis, hip disease, or hernia.

In children, abdominal pain can be classified as acute or recurrent. Common causes of acute pain include appendicitis, food poisoning, UTI, viral gastroenteritis, and bacterial enterocolitis. Recurrent abdominal pain (RAP) is defined as more than three episodes of pain in 3 months in children older than 3 years. It affects 10% to 15% of children between the ages of 3 and 14 years; of these children, 90% will not have an organic etiology.

Diagnostic reasoning: Focused history

Is this an acute condition?

Key Questions

- How long ago did your pain start?
- Was the onset sudden or gradual?
- How severe is the pain (on a scale of 1–10)?
- If a child: What is the child's level of activity?
- Does the pain wake you up from sleep?
- What has been the course of the pain since it started? Is it getting worse or better?
- When was your last bowel movement?
- Have you ever had this pain before? What was diagnosed? How was it treated?

Onset and duration

Acute onset of pain that is getting progressively worse could signal a surgical emergency. In general, patients who present with severe pain 6 to 24 hours from the onset probably have an acute surgical condition. Acute abdominal pain can signal a few potentially life-threatening conditions that must be considered first. The following are possible surgical emergencies that require immediate evaluation and intervention:

- *Perforation or ruptured appendix*: look for signs and symptoms of peritonitis ([Box 3.2](#))
- *Ectopic pregnancy*: suspect in any woman of childbearing age

- *Obstruction*: sudden onset of crampy pain usually in umbilical area
- *Ruptured abdominal aortic aneurysm*: when back pain is present
- *Intussusception*: in infants
- *Malrotation*: in infants usually younger than 1 month old

Box 3.2

Features of Peritonitis

P	Pain: front, back, sides, shoulders
E	Electrolytes fall; shock ensues
R	Rigidity or rebound of anterior abdominal wall
I	Immobile abdomen and patient
T	Tenderness with involuntary guarding
O	Obstruction
N	Nausea and vomiting
I	Increasing pulse rate, decreasing blood pressure
T	Temperature falls and then rises; tachypnea
I	Increasing girth of abdomen
S	Silent abdomen (no bowel sounds)

Modified from Shipman JJ: *Mnemonics and tactics in surgery and medicine*, ed. 2, Chicago, 1984, Mosby.

Pain of sudden onset is more likely associated with colic, perforation, or acute ischemia (torsion, volvulus). Slower onset of pain generally is associated with inflammatory conditions, such as appendicitis, pancreatitis, and cholecystitis.

Acute pain that comes and goes can be related to intestinal peristalsis. The onset of pain in relation to food ingestion provides diagnostic clues: pain occurring several hours after a meal suggests a duodenal ulcer (pain with stomach empty), but pain immediately after eating occurs with esophagitis.

In children, RAP occurs in attacks usually lasting less than 1 hour and rarely longer than 3 hours and frequently interferes with daily routines. Between episodes, the pain resolves completely. When interviewing a child, remember that the child might not be old enough to have a clear sense of time.

Severity and progression

Severity is the most difficult symptom to evaluate because of its subjective quality. It is helpful to use a scale of 1 to 10 in adults. Children often respond to the use of the FACES pain scale or the Oucher pain scale (Fig. 3.1).

OUCHER



A African American

OUCHER



B White



FIGURE 3.1 The Oucher Pain Scale illustrated with African American (A), white (B), and Hispanic (C) children to best fit the child's cultural identity. The African American child version of the Oucher was developed and copyrighted in 1990 by Mary J. Denyes, PhD, RN, FAAN (Wayne State University) and Antonia Villarruel, PhD, RN, FAAN (University of Michigan) at the Children's Hospital of Michigan. Cornelia P. Porter, PhD, RN and Charlotta Marshall, MSN, RN contributed to the development of this scale. The white child version of the Oucher was developed and copyrighted in 1983 by Judith E. Beyer, PhD, RN, currently at Graceland University School of Nursing in Independence, Missouri. Photographs were taken by Lynn Juliano, RN, BSN at Martha Jefferson Hospital in Charlottesville, Va. The Hispanic child version of the Oucher was developed and copyrighted in 1990 by Antonia M. Villarruel, PhD, RN (University of Michigan) and Mary J. Denyes, PhD, RN (Wayne State University). Photographs were taken at Children's Hospital of Michigan in Detroit.

Determine whether the pain is an acute episode or a chronic or recurrent episode. Acute abdominal pain requires immediate attention because it can signal an acute surgical condition in the abdomen. Chronic or recurrent episodes of pain can be handled in a more temperate manner.

Pain that is steady, severe, and progressive is worrisome. Pain that causes one to awake from sleep is serious. A sudden pain severe enough to cause fainting suggests perforated ulcer, ruptured aneurysm, or ectopic pregnancy. A severe knifelike pain usually indicates an emergency. Tearing pain is characteristic of an aortic aneurysm. Appendicitis is often described as an initial ache that gets progressively worse. Colicky pain that becomes steady can indicate appendicitis or strangulating intestinal obstruction.

Children are poor historians regarding the severity of pain. The caregiver should indicate how severe the child's pain is by a description of the activity level of the child. In general, avoidance of favorite activities or motion indicates an organic problem. Organic disease awakens the child from sleep.

Last bowel movement

Obstipation (the absence of stools) occurs with complete obstruction, but diarrhea can be present with partial obstruction. Lack of a bowel movement for 3 days could signal constipation. Children have a poor sense of stool patterns and may not know what it means to be constipated. Parents often do not recognize abnormal stooling patterns in the child. The onset of constipation can cause severe abdominal pain.

Previous pain

Chronic pain could result when a potential surgical event is partially controlled but is not totally resolved. Chronic pain that has been present for longer than 1 year generally is not caused by a neoplasm; consider instead IBS or colorectal, endometrial, or inflammatory causes.

Recurrent attacks of acute pain could be caused by inflammation and exacerbation of a chronic condition, such as functional colonic pain, IBS, cholecystitis, chronic pancreatitis, diverticulitis, or ulcer disease. Other causes of acute attacks of pain are recurrent infection, such as pyelonephritis or cystitis, and urinary tract stones.

Will the location of pain give me any clues?

Key Questions

- Where is the pain? Can you point to it?
- Does it travel (radiate) anywhere?

Location of the pain

The viscera are innervated bilaterally so that pain is perceived in the midline. It is often described as a deep, dull, diffuse pain. Visceral pain originates from epigastric, periumbilical, and hypogastric causes; from intraabdominal, extraperitoneal organs (pancreas, kidneys, ureters, great vessels, pelvic organs); or from a referred source.

Parietal (also known as peritoneal or somatic) pain is more localized and is described as a sharp pain. Parietal pain originates from intraabdominal and intraperitoneal organs.

Inflammation (e.g., with appendicitis) can produce either visceral or parietal peritonitis. Initially, the inflammation is limited to the serosa covering an inflamed organ. The pain is visceral and is felt diffusely. As the inflammation progresses to the adjacent parietal peritoneum, it produces a more severe localized pain that is perceived in the corresponding area of the abdomen. Children generally have a poor ability to localize pain and are not helpful in the majority of cases.

The Apley rule states that the further the localization of pain from the umbilicus, the more likely it is that there is an underlying organic disorder.

When blood, pus, or gastric fluid suddenly floods the peritoneal cavity, the pain is frequently reported as “all over the abdomen” at first. However, the maximum intensity of pain at the onset is likely to be in the upper abdomen with gastric problems and in the lower abdomen with tubal and appendix rupture. Irritating fluid from a perforated duodenal ulcer produces pain in the right hypochondrium, lumbar, and iliac regions.

Pain arising from the small intestine is felt in the epigastric and umbilical areas of the abdomen. The 9th and 11th thoracic nerves supply the small intestine via the common mesentery nerve. Appendicular nerves are derived from the same source as those that supply the small intestine, resulting in the onset of pain in the epigastric area with appendicitis.

Table 3.1 describes the structures involved in specific pain locations.

