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positron emission tomography offers advantages of improved diagnostic performance and fewer nondiagnostic studies than single-photon emission CT. **EXERCISE ELECTROCARDIOGRAPHY** Exercise electrocardiography has historically been commonly employed for completion of risk stratification of patients who have undergone an initial evaluation that has not revealed a specific cause of chest discomfort and has identified a low risk of ACS. Early exercise testing is safe in patients without ongoing chest pain or high-risk findings and may assist in refining their prognostic assessment. However, for patients with chest pain for whom both cardiac troponin and clinical risk stratification have determined the patient to have low probability of ACS, there is insufficient evidence that stress testing or cardiac imaging improves their outcomes. This evolution in evidence supports a change from past practice in which stress testing within 72 hours was broadly used for patients with acute chest pain. Exercise ECG is an alternative for patients without known coronary artery disease who remain eligible for additional testing based on intermediate risk of ACS but should be performed with cardiac imaging in patients with known coronary atherosclerosis. **OTHER NONINVASIVE STUDIES** Other noninvasive imaging studies of the chest can be used selectively to provide additional diagnostic and prognostic information in patients with chest discomfort. **Echocardiography** Echocardiography (nonstress) is not routinely necessary in patients with chest discomfort. However, in patients with an uncertain diagnosis, particularly those with nondiagnostic ST elevation, ongoing symptoms, or hemodynamic instability, detection of abnormal regional wall motion provides evidence of possible ischemic dysfunction. Echocardiography is diagnostic in patients with mechanical complications of MI or in patients with pericardial tamponade. Transthoracic echocardiography is poorly sensitive for aortic dissection, although an intimal flap may sometimes be detected in the ascending aorta. **MRI** (See Chap. 248) Cardiac magnetic resonance (CMR) imaging is a versatile technique for structural and functional evaluation of the heart and the vasculature of the chest. CMR can be performed as a modality for pharmacologic stress perfusion imaging and is an alternative for completing risk assessment in patients with intermediate risk of ACS. Gadolinium-enhanced CMR can provide early detection of MI, defining areas of myocardial necrosis accurately, and can delineate patterns of myocardial disease that are often useful in discriminating ischemic from nonischemic myocardial injury. Although not practical in some institutions for the urgent evaluation of acute chest discomfort, CMR can be a useful modality for cardiac structural evaluation of patients with elevated cardiac troponin levels in the absence of definite coronary artery disease. CMR coronary angiography is in its early stages. MRI also permits highly accurate assessment for aortic dissection but is infrequently used as the first test because CT and transesophageal echocardiography are usually more practical. ■

■ **OUTPATIENT EVALUATION OF**

CHEST DISCOMFORT Chest pain is common in outpatient practice, with a lifetime prevalence of 20–40% in the general population. More than 25% of patients with MI have had a related visit with a primary care physician in the previous month. The diagnostic principles are the same as in the ED. However, the pretest probability of acute cardiopulmonary cause is significantly lower. Therefore, testing paradigms are less intense, with an emphasis on the history, physical examination, and ECG. Moreover, decision-aids developed for settings with a high prevalence of significant cardiopulmonary disease have lower positive predictive value when applied in the practitioner's office. However, in general, if the

level of clinical suspicion of ACS is sufficiently high to consider troponin testing, the patient should be referred to the ED for evaluation.

■ ■ **FURTHER READING** Anand A et al: High-sensitivity cardiac troponin on presentation to rule out myocardial infarction: A stepped-wedge cluster randomized controlled trial. *Circulation* 153:2215, 2021. Fanaroff AC et al: Does this patient with chest pain have acute coronary syndrome? *JAMA* 315:1955, 2015. Gulati M et al: 2021 AHA/ACC/AASE/CHEST/SAEM/SCCT/SCMR guideline for the evaluation and diagnosis of chest pain: A report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation* 154:e368, 2021. Hsia RY et al: A national study of the prevalence of life-threatening Abdominal Pain CHAPTER 16 diagnoses in patients with chest pain. *JAMA Intern Med* 176:1029, 2016. Kontos MC et al: 2022 ACC expert consensus decision pathway on the evaluation and disposition of acute chest pain in the emergency department. *J Am Coll Cardiol* 80:1925, 2022. Mahler SA et al: Safely identifying emergency department patients with acute chest pain for early discharge: HEART pathway accelerated diagnostic protocol. *Circulation* 138:2456, 2018. Danny O. Jacobs

