

Abdominal Pain

The Differential Diagnosis, Classic Histories, and Diagnosis



John Ramos, MMS, PA-C, CAQ-EM*

KEYWORDS

- Abdominal emergencies • Abdominal pain • Emergency medicine
- Pelvic emergencies • Diagnostic imaging • Pathognomonic • Classic presentations
- Ureterolithiasis

KEY POINTS

- History and physical examination can distinguish serious causes of abdominal pain.
- Rarely, laboratory tests are diagnostic of conditions causing abdominal pain.
- Contrast-enhanced computed tomography is an ideal imaging modality for most emergent abdominopelvic complaints.
- Ultrasound is the test of choice for diagnosing cholecystitis, gonadal torsion, and ectopic pregnancy.

CASES

At the beginning of your shift in the emergency department (ED), you are taking care of the following patients:

Mohammed A. is a 58-year-old man with a history of diabetes mellitus type II and hypertension who presents with 3 days of left lower quadrant abdominal pain. Two days before arrival, he was seen at an outside clinic and prescribed amoxicillin-clavulanate. His pain has improved, but today he noticed a fever. His last bowel movement was 2 days ago. His temperature is 38.1 C, and the rest of his vitals are normal. On examination there is minimal tenderness to palpation in the left lower quadrant. His white blood cell count, lactate, and electrolytes are all within normal limits.

Gloria B. is a 79-year-old woman with a history of hypertension who presents with sudden-onset right-sided flank pain for 1 day. The pain lasts for a couple minutes, comes in waves, and is associated with intense nausea and emesis. During your interview she is retching violently. Her vitals show temperature 37.1 C, heart rate 104, and blood pressure 110/68 mm Hg. Her urinalysis shows 20 white blood cells and no red blood cells, nitrite, or bacteria.

Department of Emergency Medicine, Duke University Hospital, 2301 Erwin Road Suite 2600, Durham, NC 27710, USA

* Corresponding author.

E-mail address: john.ramos@duke.edu

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Lisa Z. is a 42-year-old woman with a history of gastroesophageal reflux disease and cholelithiasis who presents with right upper quadrant pain. The pain started 3 days ago and was dull and aching. She tried taking over-the-counter antacids, which did not provide any relief. The pain worsened in the last 12 hours and is now described as intense pressure. Her vitals are normal, and her examination is remarkable for a positive Murphy sign.

Reggie J. is a 21-year-old woman with no past medical history who presents with severe abdominal bloating, pain, and vomiting for 1 day. She reports frequent loose, and often bloody, stools that started 3 weeks prior to arrival. In the last week she has also had at least one episode per night of rectal discharge that has blood and mucus. On examination she is febrile and tachycardic, with diffuse abdominal tenderness. Her rectal examination shows no bright red blood or melanic stool. Her white blood cell count and lactate are elevated.

INTRODUCTION

Beware, the abdomen is full of mischief. The abdominopelvic compartment is anatomically complex, the differential includes both serious and self-limited conditions, and signs and symptoms often overlap. Among adult patients presenting to EDs with abdominal pain, about 17% have a serious diagnosis or require hospitalization.¹ Establishing a safe disposition is often resource intensive requiring diagnostic testing, pharmacotherapeutics and reassessments, specialist consultation, and patient expectation management. Many patients can be safely discharged with modern access to timely laboratory testing and diagnostic imaging, even though a specific diagnosis is not achieved in as many as one-third of patients.² This article reviews the differential diagnoses for adult patients with atraumatic abdominal pain, distinguishing features of the history and physical examination, and diagnostic tests used to identify or exclude serious illness.

ASSESSMENT

The history and physical examination alone inform an intentional approach to diagnostic testing and can lead to a correct diagnosis.³ Providers should also take into account special considerations (**Table 1**) that increase a patient's risk of illness or contribute to relatively atypical presentations.^{4–17} Timing, character, and location are important aspects of the history. The physical examination includes an assessment of vital signs, inspection, auscultation, palpation, and special maneuvers when indicated.

Defined by time of symptom onset, abdominal pain can be acute (within several days), subacute (less than 6 months), or chronic (≥ 6 months). Acute abdominal pain that is sudden in onset, or achieves maximal intensity within 1 to 2 hours, is one characteristic of surgical emergencies.¹⁴ Acute abdominal pain that develops over several hours suggests a medical condition, such as dyspepsia, infectious enterocolitis, and infections of the urinary or reproductive organs. Episodic symptoms can be seen with dyspepsia or biliary colic but may present with an acute exacerbation. Symptom onset is one piece of the history (**Table 2**) and providers should consider presentation variability to avoid representative bias and premature closure. For example, appendicitis frequently presents after 24 hours, gonadal torsion may occur in seconds, and volvulus may be episodic due to spontaneous detorsion.