Table 3.1
Pain Location and Involved Structures

PAIN LOCATION	INVOLVED STRUCTURES
Epigastric	Esophagus, stomach, duodenum, liver, gallbladder, pancreas, spleen
Upper abdominal	Esophagus, stomach, duodenum, pancreas, liver, gallbladder, or thorax
Right upper quadrant	Usually esophagus, stomach, duodenum, pancreas, liver, gallbladder, or thorax; often indicates acute cholecystitis
Left upper quadrant	Spleen
Periumbilical	Jejunum, midgut, ileum, appendix, ascending colon; pain caused by inflammation, ischemic spasm, or abnormal distention
Lower abdominal	Colon, sigmoid colon, rectum, and genitourinary structures—bladder, uterus, prostate
Right lower quadrant	Appendix, fallopian tube, ovary
Left lower quadrant	Sigmoid colon, fallopian tube, ovary
Flanks	Kidney(s)
Localized	Occurs from local inflammation of skin or peritoneum, as with appendicitis; lateralized pain occurs in paired organs—kidneys, ureters, fallopian tubes, gonads
Generalized	Produced by diffuse inflammation of gastrointestinal tract, peritoneum, or abdomen wall

Radiation of pain

Radiation of pain can help in diagnosis. Pain that radiates will do so to the area of distribution of the nerves coming from that segment of the spinal cord that supplies the affected area. Whereas biliary colic or gallbladder pain is frequently referred to the region just under the right scapula (eighth dorsal segment), renal colic in males is frequently felt in the testicle of the same side. Pain from a ruptured spleen is often referred to the top of the left shoulder.

What do the pain characteristics tell me?

Key Questions

- Can you describe the pain (e.g., burning, sharp, achy, crampy)?
- What makes it worse or better?

Character of pain

Colicky or cramping pain occurs with obstruction of a hollow viscus that produces distention. Generally, there are pain-free intervals when the pain is much less intense but still present, although it is subtle. During the painful episodes, the patient is exceedingly agitated and restless and often pale and diaphoretic. The pain from obstruction of the small intestine is rhythmic, peristaltic pain with intermittent cramping. When the obstruction site is in the proximal small intestine rather than in the more distal portion, the paroxysms of cramping occur with greater frequency.

Steady pain is associated with perforation, ischemia, inflammation, and blood in the peritoneal cavity. Burning pain is characteristic of esophagitis. Pain from a duodenal ulcer has been described as burning or “gnawing.” Pain of pancreatic origin is steady, epigastric, and prostrating. Pricking, itching, or burning pain comes from superficial causes such as herpes zoster. Dull, aching pain indicates deeper pain. In children, abdominal pain is generally characterized as colicky or inflammatory.

Remember, however, that despite descriptions of characteristic or typical abdominal pain, presentation in children and older adults is often atypical and might not fit any pattern.

Precipitating or aggravating factors

Lying down or bending forward often produces pain from esophagitis. Alcohol can aggravate gastritis or an ulcer. Eating before sleeping can aggravate gastroesophageal reflux.

Pain that is made worse by deep inspiration and is stopped or diminished by a respiratory pause indicates a pleuritic origin. If the cause is peritonitis, intraperitoneal abscess, or abdominal distention from intestinal obstruction, pain will increase on deep inspiration. Biliary colic is made worse by forced inspiration. The pain from biliary colic often causes inhibition of movement of the diaphragm.

A patient with visceral pain is restless, moves about, and has difficulty getting comfortable. A patient with parietal pain usually lies still and does not want to move. Children with inflammatory pain secondary to peritoneal irritation usually appear quiet and motionless because movement exacerbates the pain.

Relieving factors

Food or antacids can relieve pain caused by an ulcer or gastritis. Antacids often relieve pain from gastroesophageal reflux disease (GERD). Both colicky pain and inflammatory pain are alleviated significantly with analgesics. However, the pain of a vascular accident will not respond to analgesics.

Are there any precipitating events that will help narrow my diagnosis?

Key Questions

- Is the pain related to any other activity (e.g., eating, lying down)?
- Can you identify any trigger?

Relation to other events

Pain that is relieved by defecation, flatus, laxatives, or diet changes implicates the intestine. Pain associated with meals implicates the GI tract.

Pain with sexual activity (dyspareunia) suggests a pelvic origin. Pain that occurs with position changes can be referred from the spine, hips, sacroiliac joint, pelvic bones, or abdominal musculature. Exertional pain can be of cardiac origin.

What does the presence of vomiting or diarrhea tell me?

Key Questions

- Are you vomiting? Did the vomiting start before or after the pain?

- What does the vomitus look like?
- What do your stools look like?
- How frequent are your stools?

Vomiting

Vomiting that precedes the onset of abdominal pain is unlikely to signal a problem requiring surgery. Vomiting suggests that the pain is visceral in origin. Anorexia is a nonspecific symptom, but its absence makes serious disease less likely.

Vomiting associated with an acute condition of the abdomen may be from one of the following three causes:

- Severe irritation of the nerves of the peritoneum or mesentery. Sudden stimulation of many sympathetic nerves causes vomiting to occur early and to be persistent.
- Obstruction of an involuntary muscular tube. Obstruction of any of the muscular tubes causes peristaltic contraction and consequent stretching of the muscle wall, which results in vomiting. The area behind the obstruction becomes dilated, and as each peristaltic wave occurs, the tension and stretching of the muscular fibers are temporarily increased; therefore, the pain of colic usually occurs in spasms. Vomiting usually occurs at the height of the pain.
- The action of absorbed toxins on the medullary centers. The chemoreceptor trigger zone is stimulated by drugs such as cardiac glycosides, ergot alkaloids, and morphine or by uremia, diabetic ketoacidosis, or general anesthetics. Impulses to the medullary vomiting center activate the vomiting process.

Pain with vomiting

In sudden and severe stimulation of the peritoneum or mesentery, vomiting comes soon after the pain. In acute obstruction of the urethra or bile duct, vomiting is early, sudden, and intense. In intestinal obstruction, the timing of the vomiting indicates the location of the obstruction. If the duodenum is obstructed, vomiting occurs with the onset of pain. Obstruction of the large bowel causes very late or infrequent vomiting.

Vomiting is not usually seen in ectopic pregnancy, gastric or duodenal perforation, or intussusception. Vomiting occurring before pain indicates gastroenteritis. With appendicitis, pain almost always precedes the vomiting.

Appearance of vomitus

Clear vomitus suggests gastric fluid; bile-colored vomitus is from upper GI contents. Feculent vomitus occurs with distal intestinal obstruction. Coffee grounds or black color indicates GI bleeding. Patients with gastric outlet obstruction vomit fluid that contains food particles if the patient has eaten recently, but later the vomitus becomes clear. Infants with duodenal atresia and small bowel volvulus will vomit bilious fluid, but in pyloric stenosis, no bile is seen.

Diarrhea

Diarrhea (see [Chapter 12](#)) is associated with inflammatory bowel disease (IBD), IBS, diverticulitis, early obstruction, or infection. The presence of blood in the stool suggests that the pain originates in the intestinal tract. Blood can indicate neoplasm, intussusception, inflammatory lesions, or an invasive organism.

Diarrhea can precede perforation of the appendix as a result of irritation of the sigmoid colon by an inflammatory mass. Some patients will report gas stoppage symptoms: the sensation of fullness that suggests the need for a bowel movement. With appendicitis, the patient often attempts to defecate but without relief.

In children, mild diarrhea associated with the onset of pain suggests acute gastroenteritis but can also occur with early appendicitis. A low-lying appendix, close to the sigmoid colon and rectum, can induce an inflammatory process of the muscle wall of the sigmoid colon. Any distention of the sigmoid by fluid or gas, signals the child to pass gas and small amounts of stool. The cycle repeats a few minutes later. In gastroenteritis, typically the child will have large liquid stools. Children can also have abdominal pain from chronic constipation. Constipation that precedes pain suggests disease of the colon or rectum.

Are there any clues to implicate a particular organ system?

If the patient gives a positive response to the following history questions, refer to the topic or chapter indicated for additional discussion. Pain that is not abdominal in origin could be referred to or perceived to be in the abdomen. Accompanying symptoms of headache, sore throat, and general aches and pains suggest a viral, flulike cause.

Key Questions

Cardiovascular system (see [Chapter 8](#)):

- Does the pain occur with exertion or at rest?
- Do you have any chest pain, palpitations, fast heartbeat, or pain that goes to the arm or jaw?

Referred pain from the chest is common. Pain on exertion signals coronary artery disease (CAD) and angina. Right upper quadrant (RUQ) pain can be caused by congestive heart failure. Myocardial infarction (MI) and pericarditis can also cause abdominal pain.

Key Questions

Gastrointestinal system (see [Chapters 10](#) and [12](#)):

- Do you have any GI symptoms (e.g., gas, diarrhea, constipation, vomiting, heartburn)?
- Have you had any changes in your bowel habits, stools, or eating pattern?
- Is the pain relieved by defecation or burping?

Gas, bloating, diarrhea, constipation, and rectal bleeding can occur with pain that is intestinal in origin. Heartburn and dysphagia are characteristic of esophagitis and GERD. Changes in bowel habits can signal obstruction or neoplasm. Constipation alternating with diarrhea is characteristic of IBS. The patient often also reports distention, bloating, belching, gas, and mucus in the stools.