Abdominal Pain Correctly diagnosing acute abdominal pain can be quite challenging. Few clinical situations require greater judgment, because the most catastrophic of events may be heralded by the subtlest of symptoms and signs. In every instance, the clinician must distinguish those conditions that require urgent intervention from those that do not and are best managed nonoperatively. A meticulously executed, detailed history and physical examination are critically important for focusing the differential diagnosis and allowing the diagnostic evaluation to proceed expeditiously (Table 16-1). The etiologic classification in Table 16-2, although not complete, provides a useful framework for evaluating patients with abdominal pain. Any patient with abdominal pain of recent onset requires an early and thorough evaluation. The most common causes of abdominal pain on admission are nonspecific abdominal pain, acute appendicitis, pain of urologic origin, and intestinal obstruction. A diagnosis of “acute or surgical abdomen” is not acceptable because of its often misleading and erroneous connotations. Although most patients who present with acute abdominal pain will have self-limited disease processes, it is important to remember that pain severity does not necessarily TABLE 16-1 Some Key Components of the Patient's History Age Time and mode of onset of the pain Pain characteristics Duration of symptoms Location of pain and sites of radiation Associated symptoms and their relationship to the pain Nausea, emesis, and anorexia Diarrhea, constipation, or other changes in bowel habits Menstrual history

TABLE 16-2 Some Important Causes of Abdominal Pain Pain Originating in the Abdomen Parietal peritoneal inflammation Bacterial contamination Perforated appendix or other Vascular

disturbances Embolism or thrombosis Vascular rupture Pressure or torsional occlusion Sickle cell anemia Abdominal wall Distortion or traction of mesentery Trauma or infection of muscles Distension of visceral surfaces, e.g., by hemorrhage Hepatic or renal capsules Inflammation Appendicitis Typhoid fever Neutropenic enterocolitis or perforated viscus Pelvic inflammatory disease Chemical irritation Perforated ulcer Pancreatitis Mittelschmerz Mechanical obstruction of hollow viscera Obstruction of the small or large PART 2 Cardinal Manifestations and Presentation of Diseases intestine Obstruction of the biliary tree Obstruction of the ureter "typhlitis" Pain Referred from Extraabdominal Source Cardiothoracic Acute myocardial infarction Myocarditis, endocarditis, Pleurodynia Pneumothorax Empyema Esophageal disease, including pericarditis Congestive heart failure Pneumonia (especially lower lobes) Pulmonary embolus spasm, rupture, or inflammation Genitalia Torsion of the testis Metabolic Causes Diabetes Uremia Hyperlipidemia Hyperparathyroidism Acute adrenal insufficiency Familial Mediterranean fever Porphyria C1 esterase inhibitor deficiency (angioneurotic edema) Neurologic/Psychiatric Causes Herpes zoster Tabes dorsalis Causalgia Radiculitis from infection or arthritis Spinal cord or nerve root compression Functional disorders Psychiatric disorders Toxic Causes Lead poisoning Insect or animal envenomation Black widow spider bites Snake bites Uncertain Mechanisms Narcotic withdrawal Heat stroke

correlate with the severity of the underlying condition. In addition, the presence or absence of various degrees of "hunger" is unreliable as a sole indicator of the severity of intraabdominal disease. The most obvious of "acute abdomens" may not require operative intervention, but the mildest of abdominal pain could. ■ ■SOME MECHANISMS OF PAIN

ORIGINATING IN THE ABDOMEN Inflammation of the Parietal Peritoneum The pain of parietal peritoneal inflammation is steady and aching in character and is located directly over the inflamed area and is transmitted by somatic nerves. The intensity of the pain is dependent on the type and amount of material to which the peritoneal surfaces are exposed in a given time period. For example, the sudden release of a small quantity of sterile acidic gastric juice into the peritoneal cavity causes much more pain than the same amount of grossly contaminated pH neutral feces.