The location of pain or objective tenderness further narrows the differential (**Table 3**).¹⁸

The character of abdominal pain is categorized into visceral, parietal, and referred pain.

Table 1 Special considerations	
Risk factors for thromboembolic disease	Atrial fibrillation Exogenous estrogen or testosterone Past medical history of DVT (mesenteric venous thrombosis) Smoking tobacco (abdominal aortic aneurysm rupture)
Risk factors for spontaneous hemorrhage	Alcohol Steroidal and nonsteroidal antiinflammatory drugs Therapeutic anticoagulation
Risk factors for infection	Diabetes Chronic kidney disease Autoimmune conditions (eg, rheumatoid arthritis, systemic lupus erythematosus, multiple sclerosis) Chemotherapy (eg, immune checkpoint inhibitors) Chronic steroid use Immunomodulating drugs (eg, select monoclonal antibodies)
Critically ill (obtunded, intubated, hemodynamically unstable)	History and physical examination often unreliable
Elderly	Fever and peritoneal signs may be absent. More frequently hospitalized or observed
Pregnancy	A gravid uterus may displace abdominal structures, eg, migration of the appendix to the right hypochondrium or right flank. Appendicitis and cholecystitis are the most common nonobstetric surgical emergencies. Round ligament pain complicates about 30% of pregnancies, typically during the end of the first trimester and second trimester. Endomyometritis may develop up to 6 wk after delivery, and risk factors include cesarean delivery, and prolonged labor or rupture of amniotic membranes.
Previous abdominopelvic surgery	Surgically altered anatomy may obscure classic localization patterns. Adhesions are the most common cause of small bowel obstruction. Adhesions, hernias, and anastomotic breakdown are not uncommon after bariatric surgery. Dropped gallstones are relatively uncommon but more likely during laparoscopic cholecystectomies. Stump appendicitis is relatively uncommon (~1:50,000) but more likely following nonoperative management of appendiceal rupture.

Abbreviation: DVT, deep vein thrombosis.

Data from Harvard T.R., Green D., Bergan J.J., et al.: Mesenteric venous thrombosis. *J Vasc Surg* 1989; 9: pp. 328-333; and Altobelli E, Rapacchietta L, Profeta VF, Fagnano R. Risk Factors for Abdominal Aortic Aneurysm in Population-Based Studies: A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2018;15(12):2805; and Aloysius MM, Perisetti A, Goyal H, et al. Direct-acting oral anticoagulants versus warfarin in relation to risk of gastrointestinal bleeding: a systematic review and meta-analysis of randomized controlled trials. *Ann Gastroenterol*. 2021;34(5):651-659; Barkun AN, Almadi M, Kuipers EJ, et al. Management of Nonvariceal Upper Gastrointestinal Bleeding: Guideline Recommendations From the International Consensus Group. *Ann Intern Med*. 2019;171(11):805-822; Wolfe C, McCain N. Abdominal Pain in the Immunocompromised Patient. *Emerg Med Clin North Am*. 2021;39(4):807-820; Leuthauser A, McVane B. Abdominal Pain in the Geriatric Patient. *Emerg Med Clin North Am*. 2016;34(2):363-375; Ishaq A, Khan MJH, Pishori T, Soomro R, Khan S. Location of appendix in pregnancy: does it change?. *Clin Exp Gastroenterol*. 2018;11:281-287; Zachariah SK, Fenn M, Jacob K, Arthungal SA, Zachariah SA. Management of acute abdomen in pregnancy: current perspectives. *Int J Womens Health*. 2019;11:119-134; Beigi RH. Infections of the Female Pelvis. In: Bennett JE, Dolin R, Blaser MJ. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases, 2nd edition. Elsevier; 2020. p. 1477-1485; and Jackson P, Cruz MV. Intestinal obstruction: evaluation and management. *Am Fam Physician*. 2018;98(6):362-367; and Smith, Kurt. Abdominal pain. In: Walls RM, Hockberger RS, Gausche-Hill M. Rosen's Emergency Medicine: Concepts and Clinical Practice, 9th edition. Philadelphia: Elsevier; 2018. P.213-223; and Perrotti G, O'Moore P, Kirton O. Hey, you forgot something! The Management of Symptomatic Retained Gallstones. *Surgery in Practice and Science*. 2022;8; and Hadrich Z, Mroua B, Zribi S, Bouassida M, Touinssi H. Stump appendicitis, a rare but serious complication of appendectomy: A case report. *Clin Case Rep*. 2021 Sep 22;9(9):e04871; and Di Saverio S, Podda M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World J Emerg Surg*. 2020;15(1):27.

