

**American College of Radiology
ACR Appropriateness Criteria®**

Clinical Condition: Acute Pancreatitis

Variant 1: Etiology unknown, first episode of pancreatitis.

| Radiologic Procedure | Rating | Comments | RRL* |
|--|--------|----------|----------------------------------|
| US abdomen | 8 | | None |
| CT abdomen with or without contrast | 6 | | Med |
| MRI abdomen with contrast | 6 | | None |
| MRI abdomen without contrast with MRCP | 6 | | None |
| US abdomen endoscopic | 5 | | None |
| Rating Scale: 1=Least appropriate, 9=Most appropriate | | | *Relative Radiation Level |

Variant 2: Severe abdominal pain, elevated amylase lipase, no fever or evidence of fluid loss at admission; clinical score pending.

| Radiologic Procedure | Rating | Comments | RRL* |
|--|--------|----------|----------------------------------|
| US abdomen | 8 | | None |
| MRI abdomen without contrast with MRCP | 7 | | None |
| CT abdomen with or without contrast | 7 | | Med |
| MRI abdomen with contrast | 6 | | None |
| Rating Scale: 1=Least appropriate, 9=Most appropriate | | | *Relative Radiation Level |

Variant 3: Severe abdominal pain, elevated amylase lipase, 48 hours later assuming no improvement or degradation (assume no prior imaging).

| Radiologic Procedure | Rating | Comments | RRL* |
|--|--------|----------|----------------------------------|
| CT abdomen with or without contrast | 8 | | Med |
| US abdomen | 7 | | None |
| MRI abdomen with contrast | 7 | | None |
| MRI abdomen without contrast with MRCP | 7 | | None |
| Rating Scale: 1=Least appropriate, 9=Most appropriate | | | *Relative Radiation Level |

Clinical Condition:

Acute Pancreatitis

Variant 4:

Severe abdominal pain, elevated amylase lipase, fever and elevated white blood cell count.

| Radiologic Procedure | Rating | Comments | RRL* |
|--|--------|----------|----------------------------------|
| CT abdomen with or without contrast | 9 | | Med |
| MRI abdomen without contrast with MRCP | 7 | | None |
| MRI abdomen with contrast | 7 | | None |
| US abdomen | 7 | | None |
| Rating Scale: 1=Least appropriate, 9=Most appropriate | | | *Relative Radiation Level |

Variant 5:

Severe abdominal pain, elevated amylase lipase, hemoconcentration, oliguria, tachycardia.

| Radiologic Procedure | Rating | Comments | RRL* |
|--|--------|----------|----------------------------------|
| CT abdomen with or without contrast | 9 | | Med |
| US abdomen | 7 | | None |
| MRI abdomen without contrast with MRCP | 7 | | None |
| MRI abdomen with contrast | 7 | | None |
| Rating Scale: 1=Least appropriate, 9=Most appropriate | | | *Relative Radiation Level |

ACUTE PANCREATITIS

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Summary of Literature Review

This document focuses on the diagnosis and initial evaluation of patients with suspected or known acute pancreatitis. It does not address interventional procedures or documentation of complications such as abscess, pseudocyst, or pseudoaneurysm.

Interstitial edematous pancreatitis and necrotizing pancreatitis are the most frequent clinical manifestations of acute pancreatitis. Fluid collections associated with acute pancreatitis usually resolve spontaneously. Pancreatic pseudocysts are fluid collections that persist for 6 weeks or more. Pancreatic abscess is usually a complication of necrotizing pancreatitis, typically developing after 3 to 5 weeks. Determinants of the natural course of acute pancreatitis are pancreatic parenchymal necrosis, extrapancreatic retroperitoneal fatty tissue necrosis, biologically active compounds in pancreatic ascites, and infection of necrosis [1]. Early in the course of acute pancreatitis, multiple organ failure is the consequence of various inflammatory mediators that are released from the inflammatory process and from activated leukocytes attracted by pancreatic injury. Late in the course, starting the second week, local and systemic septic complications are dominant. Around 80% of deaths in acute pancreatitis are caused by septic complications.

The infection of pancreatic necrosis occurs in 8%-12% of acute pancreatitis patients and in 30%-40% of patients with necrotizing pancreatitis. Pancreatic inflammation may result in enlargement of the gland, peripancreatic inflammation with or without fluid, solitary or loculated fluid collections, necrosis of pancreatic parenchyma, and subsequent infection in any of the above sites of

inflammation. Distant organ complications can lead to organ failure, protracted course, and death [2]. Prediction of which patients will develop these complications is achieved through clinical scoring systems and imaging findings. Choice of scoring system is beyond the scope of these recommendations.

Acute pancreatitis is suspected in patients presenting with epigastric upper abdominal pain that is acute in onset, rapidly increasing in severity, and persistent without relief. The intensity of the pain almost always results in the patient seeking medical attention. Differential diagnosis includes mesenteric ischemia, perforated ulcer, intestinal obstruction, biliary colic, and myocardial infarction. Serum amylase and/or lipase levels can be considered diagnostic when the reported value(s) is ≥ 3 times normal. Lipase levels are more specific for acute pancreatitis, as hyperamylasemia may be present in a variety of conditions. Of note is that serum enzyme levels do not correlate with the severity of the disease [2]. Consequently, clinical scoring systems and imaging tests have been advocated to classify individual patients. Furthermore, the diagnosis may be overlooked in the absence of typical enzyme elevation [3]. In some patients, acute pancreatitis may be present in the absence of enzyme abnormalities [4].