Pain relieved by defecation or the passage of gas suggests IBS or gas entrapment in the large intestine. Pain relieved by burping suggests distention of the stomach by gas.

Key Questions

Genitourinary system (see [Chapters 5](#), [18](#), [27](#), and [35 to 37](#)):

- When was your last menstrual period (LMP)? Was it normal for you? Could you be pregnant?
- Do you have any vaginal symptoms or problems, such as unusual discharge, unusual bleeding, or pain with sexual intercourse?
- Do you have any menstrual irregularity or unusual bleeding? (Sexual history could provide information relevant to the possibility of sexually transmitted infections [STIs], PID, and pregnancy.)
- Do you have any urinary symptoms (e.g., frequency, urgency, dysuria, blood in urine, change in urine color)?
- Do you have pain in the back (flank)? Can you point to it?

Menstrual irregularities, vaginal discharge, unusual bleeding, or dyspareunia indicates a pelvic origin of the pain. Sexually active adolescent girls are at the highest risk for contracting PID. Patients with PID may complain of both vaginal discharge and abnormal vaginal bleeding, although pain is often the only presenting symptom. The pain is usually severe and progressive. Pain just before the onset of menses indicates endometriosis. Pain related to ovulation (mittelschmerz) occurs midcycle. In women of childbearing age, always consider ectopic pregnancy. Regard women of childbearing age as pregnant until pregnancy is ruled out.

Urinary symptoms (dysuria, hematuria, hesitancy, or frequency) point to a urinary tract cause of the pain. In young children abdominal pain and vomiting may be signs of a UTI. Flank pain is usually associated with renal calculi or pyelonephritis. Upper abdominal pain that radiates to the groin signals ureterolithiasis.

Key Questions

Musculoskeletal system (see [Chapters 22 to 24](#)):

- Does the pain occur with change in position or movement?
- Do you have any joint pain, heat, swelling, noises, or limitation in range of motion?
- Do you have any difficulty walking?

Pain produced by musculoskeletal problems and referred to the abdomen can be provoked by position changes or walking. Costochondritis can produce pain with respiration. Symptoms of joint involvement point to either a local cause with referred pain, or a systemic cause, such as rheumatoid arthritis.

Key Questions

Respiratory system (see [Chapters 11 and 14](#)):

- Do you have a cough or difficulty breathing?
- Do you have any shortness of breath?
- Does the child complain of a sore throat?

Pneumonia, especially of a lower lobe, is a common cause of pain perceived in the abdomen, especially in children. Pleurisy can produce pain on deep inspiration. Persistent coughing can produce musculoskeletal soreness that may be referred to the abdomen. Children with strep throat may present with abdominal pain.

Is the pain psychogenic, organic, or functional?

Key Questions

- Do you feel unhappy, sad, depressed?
- Are you able to eat, sleep, or engage in usual activities?
- Have you had recent problems with diarrhea or constipation?
- How is your energy level?
- Have you ever been diagnosed with or treated for a mental health or psychiatric problem?

Abdominal pain can be functional or psychogenic in origin and presents somewhat differently from organic pain ([Table 3.2](#)). In children, functional abdominal pain is caused by one of four or a combination of more than one of the following: functional dyspepsia, functional abdominal pain syndrome, IBS, or abdominal migraine.

Table 3.2
Organic versus Functional Pain

HISTORY	ORGANIC PAIN	FUNCTIONAL PAIN
Pain character	Acute, persistent pain increasing in intensity	Less likely to change or get more severe
Pain localization	Sharply localized	Various locations
Pain in relation to sleep	Awakens at night	Does not affect sleep
Pain in relation to umbilicus	Farther away	At umbilicus
Associated symptoms	Fever, anorexia, vomiting, weight loss, anemia, elevated ESR	Headache, dizziness, and multiple system complaints
Psychological stress	None reported	Present

The presence of vegetative symptoms suggests depression (see [Chapter 4](#)).

What else do I need to consider?

Key Questions

- What medications (prescribed and over the counter) are you taking? Why are you taking them?
- Have you had any operations? What were they?
- Have you recently had an involuntary weight loss?
- Have you been camping?

- If a child: Is the child in a day care setting?

Medications

Gastrointestinal distress is a common adverse reaction to many medications. Erythromycin and tetracycline are commonly associated with abdominal pain. Aspirin and nonsteroidal antiinflammatory drugs (NSAIDs) can cause pain associated with gastritis and ulcer formation.

Surgery

Prior surgery can produce adhesions that cause intestinal obstruction. Adhesion of organs to the abdominal wall can also produce pain. Prior appendectomy does not preclude appendicitis; the stump can become inflamed.

Involuntary weight loss

Involuntary weight loss raises the index of suspicion for colon cancer. Identify other factors that would lead you to suspect neoplasms, such as a recent change in bowel habits in a middle-aged patient, family history of colorectal or gynecologic cancer, and the presence of blood in the stool.

Camping or day care

Ingestion of untreated water can result in intestinal parasites. Transmission of intestinal parasites is also common in day care settings. Children with intestinal parasites may present with abdominal pain as the only symptom; therefore, stools should be evaluated for ova and parasites.

Diagnostic reasoning: Focused physical examination

Note general appearance

Patients with visceral pain are restless, move about, and have difficulty getting comfortable. These are patients with colicky type pain, often indicative of biliary obstruction, ureterolithiasis, obstruction, gastroenteritis, or early peritonitis.

Patients with parietal pain usually lie still and do not want to move. These are patients with localized peritonitis indicative of appendicitis, rupture, or perforation.

In children, note whether the child looks sick (see [Chapter 17](#)). Children can react to pain differently than adults. With peritoneal irritation, they are typically quiet and motionless with their knees flexed and drawn up. Children who are septic or have serious diseases, such as perforation or intussusception, generally lie still and look lethargic, withdrawn, and apprehensive. A child with colicky pain frequently writhes in discomfort, occasionally rocking in a rhythmic fashion.

Assess vital signs

In patients who are tachycardic and tachypneic, suspect a serious thoracic, intraabdominal, or pelvic disorder that is producing an acute condition in the abdomen. Shallow respirations could indicate pneumonia or pleurisy with referred pain. Orthostatic hypotension, an unusually low blood pressure, or a normal blood pressure in someone who is usually hypertensive can indicate an acute abdominal condition.

The presence of a fever suggests an acute inflammatory condition. A temperature of greater than 39.4°C (102.9°F) is associated more with pulmonary and renal infection than with an abdominal problem and can indicate pneumonia or pyelonephritis.

In adults, look for documented recent involuntary weight loss, which indicates a neoplasm. Weigh a child to determine weight loss and dehydration status.

Examine the throat

Note exudate, erythema, and anterior cervical adenopathy suggesting group A β hemolytic streptococcal pharyngitis.

Observe abdominal musculature

Whereas a rigid abdomen characterizes peritoneal irritation, a soft abdomen suggests otherwise. A rigid abdomen can signal an acute condition of the abdomen that requires surgical intervention.

Note coloring of abdominal skin

Ecchymosis around the umbilicus (Cullen sign) is associated with hemoperitoneum caused by either pancreatitis or ruptured ectopic pregnancy. Ecchymosis of the flanks (Grey Turner sign) is associated with hemoperitoneum and pancreatitis. Look for skin rashes of viral exanthema.

In children, a rash (palpable purpura) located on the lower extremities, buttocks, and arms indicates Henoch-Schönlein purpura (a syndrome of purpura with urticaria, erythema, arthritis, and GI symptoms).

Note abdominal distention

Generalized symmetrical distention can occur as the result of obesity, enlarged organs, fluid, or gas. Distention from the umbilicus to the symphysis can be caused by an ovarian tumor, pregnancy, uterine fibroids, carcinoma, pancreatic cyst, or gastric dilation. Asymmetrical distention or protrusion may indicate hernia, tumor, cysts, bowel obstruction, or enlargement of

abdominal organs. Remember the *F s* of distention: fat, fluid, feces, fetus, flatus, fibroid, full bladder, false pregnancy, and fatal tumor.

To determine distention in children, stoop down by the child's side and view across the abdomen. If the skin is tense and taut with a distended abdomen, and if the umbilicus is everted, ascites is often present. Superficial abdominal veins are often distended in children with peritonitis. The healthy child will usually have a flat abdominal profile. A flat abdomen is a straight line from the xiphoid to pelvis with no scaphoiding (abdomen has a concave, sunken appearance). A scaphoid abdomen can occur with marked dehydration or high intestinal obstruction.