Visceral pain is a result of activated unmyelinated C type nerve fibers that innervate organ walls and capsules. Noxious stimuli include distention of hollow organs (eg, fluid or gas) or capsular stretching (eg, edema, blood, abscesses). Visceral pain is often dull, aching, or crampy and may be steady or intermittent/colicky. Intraperitoneal organs are bilaterally innervated, and the distribution of visceral afferents correlates to embryonic somatic segments. Thus, pain localizes to a specific spinal cord level or dermatome

Table 2	
Timing of symptoms in emergent conditions	
Time to Maximal Intensity of Symptoms	Conditions
Seconds to minutes	Esophageal rupture (Boerhave syndrome) Esophageal variceal bleeding Abdominal aortic aneurysm rupture Ectopic pregnancy rupture Mesenteric arterial embolism Myocardial infarction
1-2 h	Cholecystitis Pancreatitis Appendicitis Small bowel obstruction Ureteral colic Volvulus Strangulated hernia Ovarian or testicular torsion
Days	Diverticulitis Mesenteric arterial thrombosis

Table 3 Differential diagnosis based on location of abdominal pain	
Location	Differential Diagnosis
RUQ	<i>Biliary:</i> cholecystitis, cholelithiasis, cholangitis <i>Hepatic:</i> hepatitis, hepatic abscess <i>Others:</i> pneumonia, pulmonary embolism, pancreatitis, peptic ulcer disease, retrocecal appendicitis
LUQ	<i>Splenic:</i> splenic infarct, splenic laceration <i>Cardiac:</i> myocardial infarction, pericarditis <i>Others:</i> pneumonia, pulmonary embolism, pancreatitis, peptic ulcer disease, diaphragmatic hernia
Epigastric	<i>Gastric:</i> peptic ulcer disease, gastritis <i>Pancreatic:</i> pancreatitis <i>Biliary:</i> cholecystitis, cholelithiasis, cholangitis
RLQ	<i>Colonic:</i> appendicitis, cecal diverticulitis, cecal volvulus <i>Genitourinary:</i> nephrolithiasis, ovarian torsion, PID, ectopic pregnancy, testicular torsion, inguinal hernia <i>Others:</i> mesenteric adenitis
LLQ	<i>Colonic:</i> sigmoid diverticulitis <i>Genitourinary:</i> nephrolithiasis, ovarian torsion, PID, ectopic pregnancy, testicular torsion, inguinal hernia <i>Others:</i> abdominal aortic aneurysm

Abbreviations: LLQ, left lower quadrant; LUQ, left upper quadrant; PID, pelvic inflammatory disease; RLQ, right lower quadrant; RUQ, right upper quadrant.

From: Natesan S, Lee J, Volkamer H, Thoureen T. Evidence-Based Medicine Approach to Abdominal Pain. *Emerg Med Clin North Am.* 2016;34(2):165-190; with permission.

and is experienced in the midline. For example, the sensation of a distended appendix is reported as midline epigastric or periumbilical pain (the T8 to T10 dermatomes).¹⁹

In contrast, somatic or parietal pain is caused by irritation of myelinated nerve fibers that innervate the parietal peritoneum. Thus, pain is better localized to the area of disease. For example, the wall of an obstructed appendix becomes inflamed and localizes at the right lower quadrant. Visceral pain initially manifests as tenderness and guarding and progresses to rigidity and rebound tenderness.

Referred pain may be visceral or somatic and occurs at a distance from the diseased organ, owing to shared segmental innervation of anatomically contiguous organs during embryonic development (**Fig. 1**). For example, pain at the right inferior scapula may be referred from the gallbladder and inguinal or testicular pain may be referred from an inflamed or distended ureter. Extraintestinal disease may be perceived as abdominal pain owing to shared efferent projections from the abdominal wall, for example, upper abdominal pain associated with parietal pleural irritation in pulmonary embolism or lower lobe pneumonia, or epigastric pain associated with myocardial infarction.^{20,21}