Enzymatically active pancreatic juice incites more pain and inflammation than does the same amount of sterile bile containing no potent enzymes. Because blood is normally only a mild irritant, and the response to urine is also typically bland, exposure of blood and urine to the peritoneal cavity may go unnoticed unless it is sudden and massive. Bacterial contamination, such as may occur with pelvic inflammatory disease or perforated distal intestine, causes low-intensity pain until multiplication causes significant amounts of inflammatory mediators to be released. Patients with perforated upper gastrointestinal ulcers may present entirely differently depending on how quickly gastric juices enter the peritoneal cavity and their pH. Thus, the rate at which any inflammatory material irritates the peritoneum is important. The pain of peritoneal inflammation is invariably accentuated by pressure or changes in tension of the peritoneum, whether produced by palpation or by movement such as with coughing or sneezing. The patient with peritonitis characteristically lies quietly in bed, preferring to avoid motion, in contrast to the patient with colic, who may be thrashing in discomfort. Another characteristic feature of peritoneal irritation is tonic reflex spasm of the abdominal musculature, localized to the involved body segment. Its intensity depends on the integrity of the nervous system, the location of the inflammatory process, and the rate at which it developed. Spasm over a perforated retrocecal appendix or perforation into the lesser peritoneal sac may be minimal or absent because of the protective effect of overlying viscera. Catastrophic abdominal emergencies may be associated with minimal or no detectable pain or muscle spasm in obtunded, seriously ill, debilitated, immunosuppressed, or psychotic patients. A slowly developing

process also often greatly attenuates the degree of muscle spasm. Obstruction of Hollow Viscera Intraluminal obstruction classically elicits intermittent or colicky abdominal pain that is not as well localized as the pain of parietal peritoneal irritation. However, the absence of cramping discomfort can be misleading because distention of a hollow viscus may also produce steady pain with only rare paroxysms. Small-bowel obstruction often presents as poorly localized, intermittent periumbilical or supraumbilical pain. As the intestine progressively dilates and loses muscular tone, the colicky nature of the pain may diminish. With superimposed strangulating obstruction, pain may spread to the lower lumbar region if there is traction on the root of the mesentery. The colicky pain of colonic obstruction is of lesser intensity, is commonly located in the infraumbilical area, and may often radiate to the lumbar region. Sudden distention of the biliary tree produces a steady rather than colicky type of pain; hence, the term biliary colic is misleading. Acute distention of the gallbladder typically causes pain in the right upper quadrant with radiation to the right posterior region of the thorax or to the tip of the right scapula, but discomfort is also not uncommonly found near the midline. Distention of the common bile duct often causes epigastric pain that may radiate to the upper lumbar region. Considerable variation is common, however, so that differentiation between gallbladder or disease affecting the common bile duct may be impossible. Gradual dilatation of the biliary tree, as can occur with carcinoma of the head of the pancreas, may cause no pain or only a mild aching sensation in the epigastrium or right upper quadrant. The pain of distention of the pancreatic ducts is similar to that described for distention of the common bile duct but, in addition, is very frequently accentuated by recumbency and relieved by the upright position. Obstruction of the urinary bladder usually causes dull, low-

intensity pain in the suprapubic region. Restlessness, without a specific complaint of pain, may be the only sign of a distended bladder in an obtunded patient. In contrast, acute obstruction of the intravesicular portion of the ureter is characterized by severe suprapubic and flank pain that radiates to the penis, scrotum, or inner aspect of the upper thigh. Obstruction of the ureteropelvic junction manifests as pain near the costovertebral angle, whereas obstruction of the remainder of the ureter is associated with flank pain that often extends into the same side of the abdomen.

Vascular Disturbances A frequent misconception is that pain due to intraabdominal vascular disturbances is sudden and catastrophic in nature. Certain disease processes, such as embolism or thrombosis of the superior mesenteric artery or impending rupture of an abdominal aortic aneurysm, can certainly be associated with diffuse, severe pain. Yet, just as frequently, the patient with occlusion of the superior mesenteric artery only has mild continuous or cramping diffuse pain for 2 or 3 days before vascular collapse or findings of peritoneal inflammation appear. The early, seemingly insignificant discomfort is caused by hyperperistalsis rather than peritoneal inflammation. Indeed, absence of tenderness and rigidity in the presence of continuous, diffuse pain (e.g., "pain out of proportion to physical findings") in a patient likely to have vascular disease is quite characteristic of occlusion of the superior mesenteric artery. Abdominal pain with radiation to the sacral region, flank, or genitalia should always signal the possible presence of a rupturing abdominal aortic aneurysm. This pain may persist over a period of several days before rupture and collapse occur. **Abdominal Wall Pain** arising from the abdominal wall is usually constant and aching. Movement, prolonged standing, and pressure accentuate the discomfort and associated muscle spasm. In the relatively rare case of hematoma of the rectus sheath, now most frequently encountered in association with anticoagulant therapy, a mass may be present in the lower quadrants of the abdomen. Simultaneous involvement of muscles in other parts of the body