Auscultate bowel sounds

If bowel sounds are absent, suspect peritonitis or ileus. Hyperactive bowel sounds suggest gastroenteritis, early pyloric or intestinal obstruction, or GI bleeding. High-pitched tinkling bowel sounds can indicate obstruction.

In children, use of the stethoscope can be helpful in palpation to determine abdominal pain. Begin listening to the chest; the child accepts this as painless. Then gently move the stethoscope down to the belly, slightly increasing the pressure, watching the child's face and feeling the resistance when painful.

Percuss for tones and guarding

In percussion, look for unexpected dullness. Guarding with percussion suggests peritoneal irritation. Tenderness can be elicited with gentle tapping. Tenderness is usually local and only rarely referred.

Palpate the abdomen

Start with gentle palpation and palpate the area of pain last. Testing for rebound tenderness should be performed gently. Tenderness, guarding, and rebound tenderness suggest peritoneal irritation. The most reliable clinical indicator of parietal peritonitis is involuntary guarding, which must be distinguished from voluntary guarding because of pain or fear of worsening pain as a result of the examination. Guarding is determined with gentle palpation of the abdomen, not by deep palpation of the underlying organs.

You can induce guarding by having the patient place the chin on the chest or cross the arms on the chest and sit up. Palpate the painful area again. Note that intraperitoneal pain is made less severe by induced guarding. If the severity of pain is not decreased by induced guarding, consider other causes such as functional pain or abdominal wall pain.

Palpate for the liver, gallbladder, spleen, kidneys, aorta, and bladder to detect organ tenderness or involvement. Abrupt cessation of inspiration on palpation of the gallbladder (Murphy sign) indicates acute cholecystitis.

Palpate for masses

Palpation of a mass can indicate neoplasm, obstruction, hernia, or the presence of feces in the colon. Anatomical structures can be mistaken for an abdominal mass. A mass in the upper abdomen that pulsates laterally suggests an abdominal aortic aneurysm.

A sausage-shaped mass can be felt in the upper mid-abdomen in 85% to 95% of infants with intussusception. An olive-shaped mass may be palpable in the RUQ with pyloric stenosis.

Palpate the groin

The groin must be examined in everyone who has abdominal pain to exclude an incarcerated hernia or ovary or torsion of the ovary or testicle (see [Chapter 18](#)).

Palpate for hernias

Palpate for inguinal, incisional, femoral, and umbilical hernias. Uncomplicated hernias will reduce; strangulated ones will not. Bowel sounds will be present in uncomplicated hernias.

Percuss for flank tenderness

The use of direct or indirect percussion over the costovertebral angle (CVA) can elicit tenderness if the kidney is involved. Flank pain, especially with the occurrence of hematuria, can indicate a kidney stone.

Test for peritoneal irritation

Several maneuvers can be used to test for peritoneal irritation.

- *Obturator muscle test.* Perform this test when you suspect a ruptured appendix or pelvic abscess because these conditions can cause irritation of the obturator muscle. Pain in the hypogastric region is a positive sign, indicating obturator muscle irritation. With the patient supine, flex the right leg at the hip and knee to 90 degrees. Hold the leg just above the knee, grasp the ankle, and rotate the leg laterally and medially.
- *Iliopsoas muscle test.* Perform this test when you suspect appendicitis because an inflamed appendix can cause irritation of the lateral iliopsoas muscle. Pain in the lower quadrant is a positive test result. With the patient supine, place your hand over the lower thigh and have the patient raise the leg, flexing at the hip while you push downward against the leg.
- *Markle (heel drop) test.* Perform this test if you suspect appendicitis. The patient stands with straightened knees and then rises up on the toes. The patient then relaxes and allows the heels to hit the floor, thus jarring the body. The maneuver will cause abdominal pain if positive.
- *Rovsing test.* Perform this test if you suspect appendicitis. Press on the left lower quadrant (LLQ). If pain in the right lower quadrant (RLQ) is intensified, the test result is positive.

Perform a pelvic examination in patients with a vagina and uterus

Perform a pelvic examination in women to rule out STI, PID, ovarian pain, ectopic pregnancy, and uterine fibroids. Vaginal discharge may or may not be present with STI or PID. Bleeding can accompany ectopic pregnancy.

Cervical motion tenderness (CMT) is the hallmark of PID. CMT plus adnexal pain (often bilateral) in the presence of abdominal pain and lower abdominal tenderness are criteria for a presumptive diagnosis of PID.

Adnexal tenderness in the region of pain can signal ectopic pregnancy. An adnexal mass may or may not be palpable, and its presence is not diagnostic. Vague adnexal tenderness can be present with STI. Bilateral, inflammatory ovarian pain and tenderness are usually related to PID, appendicitis, or peritonitis. A functional cyst can produce unilateral tenderness. Uterine fibroids may be palpable as masses in the uterus, or the entire uterus may be enlarged.

Perform genital and prostate examinations in patients with a penis and prostate

Perform genital and prostate examinations in men to rule out STIs and prostatitis. Look for penile discharge as an indicator of STI and perhaps prostatitis. A tender prostate signals prostatitis. In acute prostatitis, make sure the examination is gentle; vigorous examination or massage of the prostate can cause bacterial release and produce septicemia (see [Chapter 18](#)).

Perform digital rectal examination

Look for frank blood and test for occult blood. The presence of blood can indicate an acute process or carcinoma. Palpate for masses, polyps, and lesions. Occasionally, patients with a rectocecal appendix and appendicitis can have a tender, localized mass on rectal examination, even though the abdominal examination is normal.

Check peripheral pulses

Diminished femoral pulses in the presence of a pulsatile abdominal mass suggest ruptured abdominal aortic aneurysm.

Perform a generalized examination as indicated

Because abdominal pain can be referred from other areas, examine the lungs, cardiovascular system, head and neck structures, and musculoskeletal system. Palpate for regional lymphadenopathy.

Laboratory and diagnostic studies

Complete blood count with differential

An elevated white blood cell (WBC) count indicates an inflammatory or infectious condition.

Pregnancy test

Urine or serum testing for the beta subunit of the human chorionic gonadotropin (β -hCG) is used to identify or rule out pregnancy. Use serial quantitative serum testing if you are concerned about ectopic pregnancy.

Erythrocyte sedimentation rate

Inflammation or tissue injury causes an increased erythrocyte sedimentation rate (ESR). However, the test is nonspecific and does not indicate the source. The ESR is often elevated as a result of PID, infectious states, or AIDS.

Cardiac enzymes

Cardiac troponin (T or I; cTnT or cTnI) and creatinine kinase MB isoenzyme (CK-MB) are used in diagnosing MI (see [Chapter 8](#)).

Urinalysis

Urinalysis (U/A) is used to evaluate for kidney infection, presence of a kidney stone, renal failure, or a systemic disease. Microscopic hematuria suggests UTI or stone. Glycosuria and ketonuria suggest metabolic disturbances. A positive nitrite test on a U/A dipstick indicates the presence of bacteria, which can be seen on microscopic examination. The finding of 20 or more bacteria per high-powered field (HPF) indicates a UTI. The presence of greater than 0 to 1 RBCs/HPF or greater than 0 to 4 WBCs/HPF on microscopic examination also suggests UTI. RBCs can also be present as a contaminant with vaginal bleeding. The presence of red cell casts suggests kidney disease or renal infarction. White cell casts indicate pyelonephritis.

Urine for culture and sensitivity

If you suspect UTI, consider a urine test for culture and sensitivity (C&S). Uncomplicated UTIs may be treated empirically.

Molecular testing for sexually transmitted infection

DNA probes or nucleic acid amplification tests (NAAT) test for infectious organisms of *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Trichomonas vaginalis*, *Gardnerella vaginalis*, and *Candida* spp. Obtain a sample of vaginal or penile discharge with a sterile swab and place it in the medium provided. Urine can also be tested for chlamydia and gonorrhea. The results are rapid and have high sensitivity and specificity. DNA probe testing has largely replaced Gram staining and culture.

Potassium hydroxide test

The potassium hydroxide (KOH) test involves direct microscopic examination of material to determine whether fungus is present. View under the microscope for the presence of mycelial fragments, hyphae, and budding yeast cells (see [Chapter 37](#)). The presence of fishy odor (the “whiff test”) suggests bacterial vaginosis.

Saline wet prep

In a female with vaginal discharge, this test can demonstrate the presence of *Trichomonas vaginalis* or *Gardnerella* organisms by microscopic examination. The presence of trichomonads indicates *T. vaginalis*. The presence of bacteria-filled epithelial cells (clue cells) indicates bacterial vaginosis (*Gardnerella*) (see [Chapter 37](#)).