FROM

Physical Examination

Vitals are the first objective assessment. A fever is defined as a temperature greater than or equal to 38°C, and a temperature greater than 38.3°C is associated with sepsis. A temperature less than 36°C may be present in severe infections.²² Among the elderly, a fever may be defined as a single oral temperature greater than 37.8°C, repeated oral temperatures greater than 37.2°C, or repeated rectal temperatures greater than 37.5°C. Tachycardia and hypotension may be seen in severe infections,

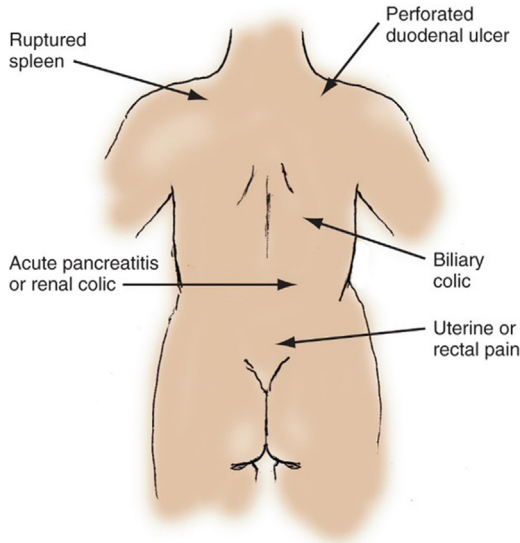


Fig. 1. Locations of referred pain. (From Smith, Kurt. Abdominal pain. In: Walls RM, Hockberger RS, Gausche-Hill M. Rosen's Emergency Medicine: Concepts and Clinical Practice, 9th edition. Philadelphia: Elsevier; 2018. p. 213-223; with permission.)

hemorrhage, and dehydration. Tachycardia may be blunted in patients treated with β -blockers, opiates, or benzodiazepines. However, analgesia does not obscure examination findings or diagnostic accuracy.²³ An elevated respiratory rate may be in response to pain or compensation for metabolic acidosis.

The abdomen should be inspected for signs of trauma, distention, and surgical wounds or scars. Unilateral skin lesions in a dermatomal distribution are diagnostic for varicella zoster. Bowel sounds are transmitted throughout the abdomen and are best auscultated with the diaphragm of a stethoscope in one location. Bowel sounds may be increased in diarrheal illnesses or early intestinal obstruction. High-pitched tinkling corresponds to luminal air tension in early obstruction. Decreased sounds occur when bowel is hypotonic (eg, ileus, advanced bowel obstruction) or perforates.

Palpation is used to localize and quantify depth and severity of pain. Voluntary guarding is seen when a patient contracts their abdominal wall muscles to avoid intra-abdominal palpation. Voluntary guarding can be attenuated with analgesia, relaxation techniques, and patient positioning (raising the knees and head, patient's arms placed at sides or crossed over the chest). Involuntary guarding is a reflexive spasm of the abdominal wall occurring with peritoneal inflammation. Rebound tenderness is a more severe tenderness after the abrupt removal of the examiner's hand during palpation, resulting from movement of inflamed peritoneum. Special maneuvers are sometimes indicated for specific conditions ([Table 4](#)). Considering the generally low sensitivity of obturator, psoas, and Rovsing signs, their absence does not rule out appendicitis.

Genitourinary Examination

A pelvic examination is indicated for women with lower abdominal pain or genitourinary symptoms or when there is no reasonable alternative diagnosis.²⁴ Some research has shown poor reliability between individual examiners and poor correlation of examination and laparotomy findings.^{25,26} However, abnormalities encountered during the

Sign	Diseases	Description
McBurney	Acute appendicitis	Pain elicited when palpating McBurney's point (1.5–2 inches from the anterior superior iliac spine on an imaginary line drawn to the umbilicus).
Rovsing	Acute appendicitis	Deep palpation of the left lower quadrant provokes pain at McBurney's point.
Psoas	Acute appendicitis, pyelonephritis, psoas abscess	Although the patient lies on the opposite side, extension of the thigh on the affected side elicits pain. Patient may also flex their hip on the affected side to relieve pain.
Obturator	Acute appendicitis	Standing on the right side of the patient, the patient's right thigh is slightly flexed and internally rotated at the hip. Thigh flexion relaxes the psoas muscle. A positive test elicits hypogastric pain.
Murphy	Acute cholecystitis	Inspiratory arrest or inability to fully inspire with deep palpation of the right costal margin.

pelvic examination may prompt additional diagnostic testing or empirical treatment of conditions such as cervicitis (cervical friability or discharge) or pelvic inflammatory disease (cervical motion, uterine, or adnexal tenderness).