usually serves to differentiate myositis of the abdominal wall from other processes that might cause pain in the same region. ■ ■REFERRED PAIN IN ABDOMINAL DISEASE Pain referred to the abdomen from the thorax, spine, or genitalia may present a diagnostic challenge because diseases of the upper part of the abdominal cavity such as acute cholecystitis or perforated ulcer may be associated with intrathoracic complications. A most important, yet often forgotten, dictum is that the possibility of intrathoracic disease must be considered in every patient with abdominal pain, especially if the pain is in the upper abdomen. Systematic questioning and examination directed toward detecting myocardial or pulmonary infarction, pneumonia, pericarditis, or esophageal disease (the intrathoracic diseases that most often masquerade as abdominal emergencies) will often provide sufficient clues to establish the proper diagnosis. Diaphragmatic pleuritis resulting from pneumonia or pulmonary infarction may cause pain in the right upper quadrant and pain in the supraclavicular area, the latter radiation to be distinguished from the referred subscapular pain caused by acute distention of the extrahepatic biliary tree. The ultimate decision as to the origin of abdominal pain may require deliberate and planned observation over a period of several hours, during which repeated questioning and examination will provide the diagnosis or suggest the appropriate studies. Referred pain of thoracic origin is often accompanied by splinting of the involved hemithorax with respiratory lag and a decrease in excursion more marked than that seen in the presence of intraabdominal disease. In addition, apparent abdominal muscle spasm caused by referred pain will diminish during inspiration, whereas it persists throughout both respiratory phases if it is of abdominal origin. Palpation over the area of referred pain in the abdomen also does not usually accentuate the pain and, in many instances, actually seems to relieve it. Thoracic disease and abdominal disease frequently coexist and may be difficult or impossible to differentiate. For example, the patient with known biliary tract disease often has epigastric pain during myocardial infarction, or biliary colic may be referred to the precordium or left shoulder in a patient who has suffered previously from angina pectoris. For an explanation of the radiation of pain to a previously diseased area, see Chap. 14. Referred pain from the spine, which usually involves compression or irritation of nerve roots, is characteristically intensified by certain motions such as cough, sneeze, or strain and is associated with hyperesthesia over the involved dermatomes. Pain referred to the abdomen from the testes or seminal vesicles is generally accentuated by the

slightest pressure on either of these organs. The abdominal discomfort experienced is of dull, aching character and is poorly localized.

■ ■METABOLIC ABDOMINAL CRISES Pain of metabolic origin may simulate almost any other type of intraabdominal disease. Several mechanisms may be at work. In certain instances, such as hyperlipidemia, the metabolic disease itself may be accompanied by an intraabdominal process such as pancreatitis, which can lead to unnecessary laparotomy unless recognized. C1 esterase deficiency associated with angioneurotic edema is often associated with episodes of severe abdominal pain. Whenever the cause of abdominal pain is obscure, a metabolic origin always must be considered. Abdominal pain is also the hallmark of familial Mediterranean fever (Chap. 381). Rarely, some patients with COVID-19 may present with severe abdominal pain in the absence of pulmonary symptoms. Abdominal Pain CHAPTER 16 The pain of porphyria and of lead colic is usually difficult to distinguish from that of intestinal obstruction because severe hyperperistalsis is a prominent feature of both. The pain of uremia or diabetes is nonspecific, and the pain and tenderness frequently shift in location and intensity. Diabetic acidosis may be precipitated by acute