Fecal occult blood test

Perform the fecal occult blood test (FOBT) to rule out GI bleeding. The test result is positive if a stool smear on a prepared card turns color (usually blue or green) when a solution is applied. A three-sample series provides more reliable results.

Fecal immunochemical test

Also called immunochemical FOBT (iFOBT), the fecal immunochemical test (FIT) uses antibodies to hemoglobin to detect a specific portion of a human blood protein. This test is done essentially the same way as conventional FOBT but is more specific and reduces the number of false positive results. Vitamins or foods do not affect the fecal immunochemical test, and some forms require only one or two stool specimens.

Stool testing

Stool testing for ova and parasites and giardia can be useful in patients with abdominal pain accompanied by diarrhea and who have traveled recently. Fresh stool is required to preserve the trophozoites of some parasites. 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.

Rapid strep screen

The throat and tonsils are swabbed, and a rapid antigen test is ordered. The test can determine if strep is present. A negative strep result often indicates no group A streptococcus is present.

Electrocardiogram

An electrocardiogram (ECG) can add objective data to the diagnostic process if you suspect the pain is of cardiac origin. ST segment elevation or depression indicates the presence of injured myocardium. T-wave inversion will demonstrate the presence of ischemia. The appearance of both strongly supports ischemia but is not diagnostic of coronary artery disease. Arterial spasm, pericarditis, and electrolyte imbalance can also cause these variations from normal (see [Chapter 8](#)).

Helicobacter pylori testing

Helicobacter pylori (*H. pylori*) testing may be useful in high prevalence areas or in patients with epigastric pain when *H. pylori* infection is suspected. Laboratory methods for testing include antibody or antigen testing with serology, urine or stool, or urea breath test.

Radiography

Abdominal radiographs are of limited value in evaluating abdominal pain. An anteroposterior radiograph of the abdomen shows the kidneys, ureters, and bladder (KUB) and adjacent structures. It can be used to exclude free air (perforation) and obstruction (e.g., renal calculi) or to confirm intestinal obstruction. A chest radiograph can reveal the presence of pneumonia or air under the diaphragm (see [Chapters 40](#) and [41](#)).

Abdominal and pelvic ultrasound

Abdominal ultrasound is useful if you are considering ectopic pregnancy, abdominal aortic aneurysm, acute cholecystitis, acute pancreatitis, incarcerated hernia, hernia, or diverticular disease.

Computed tomography and magnetic resonance imaging

Computed tomography (CT) scanning and magnetic resonance imaging (MRI) are appropriate if you suspect retroperitoneal bleeding, pelvic abscess, pancreatitis, obstruction, hernia, incarcerated hernia, or diverticular disease. CT scanning is the preferred imaging study for diagnosing suspected appendicitis and in patients in whom appendiceal perforation is suspected. Noncontrast-enhanced helical CT is used to definitively diagnose urolithiasis. Helical CT scanning with rectal contrast is accurate and efficient in evaluating adults with equivocal presentations for appendicitis.

Colonoscopy or sigmoidoscopy

If you suspect GI origin of pain, both colonoscopy and sigmoidoscopy are useful in directly visualizing the colon.

Anorectal manometry

Anorectal manometry is used to evaluate constipation or fecal incontinence. The test measures the pressures of the anal sphincter muscles, the sensation in the rectum, and the neural reflexes that are needed for normal bowel movements.



Use of Computed Tomography in Diagnosing Appendicitis in Children

This study evaluated the impact of a clinical algorithm on computed tomography (CT) use and diagnostic accuracy of appendicitis in children. The study included 331 patients with 41% in the preimplementation period and 59% in the postimplementation period. CT use decreased from 39% to 18% ($P < .001$) after implementation of the algorithm. The negative appendectomy rate increased from 9% to 11% ($P = .59$). Use of CT did not have an impact on the risk of negative appendectomy ($P = .64$). The authors concluded that use of CT was significantly reduced after implementing a diagnostic algorithm for appendicitis without having an impact on diagnostic accuracy. Given the concern for increased risk of cancer after CT, these results support use of an algorithm in children with suspected appendicitis.

Reference: Polites et al, 2014.

Differential diagnosis

When there is no worrisome history or there are no physical findings, use the specific history questions to point you in the right direction. Then determine whether the clinical findings are consistent. Review the history to see evolution over time, especially of an acute condition.

Identify physical findings that are worrisome as well, such as lower abdominal pain beginning at older age, involuntary weight loss, abnormal bleeding in a perimenopausal or postmenopausal woman, palpable abdominal or pelvic mass, or stool that is positive for occult blood.

Initially, look for surgical problems. Serial abdominal examinations are the best indicator of progression of an abdominal problem. Try to identify what organ seems to be involved and remember that extraabdominal systems can cause abdominal pain (e.g., pneumonia). Try to determine if the pain is organic or functional in origin. Remember that common causes of acute pain differ from common causes of chronic pain. [Box 3.3](#) lists indicators of abdominal emergencies.

Box 3.3

Indicators of Abdominal Emergencies

Subjective findings

- Progressive intractable vomiting
- Lightheadedness on standing
- Acute onset of pain
- Pain that progresses in intensity over hours

Objective findings

- Involuntary guarding
- Progressive abdomen distention
- Orthostatic hypotension
- Fever
- Leukocytosis and granulocytosis
- Decreased urine output

Acute conditions that cause abdominal pain

Appendicitis

The incidence of appendicitis peaks at age 10 to 20 years, although it can occur at any age. The patient reports sudden onset of colicky pain that progresses to a constant pain. The pain can begin in the epigastrium or periumbilicus and later localize to the RLQ. The pain worsens with movement or coughing. Vomiting after the onset of pain sometimes occurs. On physical examination, the patient will be lying still and demonstrate involuntary guarding. Classically, tenderness occurs in the RLQ. The results of other tests for peritoneal irritation will be positive. Rebound tenderness may be present. Variation in presentation is common, particularly with infants, children, and older adults. Diagnostic testing includes complete blood count (CBC) with differential to confirm or rule out infection and the use of either ultrasonography, CT scan, or MRI. Ultrasonography is the preferred modality, with MRI and CT used if diagnosis remains unclear.



EVIDENCE-BASED PRACTICE

Clinical Diagnosis of Appendicitis

In a review of clinical decision rules to assist in diagnosing appendicitis, the authors concluded that decision models that score combinations of findings from the history and clinical examination are more powerful than any single finding. They point to the Alvarado model as one that balances accuracy with ease of use and familiarity to clinicians. It combines the results for eight findings; a score of 7 or more of a potential 10 indicates the need for surgical intervention. The Alvarado model has a sensitivity of 81% and a specificity of 74%.

ALVARADO SCORE FOR EARLY DIAGNOSIS OF ACUTE APPENDICITIS	
VARIABLE	SCORE
Migration of pain	1
Anorexia-acetone	1
Nausea or vomiting	1
Tenderness in the RLQ	2
Rebound pain	1
Elevation of temperature	1
Leukocytosis	2
Shift to the left on differential (neutrophils >75%)	1
Maximum total score	10
Positive score	$\geq 7^a$

^aA score of 7 or more indicates the need for surgical intervention.

References: Wagner and Shojania, 2009; Alvarado, 1986.

RLQ, Right lower quadrant.

Ectopic pregnancy

Ectopic pregnancy can occur in any sexually active woman of childbearing age, especially those with a history of irregular menses. The patient experiences a sudden onset of spotting and persistent cramping in the lower quadrant that begins shortly after a missed period. On examination, the patient shows signs of hemorrhage, shock, and lower abdominal peritoneal irritation that can be lateralized. On pelvic examination, the uterus is enlarged but smaller than anticipated from dates provided. The cervix is tender to motion, and a tender adnexal mass can be palpable. Diagnosis is confirmed by positive hCG test results and ultrasound. Serial quantitative serum hCG levels can be useful. A ruptured ectopic pregnancy is a surgical emergency.

Peptic ulcer perforation

The patient reports sudden onset of severe, intense, steady epigastric pain that radiates to the sides, back, or right shoulder. The patient can give a history of burning, gnawing pain that worsens with an empty stomach. The patient lies as still as possible. Epigastric tenderness will be present with palpation or percussion. Rebound tenderness is intense. The abdominal muscles are rigid, and bowel sounds can be absent. The diagnosis is confirmed by upright or lateral decubitus radiographs, showing air under the diaphragm or in the peritoneal cavity. Perforation is a surgical emergency.