Male genitourinary examination is essential for evaluating testicular torsion, epididymitis/orchitis, inguinal hernia, and soft tissue infections. Among prepubertal men, abdominal pain is more frequently observed as an isolated symptom of testicular torsion.²⁷

Rectal Examination

The rectal examination can yield useful information in select cases, but routine use in undifferentiated abdominal pain does not increase diagnostic accuracy (eg, appendicitis). Digital rectal examination is relatively contraindicated in the neutropenic or critically ill patient, out of concern for bacterial seeding. An empty rectal vault in the setting of constipation is concerning for large bowel obstruction or malignancy. Anoscopy is useful for visualizing hemorrhoids, mucosal lesions, and fistulous tract openings. A tender or boggy prostate on digital palpation indicates prostatitis.²⁸ Fecal inspection for bright red blood or melena should be performed in the appropriate clinical context; however, fecal occult blood testing is primarily used for outpatient colorectal cancer screening and rarely changes ED management.²⁹

ADDITIONAL TESTS

Laboratory tests are useful in select clinical indications (Table 5) but otherwise rarely establish a diagnosis. The white blood cell count is elevated in about 50% of patients with severe intraabdominal pathology, but a normal white blood cell count does not exclude serious pathology.³⁰ Hemoglobin and hematocrit are mostly useful for

Tests	Clinical Indication
hCG, urinary or serum quantitative	Pregnancy
Lipase	Pancreatitis
Liver function tests	Biliary obstruction, hepatitis
Urinalysis	Urethritis, cervicitis, pelvic inflammatory disease
Pathogen-specific testing	
Lactate, blood gas analysis	Systemic inflammatory response syndrome, sepsis
Glucose, anion gap, ketones, osmoles	Hyperglycemia, diabetic ketoacidosis
Fecal calprotectin, leukocytes	Inflammatory bowel disease

decisions regarding transfusion and endoscopic interventions in the context of gastrointestinal bleeding. Further, anemia may not be present in early cases of gastrointestinal bleeding when clinical presentation may be more informative,¹⁴ for example,; tachycardia, hypotension, new or worsened hypoxia, altered mental status, frank hematemesis, and bright red blood per rectum. Serum electrolytes are rarely abnormal, even in the context of severe emesis or diarrhea.³¹

Diarrheal illnesses are often self-limited, and enteropathogenic stool testing is reserved for patients in whom antimicrobial treatments may confer clinical benefit. Targeted stool tests are considered for patients with fever, bloody stools, greater than 6 unformed stools in 24 hours, traveler's diarrhea for 2 weeks or more, endemic exposure, and immunosuppression.³² *Clostridium difficile* infection should be suspected in patients with unexplained and new-onset more than or equal to 3 unformed stools in 24 hours and a history of prolonged hospitalization or antibiotic treatment in the preceding 3 months.³³ Other risk factors for *C difficile* infection include age greater than 65 years, nursing home residence, proton pump inhibitor therapy, and immunosuppression.

IMAGING

Contrast-enhanced computed tomographic (CT) imaging is often used for the diagnosis of infectious, inflammatory, and ischemic conditions. Contrast-induced nephropathy remains controversial, and there is no consensus recommendation for the safe use of intravenous contrast in patients with glomerular filtration rate (GFR) 15 to 30 who are not dialysis dependent. For patients with GFR 30 to 45, one should consider prophylactic volume expansion with isotonic fluids.³⁴

Ultrasound (US) is considered the first-line imaging modality for biliary obstruction and infection (eg, symptomatic cholelithiasis, cholecystitis, choledocholithiasis). US is the test of choice for testicular and ovarian torsion and ectopic pregnancy.

Emergent endoscopy is diagnostic and therapeutic in the management of acute upper gastrointestinal bleeding and should typically be performed within 24 hours of presentation.⁷ Urgent upper endoscopy is useful for patients with dyspepsia refractory to medical treatment or with worrisome features such as dysphagia, weight loss, or age greater than 50 years. Lower endoscopy is useful in the diagnosis of colorectal cancer and inflammatory bowel disease, and the evaluation of gastrointestinal bleeding and nonspecific CT findings of colitis. Colonoscopy is recommended for patients after clinical resolution of complicated diverticulitis if they have not had a recent colonoscopy.³⁵ Diverticulitis is considered complicated when there is an associated abscess, phlegmon, fistula, obstruction, bleeding, or perforation.