appendicitis or intestinal obstruction, so if prompt resolution of the abdominal pain does not result from correction of the metabolic abnormalities, an underlying organic problem should be suspected. Black widow spider bites produce intense pain and rigidity of the abdominal muscles and back, an area infrequently involved in intraabdominal disease. ■ ■IMMUNOCOMPROMISE Evaluating and diagnosing causes of abdominal pain in immunosuppressed or otherwise immunocompromised patients is very difficult. This includes those who have undergone organ transplantation; who are receiving immunosuppressive treatments for autoimmune diseases, chemotherapy, or glucocorticoids; who have AIDS; and who are very old. In these circumstances, normal physiologic responses may be absent or masked. In addition, unusual infections may cause abdominal pain where the etiologic agents include cytomegalovirus, mycobacteria, protozoa, and fungi. These pathogens may affect all gastrointestinal organs, including the gallbladder, liver, and pancreas, as well as the gastrointestinal tract, causing occult or overtly symptomatic perforations of the latter. Splenic abscesses due to *Candida* or *Salmonella* infection should also be considered, especially when evaluating patients with left upper quadrant or left flank pain. Acalculous cholecystitis may be observed in immunocompromised patients or those with AIDS, where it is often associated with cryptosporidiosis or cytomegalovirus infection. Neutropenic enterocolitis (typhlitis) is often identified as a cause of abdominal pain and fever in some patients with bone marrow suppression due to chemotherapy. Acute graft-versus-host disease should be considered in this circumstance. Optimal management of these patients requires meticulous follow-up including serial examinations to assess the need for more surgical intervention, for example, to address perforation. ■ ■NEUROGENIC CAUSES Diseases that injure sensory nerves may cause causalgic pain. This pain has a burning character and is usually limited to the distribution of a given peripheral nerve. Stimuli that are normally not painful such as touch or a change in temperature may be causalgic and are often present even at rest. The demonstration of irregularly spaced cutaneous "pain spots" may be the only indication that an old nerve injury exists. Even though the pain may be precipitated by gentle palpation, rigidity of the abdominal muscles is absent, and the respirations are not usually disturbed. Distention of the abdomen is uncommon, and the pain has no relationship to food intake. Pain arising from spinal nerves or roots comes and goes suddenly and is of a lancinating type (Chap. 18). It may be caused by herpes zoster, impingement by arthritis, tumors, a herniated nucleus pulposus, diabetes, or syphilis. It is not associated with food intake, abdominal distention, or changes in respiration. Severe muscle spasms, when present, may be relieved by, but are usually not accentuated by, abdominal

palpation. The pain is made worse by movement of the spine and is usually confined to a few dermatomes. Hyperesthesia is very common.

Pain due to functional causes conforms to none of the aforementioned patterns. Here mechanisms of disease are not as clearly established. For example, irritable bowel syndrome (IBS) is a functional gastrointestinal disorder characterized by abdominal pain and altered bowel habits. The diagnosis is made on the basis of clinical criteria (Chap. 338) and after exclusion of demonstrable structural abnormalities. The episodes of abdominal pain may be brought on by stress, and the pain varies considerably in type and location. Nausea and vomiting are rare. Localized tenderness and muscle spasm are inconsistent or absent. The causes of IBS or related functional disorders are not yet fully understood, although proinflammatory cells and lipotoxic lipids likely play a role. PART 2 Cardinal Manifestations and Presentation of Diseases APPROACH TO THE PATIENT Abdominal Pain Few abdominal conditions require such urgent operative intervention that an orderly approach

needs to be abandoned, no matter how ill the patient is. Only patients with exsanguinating intraabdominal hemorrhage (e.g., ruptured aneurysm) must be rushed to the operating room immediately, but in such instances, only a few minutes are required to assess the critical nature of the problem. Under these circumstances, all obstacles must be swept aside, adequate venous access for fluid replacement obtained, and the operation begun. Unfortunately, many of these patients may die in the radiology department or the emergency room while awaiting unnecessary examinations. There are no absolute contraindications to operation when massive intraabdominal hemorrhage is present. Fortunately, this situation is relatively rare. This statement does not necessarily apply to patients with intraluminal gastrointestinal hemorrhage, who can often be managed by other means (Chap. 51). In these patients, obtaining a detailed history when possible can be extremely helpful even though it can be laborious and timeconsuming. Decision-making regarding next steps is facilitated and a reasonably accurate diagnosis can be made before any further diagnostic testing is undertaken. In cases of acute abdominal pain, a diagnosis can be readily established in most instances, whereas success is not so frequent in patients with chronic pain. IBS is one of the most common causes of abdominal pain and must always be kept in mind (Chap. 338). The location of the pain can assist in narrowing the differential diagnosis (Table 16-3); however, the chronological sequence of events in the patient's history is often more important than the pain's location. Careful attention should be paid to the extraabdominal regions. Narcotics or analgesics should not be withheld until a definitive diagnosis or a definitive plan has been formulated; obtundation of the diagnosis by adequate analgesia is unlikely. An accurate menstrual history in a female patient is essential. It is important to remember that normal anatomic relationships can be significantly altered by the gravid uterus. Abdominal and pelvic pain may occur during pregnancy due to conditions that do not require operation. Lastly, some otherwise noteworthy laboratory values (e.g., leukocytosis) may represent the normal physiologic changes of pregnancy. In the examination, simple critical inspection of the patient, for example, of facies, position in bed, and respiratory activity, provides valuable clues. The amount of information to be gleaned is directly proportional to the gentleness and thoroughness of the examiner. Once a patient with peritoneal inflammation has been examined brusquely, accurate assessment by the next examiner becomes almost impossible. Eliciting rebound tenderness by sudden release of a deeply palpating hand in a patient with suspected peritonitis is cruel and unnecessary. The same information can be obtained by gentle percussion of the abdomen (rebound tenderness on a miniature scale), a maneuver that can be far more precise and localizing. Asking the patient to cough will elicit true rebound tenderness