Dissection of aortic aneurysm

This condition occurs most frequently in men and persons older than 50 years, especially those with a history of uncontrolled hypertension. The patient experiences the sudden onset of excruciating pain that can be felt in the chest or abdomen and may radiate to the legs and back. Vital signs will reflect impending shock, and there can be a deficit or difference in femoral pulses. The diagnosis can be made by CT or MRI. Additional tests include ECG and cardiac enzymes. This is a surgical emergency with a high death rate.

Myocardial infarction

In patients older than 50 years, acute MI can present with abdominal pain and GI symptoms rather than the classic chest pain. If there is no other explanation for the pain, consider a cardiac origin.

Peritonitis

The most common cause of peritonitis is perforation of the GI tract. It occurs more often in older adults. The patient experiences the sudden onset of severe pain that is diffuse and worsens with movement or coughing. On examination, the patient will be guarding and have rebound tenderness. Bowel sounds will be decreased or absent. Diagnostic tools include CBC with differential and abdominal radiographs.

Acute pancreatitis

Acute pancreatitis is more common in patients with cholelithiasis or a history of alcohol abuse. The pain is steady and boring in quality and is unrelieved by change of position. It is located in the left upper quadrant (LUQ) and radiates to the back. The patient can also experience nausea, vomiting, and diaphoresis and will appear acutely ill. Abdominal distention, decreased bowel sounds, and diffuse rebound tenderness will be present on physical examination. The upper abdomen can show muscle rigidity. Examination of the lungs can reveal limited diaphragmatic excursion. Diagnostic testing includes CBC with differential, ultrasonography, radiography, and serum amylase and lipase levels.

Mesenteric adenitis

Adenovirus-induced (commonly *Yersinia* spp.) adenopathy of the mesenteric lymph nodes can result in fever and RLQ abdominal pain that mimics appendicitis. This condition is difficult to diagnose, but the WBC count is elevated and an abdominal radiograph will show abnormalities of the terminal ileus.

Cholecystitis or lithiasis

Cholecystitis or lithiasis occurs more often in adults than in children and more often in females than in males. The pain is colicky in nature and progresses to a constant pain. The patient reports pain in the RUQ, which can radiate to the right scapular area. The typical pain of cholelithiasis is constant, progressively rising to a plateau and falling gradually. The patient can also experience nausea and vomiting and give a history of dark urine or light stools. On physical examination, the patient will be tender to palpation or percussion in the RUQ. The gallbladder is palpable in about half of cases of cholecystitis. Painful splinting of respiration during deep inspiration (Murphy sign) is frequently present with cholecystitis. Diagnostic testing includes CBC with differential, ultrasonography, radiography, and serum amylase and lipase levels.

Ureterolithiasis

The patient reports the sudden onset of excruciating intermittent colicky pain that can progress to a constant pain. The pain is in the lower abdomen and flank and radiates to the groin. The patient can also experience nausea, vomiting, abdominal distention, chills, and fever. There is CVA tenderness on examination along with increased sensitivity in the lumbar and groin areas. Hematuria and increased frequency of urination can be present. U/A should be performed. Urine pH and the presence of crystals can help identify stone composition. Definitive diagnostic testing is via noncontrast-enhanced helical CT.



EVIDENCE-BASED PRACTICE

Clinical Diagnosis of Acute Cholecystitis

In both the original and updated systematic reviews, the authors concluded that no single clinical finding, or known combination of clinical history and physical examination findings, efficiently establishes a diagnosis of acute cholecystitis. Individual findings with the highest diagnostic value are a Murphy sign and right upper quadrant tenderness. The authors concluded the clinician's gestalt is the most important piece of evidence from the clinical evaluation and that bedside ultrasonography by a trained clinician may be useful in diagnosis.

Reference: Trowbridge et al, 2009.

Urinary tract infection and pyelonephritis

Abdominal pain associated with UTI or pyelonephritis is common in children and could be the only presenting complaint. U/A and C&S are done to confirm the diagnosis.

Pelvic inflammatory disease and salpingitis

Pelvic inflammatory disease occurs most commonly in women younger than 35 years of age who are sexually active and have more than one sexual partner. Infection results from organisms transmitted via intercourse, through childbirth, or with abortion. PID is most often caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Infection begins intravaginally in most cases and then spreads upward, causing salpingitis. The tubal infection produces an exudate, and as it spreads, peritonitis can result. The onset is usually shortly after menses. Patients have lower abdominal pain that becomes progressively more severe. On examination, abdominal tenderness, CMT, and adnexal tenderness (usually bilateral) are present. With peritonitis, patients can also have guarding and rebound tenderness. Patients can also have a fever, irregular bleeding, vaginal discharge, or vomiting. WBC count and ESR are usually elevated. DNA probes, cultures, and Gram staining can assist with diagnosis.

Obstruction

Obstruction occurs most often in newborns, older adults, and those with recent GI surgery. The patient presents with a sudden onset of crampy pain, usually in the umbilical area of the epigastrium. Vomiting occurs early with small intestinal obstruction and late with large bowel obstruction. Obstipation occurs with complete obstruction, but diarrhea can be present with partial obstruction. Hyperactive, high-pitched bowel sounds can be present in small bowel obstruction. A mass can be palpable in lower obstruction. Abdominal distention can

be present. The rectum will be empty on digital examination. Diagnosis is confirmed with abdominal radiographs (supine and sitting), MRI, or CT.

Ileus

Ileus is associated with intraperitoneal or retroperitoneal infection, metabolic disturbances, and intraabdominal surgery. The patient experiences abdominal distention, vomiting, obstipation, and cramps. On auscultation, there is minimal or absent peristalsis. Abdominal radiographs show gaseous distention of isolated segments of both the small and large intestines.

Intussusception

Bowel obstruction in children ages 2 months to 2 years usually occurs in the ileocecal region and classically presents with vomiting, colicky abdominal pain with drawing up of the legs, and eventual currant jelly stools. The onset is dramatic. The child is asleep or awake when suddenly he or she cries out with severe pain. The child twists and squirms; nothing gives any relief until, almost suddenly, there is a lull with absence of pain followed by a similar painful episode. The abdomen has a sausage-shaped mass that can be felt in the RUQ. The stool tests positive for blood.

Malrotation and volvulus

Improper rotation and fixation of the duodenum and colon can cause an artery to obstruct, and the patient experiences ischemic necrosis. This disorder of the embryonic gut is usually seen in the first month of life. The infant presents with bilious emesis followed by abdominal distention and GI bleeding. Shock occurs from progression of the ischemia.

Henoch-schönlein purpura

In Henoch-Schönlein purpura, crampy, acute abdominal pain and bleeding are secondary to edema and hemorrhage of the intestinal wall. This disease is an immunoglobulin A (IgA)-mediated vasculitis that affects very small vessels. An urticarial rash occurring on the buttocks and lower extremities progresses to papular purpuric lesions. The laboratory findings show an elevated WBC count but a normal platelet count. A mild increase in ESR, an increase in IgA concentration, and negative antinuclear antibodies (ANA test) are also found.

Incarcerated hernia

Incarcerated hernia occurs most commonly in older adults. The patient reports a constant severe pain in the RLQ or LLQ that worsens with coughing or straining. Physical examination reveals a hernia or mass that is nonreducible. Diagnosis is confirmed by MRI or CT. Surgical intervention is indicated.

Pneumonia

Pneumonia is a frequently overlooked cause of abdominal pain in children. The pain is referred from right lower lobe pneumonia because of associated phrenic nerve irritation, which can cause muscular spasm, ileus, and pain referred to the RLQ. The WBC count in pneumonia is typically higher than that in early appendicitis.

Chronic conditions that cause lower abdominal pain

Irritable bowel syndrome

Irritable bowel syndrome begins in adolescent and young adult years. It produces crampy hypogastric pain that is of variable, infrequent duration. The pain is associated with bowel function, gas, bloating, and distention. Relief is often obtained with the passage of flatus or

feces. The patient has a normal abdominal examination and the stool is negative for blood. Consider a proctosigmoidoscopy or barium enema (BE) if onset is at middle age or older, if the stool is positive for blood, if there is a family history of colorectal cancer or polyps, or if the patient fails to improve after 6 to 8 weeks of therapy.

Crohn disease

Crohn disease is an inflammatory bowel disease that presents with abdominal pain or cramping, abdominal tenderness, and diarrhea (see [Chapter 12](#)). Rectal bleeding may accompany the diarrhea.

Lactose intolerance

Lactose intolerance produces crampy pain and diarrhea after the consumption of milk or milk product foods (see [Chapter 12](#)). It is caused by a deficiency in lactase, an enzyme that decreases in activity with increasing age. It is more common in Asians, Native Americans, and African Americans. A trial elimination of offending foods can aid in diagnosis. The use of the Hydrogen Breath Test for diagnoses is popular but lacks sensitivity and specificity.