Table 6
Classic presentations of abdominal emergencies

Differential Diagnosis	Classic History	Key Physical Exam Findings	Diagnosis
AAA, ruptured or leaking	Abdominal or back pain, limb ischemia	Pulsatile abdominal mass	CT, US
Appendicitis	Periumbilical or epigastric pain, may localize to RLQ, anorexia, nausea, obstipation	Fever (late finding), RLQ tenderness (LR+ = 8.0), Psoas sign (LR+ = 2.38)	US, CT
Bowel obstruction	Diffuse, colicky (early) or steady and localized (late) pain, nausea, anorexia, no passage of flatus and/or stool Etiology: Small bowel; adhesions, hernia, malignancy. Large bowel; malignancy, medications	Distention (LR+ = 5.6–16.8) Bowel sounds increased, high-pitched tinkling, or, decreased (late finding)	CT
Cholangitis	RUQ pain	Charcot's triad (50-70% of patients): Abdominal tenderness, fever, jaundice Reynold's pentad ($\leq 30\%$ of patients): Charcot's triad, hypotension, AMS	Bilirubin ≥ 2 mg/dL LFTs > 1.5 x ULN Elevated WBC, CRP, ESR US, CT, MRCP, ERCP
Cholecystitis	RUQ pain, associated with fatty meals Risk factors: female-to-male ratio 3:1, multiparity, obesity, alcohol intake, oral contraceptives	Murphy sign (Sensitivities range 58-97%) RUQ tenderness (LR 1.6)	US, CT, HIDA LFTs abnormal in $\sim 30\%$ of patients
Diverticulitis	LLQ or suprapubic pain (partial relief with passing flatus or stool), constipation or loose stools	Localizing tenderness in LLQ, fever (late finding)	CT
Enterocolitis	Fevers, vomiting, diarrhea IBD: blood or mucous in stool, night time awakenings, extraintestinal manifestations (arthritis, uveitis, dermatitis)	Poorly localizing tenderness Toxic megacolon: peritoneal abdomen	Toxic megacolon/IBD: CRP, ESR, stool studies, CT, endoscopy

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Table 6
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Differential Diagnosis	Classic History	Key Physical Exam Findings	Diagnosis
Ectopic pregnancy, ruptured	Lower abdominal pain, vaginal bleeding, amenorrhea Risk factors: nonwhite race, older age, history of STI or PID, infertility treatment, intrauterine contraceptive device placed within the past year, tubal sterilization, and previous ectopic pregnancy.	CMT, localized adnexal tenderness, hypotension (positional), tachycardia, bradycardia, AMS	Doppler US, laparoscopy
GI Bleed	UGIB: Coffee-ground or bloody emesis LGIB: Poorly localized discomfort, bright red blood per rectum. Risk factors: Peptic ulcer disease, gastritis, liver disease, therapeutic anticoagulation, alcoholism	Tachycardia and hypotension with severe blood loss.	Endoscopy
Hepatitis, acute	Dull or intense RUQ pain, worse with deep inspiration, anorexia, nausea	Jaundice, enlarged and tender liver	LFTs, virus specific Ag/Ab
Mesenteric ischemia	Sudden (AMAE) or insidious onset (AMAT, NOMI), postprandial pain (AMAT, NOMI) Risk factors: atherosclerosis (AMAT), low perfusion states such as sepsis or heart failure (NOMI) 50% are AMAE, 20-30% are NOMI	Objectively benign abdominal exam (out of proportion to subjective description), distention, peritoneal abdomen	CT or MR with angiography Endoscopy
Pancreatitis	Epigastric abdominal pain radiating to back, vomiting Most common etiologies: cholelithiasis, alcohol, hypertriglyceridemia	Low grade fever, hypotension, Flank or periumbilical ecchymosis in hemorrhagic or necrotizing pancreatitis.	2 of the following: Symptoms, lipase or amylase > 3 x UNL, radiographic evidence (US, CT, MR)
Pelvic inflammatory disease	Lower abdominal or pelvic pain, vaginal discharge or bleeding Etiology: Neisseria gonorrhoea or Chlamydomphila trachomatis (50% of cases)	CMT, uterine or adnexal tenderness, fever	Vaginal wet prep, pathogen specific tests, ESR, CRP CT (tubo-ovarian abscess), laparoscopy
Perforated viscus	Sudden onset generalized abdominal pain	Rebound, guarding, rigidity	CT