TABLE 16-3 Differential Diagnoses of Abdominal Pain by Usual Location

Location	Diagnoses
Right Upper Quadrant	Cholecystitis, Cholangitis, Pancreatitis, Pneumonia/empyema
Left Upper Quadrant	Pleurisy/pleurodynia, Subdiaphragmatic abscess, Hepatitis, Budd-Chiari syndrome, Peptic ulcer disease, Gastritis, GERD, Pancreatitis, Myocardial infarction, Pericarditis, Ruptured aortic aneurysm
Epigastric	Esophagitis, Splenic infarct, Splenic rupture, Splenic abscess, Gastritis, Gastric ulcer, Pancreatitis
Subdiaphragmatic abscess	Right Lower Quadrant, Periumbilical
Left Lower Quadrant	Appendicitis, Salpingitis, Inguinal hernia, Ectopic pregnancy, Nephrolithiasis, Inflammatory bowel disease
Mesenteric	Lymphadenitis, Typhlitis, Early appendicitis, Gastroenteritis, Bowel obstruction, Ruptured aortic aneurysm, Diverticulitis, Salpingitis, Inguinal hernia, Ectopic pregnancy, Nephrolithiasis, Irritable bowel syndrome, Inflammatory bowel disease, Diffuse Nonlocalized Pain, Gastroenteritis, Mesenteric ischemia, Bowel obstruction, Irritable bowel syndrome, Peritonitis, Diabetes, Malaria, Familial Mediterranean fever, Metabolic diseases, Psychiatric disease

Abbreviation: GERD, gastroesophageal reflux disease. without the need for placing a hand on the abdomen.

Furthermore, the forceful demonstration of rebound tenderness will startle and induce protective spasm in a nervous or worried patient in whom true rebound tenderness is not present. A palpable gallbladder will be missed if palpation is so aggressive that voluntary muscle spasm becomes superimposed on involuntary muscular rigidity. As with history taking, sufficient time should be spent in the examination. Abdominal signs may be minimal but, nevertheless, if accompanied by consistent symptoms, may be exceptionally meaningful. Abdominal signs may be virtually or totally absent in cases of pelvic peritonitis, so careful pelvic and rectal examinations are mandatory in every patient with abdominal pain. Tenderness on pelvic or rectal examination in the absence of other abdominal signs can be caused by operative indications such as perforated appendicitis, diverticulitis, twisted ovarian cyst, and many others. Much attention has been paid to the presence or absence of peristaltic sounds, their quality, and their frequency. Auscultation of the abdomen is one of the least revealing aspects of the physical examination of a patient with abdominal pain. Catastrophes such as a strangulating small-intestinal obstruction or perforated appendicitis may occur in the presence of normal peristaltic sounds. Conversely, when the proximal part of the intestine above obstruction becomes markedly distended and edematous, peristaltic sounds may lose the characteristics of borborygmi and become weak or absent, even when peritonitis is not present. It is usually the severe chemical peritonitis of sudden onset that is associated with the truly silent abdomen. Laboratory examinations may be valuable in assessing the patient with abdominal pain, yet, with few exceptions, they rarely establish a diagnosis. Leukocytosis should never be the single deciding factor as to whether or not operation is indicated. A white blood cell count $>20,000/\mu\text{L}$ may be observed with perforation of a viscus, but pancreatitis, acute cholecystitis, pelvic inflammatory disease, and intestinal infarction may also be associated with marked leukocytosis. A normal white blood cell count is not rare in cases of

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