Diverticular disease

Diverticular disease causes localized abdominal pain and tenderness. The patient will have a fever, elevated ESR, and leukocytosis. Perform a barium enema or proctoscopy or colonoscopy if there is rectal bleeding.

Simple constipation

In adults, constipation is associated with infrequency, or difficulty passing dry, hard stools and abdominal bloating.

Children with constipation frequently report abdominal pain. The pain is usually colicky in nature but can be dull and steady. The pain varies and is not persistent or progressively worsening. Mild, poorly localized periumbilical tenderness, and perhaps guarding are reported. A fecal mass may be palpable.

Habitual constipation

With habitual constipation, the patient presents with a lifelong history of constipation with onset as a young adult, has a normal physical examination, and does not have occult blood in the stool. Diet, activity, and bowel habits are often causal factors. Consider sigmoidoscopy, anorectal manometry, or colonoscopy if you suspect a metabolic or systemic cause, if the stool is heme positive, or if the patient is middle-aged or older or fails to respond to treatment.

Dysmenorrhea

Dysmenorrhea, a typically lower abdominal pain or cramping, occurs with menstruation. Dysmenorrhea can be classified as primary (no organic cause) or secondary (pathological cause). In primary dysmenorrhea, the onset is usually soon after menarche and gradually diminishes with age. The woman will have a normal pelvic examination. Secondary dysmenorrhea is associated with specific conditions and disorders such as endometriosis, PID, cervical stenosis, and uterine fibroids. Obtain a gynecologic (GYN) consult or pelvic ultrasound for secondary dysmenorrhea, dysmenorrhea with increasing severity, or abnormal findings on pelvic examination.

Uterine fibroids

Fibroids produce pain related to the menstrual cycle and intercourse. The patient can experience dysfunctional uterine bleeding. On examination, palpable myomas are often present. Suspect this cause when there is no suspicion of other pelvic disorder. Order a pelvic ultrasound if ovarian or uterine neoplasm cannot be excluded. Obtain a GYN consult for abnormal bleeding or severe symptoms.

Hernia

A hernia is a loop of intestine that has prolapsed through the inguinal wall or canal or through the abdominal musculature. The patient reports intermittent localized pain that can be exacerbated with exertion or lifting. A physical examination will document the hernia, especially when the patient is instructed in maneuvers or

positions to increase intraabdominal pressure. Consider CT or MRI if you suspect strangulation or bowel obstruction.

Ovarian cysts

Ovarian cysts occur most commonly in young women and produce adnexal pain. The cysts may be palpable, late cycle (corpus luteum) cysts. A pelvic ultrasound is indicated. Ovarian cysts can become quite large before producing symptoms.

Abdominal wall disorder

With abdominal wall disorder, the patient can present with a history of trauma. Ecchymosis or swelling may be visible. The patient may report pain with rectus muscle stress. GI and genitourinary symptoms are absent. A hernia may be palpable. Obtain a CT scan if internal disease cannot be excluded.

Chronic conditions that cause upper abdominal pain

Esophagitis and gastroesophageal reflux disease

With GERD (see [Chapter 20](#)), the patient reports a burning, gnawing pain in the mid-epigastrium (heartburn) that worsens with recumbency. Regurgitation of gastric contents (water brash or pyrosis) that occurs with hypersalivation secondary to acid stimulation of the lower esophagus is commonly reported. The pain typically occurs after eating or when lying down and may be relieved with antacids. The physical examination results are negative. Consider endoscopy if symptoms are severe or the patient does not respond to therapy.

Peptic ulcer

The patient reports a burning or gnawing pain that occurs most often with an empty stomach, stress, and alcohol intake. The pain is relieved by food intake. Some patients describe the pain as a soreness, empty feeling, or hunger. Typical pain is steady, mild, or severe and located in the epigastrium. Complaints can be atypical in children and minimal in older adults. There can be epigastric tenderness on palpation. Endoscopy and *H. pylori* testing can aid in diagnosis.

Gastritis

Gastritis pain is a constant burning pain in the epigastric area that can be accompanied by nausea, vomiting, diarrhea, or fever. Alcohol, NSAIDs, and salicylates make the pain worse. The physical examination results are negative. No diagnostic testing is necessary if the patient responds to therapy.

Gastroenteritis

Gastroenteritis can occur at any age and produces a diffuse, crampy pain that is accompanied by nausea, vomiting, diarrhea, and fever. Hyperactive bowel sounds will be heard on auscultation. The condition usually resolves on its own, and no diagnostic testing is needed. If the patient has traveled recently, consider stool testing for ova and parasites and giardia

Abdominal migraine

This condition is most common in female children ages 7 to 10 years old. Patients experience episodic periumbilical pain lasting more than 1 hour that is accompanied by nausea, photophobia, headache, and vomiting. In between episodes, patients are healthy and symptom free. There is frequently a family history of migraines.

Functional dyspepsia

Functional dyspepsia refers to GI symptoms in which a pathological condition is not present or does not entirely explain the clinical presentation, although altered physiological activity can be present. The patient has vague reports of indigestion, heartburn, gaseousness, or fullness. The patient also reports

belching, abdominal distention, and occasionally nausea. The physical examination results are negative. Perform a CBC and fecal testing for occult blood. Test for presence of *H. pylori* infection. Consider endoscopy if there is no response to empiric treatment. Consider an upper and lower GI series if the patient also has dysphagia, weight loss, vomiting, or a change in the pattern of the symptoms (see [Chapter 20](#)).

Recurrent abdominal pain

Recurrent abdominal pain (RAP) usually presents in children 5 to 10 years of age—rarely after 14 years of age. The patient reports dull, colicky, periumbilical pain that is intermittent, occurs daily, and lasts from 1 to 3 hours with complete recovery between episodes. The pain does not awaken the child from sleep but can interfere with the ability to fall asleep. The child can have a low-grade fever, pallor, headache, and constipation. A history of stress associated with school social activities, parental conflicts, or with loss is frequently elicited. Physical examination results are essentially negative. Initial laboratory tests are CBC, ESR, U/A, fecal blood testing, and stool for ova and parasites (O&P).



DIFFERENTIAL DIAGNOSIS OF *Common Causes of Acute Abdominal Pain*

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
Appendicitis	Age 10–20 yr, although it can occur at any age; patient reports sudden onset of colicky pain that progresses to constant pain; pain can begin in epigastrium or periumbilicus and then later localizes in RLQ; pain worsens with movement or coughing; vomiting after onset of pain is sometimes present	Patient lying still; involuntary guarding; tenderness in RLQ; other tests for peritoneal irritation positive; rebound tenderness; variation in presentation common, particularly with infants, children, and older adults	CBC with differential, ultrasonography (preferred), CT, MRI
Ectopic pregnancy	Women of childbearing age; sudden onset of spotting and persistent cramping in lower quadrant that begins shortly after missed period	Signs of hemorrhage, shock, and lower abdominal peritoneal irritation that can be lateralized; enlarged uterus; CMT; tender adnexal mass	Positive hCG, ultrasound; ruptured ectopic pregnancy is surgical emergency
Peptic ulcer perforation	Sudden onset of severe intense, steady epigastric pain that radiates to sides, back, or right shoulder; history of burning, gnawing pain that worsens with empty stomach	Patient lying still; epigastric tenderness; rebound tenderness; abdominal muscles rigid; bowel sounds can be absent	Diagnosis confirmed by upright or lateral decubitus radiograph showing air under diaphragm or in peritoneal cavity; perforation is surgical emergency
Dissection of aortic aneurysm	Most frequent in older adults, especially if hypertensive; sudden onset of excruciating pain that can be felt in chest or abdomen and can radiate to legs and back	Patient appears shocky, vital signs reflect impending shock; deficit or difference in femoral pulses	CT or MRI; additional tests include ECG and cardiac enzymes; surgical emergency
Myocardial infarction	Upper or diffuse abdominal pain; can be accompanied by nausea, vomiting, dyspepsia	Hypertension or hypotension, cardiac arrhythmia, paradoxical S ₂	Serial ECG, serial cardiac enzymes
Peritonitis	Occurs more often in older adults; sudden onset of severe pain that is diffuse and worsens with movement or coughing	Guarding; rebound tenderness; bowel sounds decreased or absent	CBC with differential, abdominal radiographs
Acute pancreatitis	History of cholelithiasis or excessive alcohol use; pain is steady and boring in quality and is unrelieved by change of position; located in LUQ	Patient appears acutely ill; abdominal distention, decreased bowel sounds, diffuse rebound tenderness;	CBC with differential, serum amylase and lipase levels, triglyceride level, calcium level, and liver