Proctocolitis	Anorectal pain or discharge, tenesmus, diarrhea. Risk factors: receptive anal intercourse, HIV	Rectal tenderness, ulcers, friable mucosae	Exudate smear, gram stain, pathogen specific testing Endoscopy
Peptic ulcer disease	Burning or gnawing upper abdominal pain, postprandial pain or relief Etiology: Helicobacter pylori, aspirin, NSAIDS	Epigastric tenderness	Endoscopy
Ovarian torsion	Colicky to constant unilateral abdominal pain	Adnexal tenderness or mass	Doppler US
Ureterolithiasis	Unilateral colicky flank or back pain, may radiate to groin or testicle	CVA tenderness	CT, US

Abbreviations: AAA, abdominal aortic aneurysm; AMAE, acute mesenteric arterial embolism; AMAT, acute mesenteric arterial thrombus; AMS, altered mental status; CMT, cervical motion tenderness; CRP, C-reactive protein; CT, computed tomography; ERCP, Endoscopic retrograde cholangiopancreatography; HIDA, hepatobiliary iminodiacetic acid scan; HIV, human immunodeficiency virus; IBD, inflammatory bowel disease; LFTs, liver function tests; LLQ, left lower quadrant; LR, likelihood ratio; MR, magnetic resonance; MRCP, magnetic resonance cholangiopancreatography; NOMI, non-occlusive mesenteric ischemia; NSAIDS, non-steroidal anti-inflammatory drugs; OMI; occlusive mesenteric ischemia; RLQ, right lower quadrant; RUQ, right upper quadrant; UC, ulcerative colitis; ULN, upper limit of normal; US, ultrasound; Sx, symptoms.

Data from Fink HA, Lederle FA, Roth CS, et al. The accuracy of physical examination to detect abdominal aortic aneurysm. *Arch Intern Med.* 2000;160(6):833-836; and 17. Di Saverio S, Podda M, De Simone B, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. *World J Emerg Surg.* 2020;15(1):27; and Natesan S, Lee J, Volkamer H, Thouren T. Evidence-Based Medicine Approach to Abdominal Pain. *Emerg Med Clin North Am.* 2016;34(2):165-190; and Jackson P, Cruz MV. Intestinal obstruction: evaluation and management. *Am Fam Physician.* 2018;98(6):362–367; Miura F, Okamoto K, Takada T, et al. Tokyo Guidelines 2018: initial management of acute biliary infection and flowchart for acute cholangitis. *J Hepatobiliary Pancreat Sci.* 2018;25(1):31-40; and Buxbaum JL, Buitrago C, Lee A, et al. ASGE guideline on the management of cholangitis. *Gastrointest Endosc.* 2021;94(2):207-221; and Smith, Kurt. Abdominal pain. In: Walls RM, Hockberger RS, Gausche-Hill M. *Rosen's Emergency Medicine: Concepts and Clinical Practice*, 9th edition. Philadelphia: Elsevier. P 213-223; and Sekimoto R., Iwata K.: Sensitivity of murphy's sign on the diagnosis of acute cholecystitis: is it really so insensitive. *J Hepatobiliary Pancreat Sci* 2019; 26: p.E10; and Padda M, Singh S, Tang S, et al. Liver test patterns with acute calculous cholecystitis and/or choledocholithiasis. *Aliment Pharmacol Ther.* 2009;29:1011-1018; and Pisano M, Allievi N, Gurusamy K, et al. 2020 World Society of Emergency Surgery updated guidelines for the diagnosis and treatment of acute calculus cholecystitis. *World J Emerg Surg.* 2020;15(1):61; and Sartelli M, Weber DG, Kluger Y, et al. 2020 update of the WSES guidelines for the management of acute colonic diverticulitis in the emergency setting. *World J Emerg Surg.* 2020;15(1):32; and Barkun AN, Almadi M, Kuipers EJ, et al. Management of Nonvariceal Upper Gastrointestinal Bleeding: Guideline Recommendations From the International Consensus Group. *Ann Intern Med.* 2019;171(11):805-822; and De Simone B, Davies J, Chouillard E, et al. WSES-AAST guidelines: management of inflammatory bowel disease in the emergency setting. *World J Emerg Surg.* 2021;16(1):23; and Bala M, Kashuk J, Moore EE, et al. Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery. *World J Emerg Surg.* 2017;12:38; and Crockett SD, Wani S, Gardner TB, Falck-Ytter Y, Barkun AN; American Gastroenterological Association Institute Clinical Guidelines Committee. American Gastroenterological Association Institute Guideline on Initial Management of Acute Pancreatitis. *Gastroenterology.* 2018;154(4):1096-1101; and Chappell CA, Wiesenfeld HC. Pathogenesis, diagnosis, and management of severe pelvic inflammatory disease and tuboovarian abscess. *Clin Obstet Gynecol.* 2012;55(4):893-903; and Moore CL, Carpenter CR, Heilbrun ME, et al. Imaging in Suspected Renal Colic: Systematic Review of the Literature and Multispecialty Consensus. *J Am Coll Radiol.* 2019;16(9):1132-1143; and Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. *N Engl J Med.* 2014;371(12):1100-10.

CONSIDERATIONS

Appendicitis

Although CT is typically the test of choice, in the hands of an experienced sonographer US can diagnose acute uncomplicated appendicitis in patients with lean body habitus. US and MRI are also considered first-line imaging options in pregnancy. Although a weak recommendation, CT may be avoided before laparotomy for adult patients younger than 40 years with strong signs and symptoms suggesting acute uncomplicated appendicitis, in conjunction with high-risk clinical scores (Appendicitis Inflammatory Response Score 9–12, Alvarado Score 9–10, and Adult Appendicitis Score ≥ 16).¹⁷

Diverticulitis

CT is the modality of choice for diagnosing acute diverticulitis. Clinical parameters (eg, previous history of diverticulitis or fever) and C-reactive protein (CRP) can exclude complicated (eg, abscess, perforation) or severe uncomplicated left-sided colonic diverticulitis.³⁶ Although a clinical diagnosis may reduce the need for CT imaging or ED visits, the extrapolation of this approach to the ED setting should be done cautiously.

Ureterolithiasis

Ureteral colic is largely a self-limited condition, and urologic intervention is reserved for those with concomitant urinary tract infection, failure of medical expulsive therapy, or kidney injury disproportionate to anuria, dehydration, or obstruction. Stones greater than 5 to 10 mm are more likely to require urologic intervention. The gold standard for diagnosis is CT without contrast, offering more precise estimation of stone size, ureteral obstruction, and infection. Low-radiation-dose protocols can detect small stones (<2 mm) in non-obese patients. Contrast-enhanced CT can accurately detect clinically significant stones (ie, stones ≥ 3 mm) and augment operative planning for patients requiring surgical intervention.³⁷ Further, contrast-enhanced CT is useful in the diagnosis of alternative conditions with similar presentations. US detects signs of ureteral obstruction, rather than estimating stone size or location, and is unlikely to miss pathology requiring emergent intervention.³⁸ US, MRI, and intravenous pyelography (less frequently used) are alternative imaging modalities.

Case Resolution

Mohammed A.: a CT abdomen and pelvis with intravenous (IV) contrast shows sigmoid diverticulitis with a 3 cm \times 2 cm fluid collection concerning for a contained perforation. He is admitted for intravenous antibiotics and analgesics, and interventional radiology is consulted for placement of a percutaneous drain.

Gloria B.: a CT abdomen and pelvis with IV contrast shows left-sided perinephric stranding and a 1.5 mm obstructing ureteral stone. Her serum creatinine is elevated, and analgesics and antiemetics do not effectively control her symptoms. Urology is consulted for percutaneous nephrostomy.

Lisa Z. has an US that shows multiple gall stones, pericholecystic fluid, and dilation of the common bile duct (1.2 cm). She is admitted for intravenous antibiotics and analgesics, and gastroenterology is consulted for endoscopic retrograde cholangiopancreatography.

Reggie J. has a CT abdomen pelvis with IV contrast that shows diffuse colonic dilation, concerning for toxic megacolon. Her CRP, fecal leukocytes, and fecal calprotectin are elevated. She is admitted for nasogastric decompression and IV antibiotics, fluids, analgesics, and antiemetics. Twelve hours later, she develops abdominal

rigidity, worsening fevers, and hypotension. She is consented for a laparoscopic proctocolectomy.

SUMMARY

Abdominal pain is the most common chief complaint encountered in the ED. Recognizing classic presentations (see [Table 6](#)) is essential for clinical reasoning, as well as selecting appropriate diagnostic tests^{7,13,14,17,18,24,36–48}.

CLINICS CARE POINTS

- History and physical examination can often distinguish serious causes of abdominal pain.
- Extremes of age and immunosuppression may blunt physiologic manifestations of serious illness.
- Sudden onset of pain is associated with surgical emergencies.
- Laboratory tests are sometimes diagnostic and more often identify sequela of acute and chronic diseases.
- Contrast-enhanced CT is an ideal imaging modality for most emergentabdominopelvic complaints.
- US is the test of choice for diagnosing cholecystitis, gonadal torsion, and ectopic pregnancy.

DISCLOSURE

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