CONDITION	HISTORY	PHYSICAL FINDINGS	DIAGNOSTIC STUDIES
	and radiates to back; nausea, vomiting, and diaphoresis	upper abdomen can show muscle rigidity; can have limited diaphragmatic excursion of lungs	chemistries; ultrasonography; CT
Mesenteric adenitis	Fever, pain in RLQ, other symptoms suggestive of appendicitis	Pain on palpation in RLQ; there can be pharyngitis, cervical adenopathy	CBC with differential; adenovirus found in tissue of surgical specimen
Cholecystitis or lithiasis	Appears in adults more than in children, females more than males; colicky pain with progression to constant pain; pain in RUQ that can radiate to right scapular area; pain of cholelithiasis is constant, progressively rising to plateau and falling gradually; nausea, vomiting, history of dark urine or light stools; may be aggravated by certain foods	Tender to palpation or percussion in RUQ; gallbladder palpable in about half cases of cholecystitis; positive Murphy sign	CBC with differential, ultrasonography, radiographs, serum amylase and lipase levels
Ureterolithiasis			

	Sudden onset, excruciating intermittent colicky pain that can progress to constant pain; pain in lower abdomen and flank and radiates to groin; nausea, vomiting, abdominal distention, chills, and fever; increased frequency of urination	CVA tenderness; increased sensitivity in lumbar and groin areas; hematuria	U/A, noncontrast-enhanced helical CT
Urinary tract infection (UTI) or pyelonephritis	Urinary symptoms with UTI, back pain with pyelonephritis; infants present with fever, failure to thrive, irritability; toddlers report pain in abdomen; may not report dysuria or frequency	Altered voiding pattern, malodorous urine, fever	U/A and culture
Pelvic inflammatory disease (PID)	Lower abdominal pain that becomes progressively more severe; can have irregular bleeding, vaginal discharge, and vomiting; most common in sexually active women	Abdominal tenderness, CMT and adnexal tenderness (usually bilateral); with peritonitis can also have guarding and rebound tenderness; fever and vaginal discharge common	WBC count and ESR usually elevated; DNA testing, cultures and Gram staining for STIs
Obstruction	Sudden onset of crampy pain usually in umbilical area of epigastrium; vomiting occurs early with small intestinal obstruction and late with large bowel obstruction; obstipation or diarrhea	Hyperactive, high-pitched bowel sounds; fecal mass can be palpated; abdominal distention; empty rectum on digital examination	Diagnosis confirmed with CT, abdominal radiographs
Ileus	Abdominal distention, vomiting, obstipation, and cramps	Minimal or absent peristalsis on auscultation	Gaseous distention of isolated segments of both small and large intestines shown on radiographs
Intussusception	Sudden-onset pain in infant; occurs with sudden relief, then pain again	Fever, vomiting, currant jelly stools	Abdominal films, ultrasound
Malrotation or volvulus	Seen in infants up to 1 mo old; irritability, pain		Abdominal films

		Bilious emesis, abdominal distention	
Henoch-Schönlein purpura	Seen in children age 2–8 yr	Rash on lower extremities or buttocks; arthralgias; hematuria	CBC, ESR, serum IgA
Incarcerated hernia	More common in older adults; constant severe pain in RLQ or LLQ that worsens with coughing or straining	Hernia or mass that is nonreducible	MRI, CT, ultrasound
Pneumonia	Children age 2–5 yr can present with only abdominal pain and fever	Tachypnea, retractions, pallor, nasal flaring, crackles	CBC, chest radiograph demonstrating infiltrations
Irritable bowel syndrome (IBS)	Begins in adolescence or as young adult; hypogastric pain; crampy, variable infrequent duration; associated with bowel function; associated with gas, bloating, distention; relief with passage of flatus, feces	Normal examination; heme-negative stool	Proctosigmoidoscopy, colonoscopy if onset at middle age or older, stool positive for blood, family history of colorectal cancer or polyps, failure to improve after 6–8 wk of therapy
Crohn disease	Abdominal pain with chronic bloody diarrhea	Abdominal tenderness; weight loss	Colonoscopy or biopsy
Lactose intolerance	Crampy pain after eating milk or milk products	Negative physical examination results	Trial elimination of offending foods Hydrogen Breath Test may be useful
Diverticular disease	Localized pain, usually LLQ; older patient	Abdominal tenderness; fever	CT, contrast enema, cystography, ultrasound, colonoscopy sometimes useful but not used during acute attack
Simple constipation	Colicky or dull and steady pain that does not progress and worsen	Fecal mass palpable, stool in rectum	None
Habitual constipation	Lifelong history; younger patient	Normal examination; heme-negative stool	Sigmoidoscopy, anorectal manometry, colonoscopy if symptoms are alarming
Dysmenorrhea	Typical premenstrual pain onset soon after	Normal pelvic examination	Gynecology consult; pelvic ultrasound if secondary

Uterine fibroids

menarche, gradually
diminishing with age

dysmenorrhea,
increasing disability, or
abnormal pelvic
examination

	Pain related to menses, intercourse	Palpable myomas; no suspicion of other pelvic disorder	Pelvic ultrasound if ovarian or uterine neoplasm cannot be excluded; gynecology consult if abnormal bleeding or severe symptoms
Hernia	Localized pain that increases with exertion or lifting	Physical examination documents hernia	MRI, CT, ultrasound, BE if suspect strangulation or bowel obstruction
Ovarian cyst(s)	Young woman	Adnexal pain and palpable ovarian cysts, especially in late cycle (corpus luteum)	Pelvic ultrasound
Abdominal wall disorder	History of trauma	Visible ecchymosis or swelling; palpable hernia pain with rectus muscle stress; no GI or GU symptoms	CT if internal disease cannot be excluded
Esophagitis or GERD (see Chapter 20)	Burning, gnawing pain in midepigastrium that worsens with recumbency; water brash; pain occurs after eating and can be relieved with antacids; in infant: failure to thrive, irritability, postprandial spitting and vomiting	Physical examination negative; in infants: weight loss, in some cases aspiration pneumonia	Endoscopy if symptoms are severe or do not respond to therapy; manometry, pH monitoring
Peptic ulcer	Burning or gnawing pain; soreness, empty feeling, or hunger; occurs most often with empty stomach, stress, and alcohol, and relieved by food intake; pain steady, mild, or severe and located in epigastrium; can be atypical in children and minimal in older adults	Can be epigastric tenderness on palpation	<i>Helicobacter pylori</i> testing; endoscopy if no response to therapy
Gastritis	Constant burning pain in epigastric area that can be accompanied by nausea, vomiting, diarrhea, or fever; alcohol, NSAIDs, and salicylates make pain worse	Physical examination negative	No diagnostic testing necessary if patient responds to therapy
Gastroenteritis	Occurs at any age and produces diffuse crampy pain accompanied by nausea, vomiting, diarrhea, and fever;	Hyperactive bowel sounds will be heard on auscultation;	No diagnostic testing needed; if recent travel test for O&P, giardia

	can have history of recent travel, family members ill	dehydration if severe	
Functional dyspepsia	Vague reports of indigestion, heartburn, gassiness, or fullness; belching, abdominal distention, and occasionally nausea	Physical examination negative	<i>H. pylori</i> testing; consider endoscopy if no response to empiric treatment; CBC, FOBT, or FIT
Abdominal migraine	Girls age 7–10 yr; episodic periumbilical pain lasting more than 1 hr accompanied by nausea, photophobia, headache, and vomiting; family history of migraines	Physical examination negative	Rule out other causes of episodic pain
Recurrent abdominal pain (RAP)	Children age 5–10 yr; history of environmental or psychological stress	Physical examination negative	CBC, U/A, ESR, FOBT, or FIT, stool for O&P

BE, barium enema; *CBC*, complete blood count; *CMT*, cervical motion tenderness; *CT*, computed tomography; *CVA*, costovertebral angle; *ECG*, electrocardiography; *ESR*, erythrocyte sedimentation rate; *FIT*, fecal immunochemical test; *FOBT*, fecal occult blood test; *GERD*, gastroesophageal reflux disease; *GI*, gastrointestinal; *GU*, genitourinary; *GYN*, gynecological; *hCG*, human chorionic gonadotropin test; *LLQ*, left lower quadrant; *LUQ*, left upper quadrant; *MRI*, magnetic resonance imaging; *NSAID*, nonsteroidal antiinflammatory drug; *O&P*, ova and parasites; *RLQ*, right lower quadrant; *RUQ*, right upper quadrant; *WBC*, white blood cell.