Imaging tests available for the diagnosis of acute pancreatitis include transabdominal ultrasound (US), endoscopic ultrasound (EUS), computed tomography (CT) scanning, magnetic resonance imaging (MRI), and magnetic resonance cholangiopancreatography (MRCP) [5-7]. Imaging tests are performed for various reasons, including detection of gallstones, detection of biliary obstruction, diagnosis of pancreatitis when the clinical situation is unclear, identification of patients with high-risk pancreatitis, and detection of complications of pancreatitis.

US to detect gallbladder stones should be performed in every patient with acute pancreatitis, even alcoholics [8]. US is also effective in diagnosing biliary obstruction, which, when present, often prompts endoscopic retrograde cholangiopancreatography (ERCP) to relieve the cause of obstruction [9]. US is less successful in diagnosing choledocholithiasis [10] and has limited applications in the early staging of the disease. Visualization of the pancreas is often impaired because of overlying bowel gas, and the detection of intraparenchymal and retroperitoneal fluid collections correlates poorly with pancreatic necrosis [8]. US with color Doppler is useful to detect venous complications of acute pancreatitis [11]. In patients with suspected acute gallstone pancreatitis or with repeating acute pancreatitis, ERCP is used to reach a definite diagnosis and to investigate the etiology. EUS is useful, when needed clinically, to detect common duct stones when initial studies are negative. It can often determine an etiology (usually biliary) in patients initially diagnosed with idiopathic acute pancreatitis [12-15].

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CT is an insensitive detector of biliary calculi, but is superb in delineating the pancreas and acute pancreatitis-associated abnormalities. CT scanning provides clear images of the pancreas and adjacent structures [16] and allows for the differentiation of acute pancreatitis from other abdominal diseases. CT findings helpful for diagnosing acute pancreatitis include pancreatic enlargement, peripancreatic inflammatory changes, fluid collections, and uneven density of pancreatic parenchyma.

MRI demonstrates pancreatic enlargement and the inflammatory changes around the pancreas [6]. It has the advantage of no x-ray exposure. Nevertheless, it takes a much longer time to scan the pancreas in comparison with CT. MRCP has a high accuracy in detecting bile duct stones [17].

Physiologically based scoring systems such as the APACHE II and Ranson's criteria are designed to identify early prognostic signs that predict severity of clinical course in an individual patient. In 1985, Balthazar et al [10] showed that although clinical scoring systems were highly correlated with increasing CT severity, disease severity was sometimes underestimated by clinical scoring alone. The key criterion for identifying patients at higher risk for fatal pancreatitis is the presence of pancreatic necrosis [3,8,18-21]. Balthazar et al [22] revised their scoring system in 1990 to account for the significance of pancreatic necrosis and created the CT severity index. The utility of the Ranson's criteria compared with that of the Balthazar CT severity index for predicting the necessity for admission to an ICU in patients with acute pancreatitis was analyzed in a recent study. The Balthazar CT severity index correlated highly with the overall occurrence of complications ($r^2=0.96$), the occurrence of sepsis ($r^2=0.99$), and death ($r^2=0.99$), and it was a better prognostic indicator than the Ranson criteria for complications and mortality [23].

A modified CT severity index, which simplifies the evaluation of pancreatic necrosis, inflammatory changes, and extrapancreatic complications, has also been proposed [24]. There are isolated reports of clinical scoring systems yielding equivalent or superior results to imaging tests [25,26]. However, it also should be remembered that most clinical systems require a second assessment within 48 hours to monitor progression or stability, as opposed to relatively instantaneous evaluation at imaging.

Contrast CT and/or gadolinium-enhanced MRI [19,27-31] can both be used to assess pancreatic necrosis and evaluate peripancreatic inflammation and fluid collections. MRI is particularly useful in patients who cannot receive iodinated contrast material due to prior adverse contrast reaction or renal insufficiency. Furthermore, the integrity of the pancreatic duct can be assessed by means of MRCP in an MRI study; this is important, since in previous studies pancreatic duct rupture was reported in about 30% patients with acute pancreatitis [32]. In both CT and MRI studies of the pancreas, pancreatic necrosis can be diagnosed when

segments of pancreatic parenchyma do not enhance on images obtained following intravenous contrast administration. These unenhanced areas have been proved to represent necrotic regions when correlated with findings at pancreatic debridement [33]. While some have suggested that the site of necrosis within the pancreas may further predict outcome [21], others have found no such correlation [4]. The presence of peripancreatic fluid collections is usually associated with severe disease [10,25,30]. Echo-enhanced US has been recently reported as a new initial imaging approach [34]; it can be used as an alternative in patients in whom both CT and MRI are contraindicated.

Controversy has emerged because of the observation that intravenous contrast impairs the microcirculation of the pancreas in rats with acute necrotizing pancreatitis and may increase the severity of the disease [35,36]. These results could not be reproduced in the opossum [37]. No prospective human trials have been published to date. Most experts believe the benefits of detecting necrosis outweigh any potential risk.

No objective clinical selection criteria exist that can determine which patients should have CT to assess the risk of severe pancreatitis. Imaging is clearly indicated when the cause of abdominal pain is unclear. In patients with known acute pancreatitis, however, CT is reserved for patients with clinical, biochemical, or physiologic indications of severe disease [2]. There is no information suggesting that routine CT in patients with milder disease (low APACHE II or Ranson scores) would result in upstaging a significant number of patients.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® [Radiation Dose Assessment Introduction](#) document.

| Relative Radiation Level Designations | |
|---------------------------------------|-------------------------------|
| Relative Radiation Level | Effective Dose Estimate Range |
| None | 0 |
| Minimal | < 0.1 mSv |
| Low | 0.1-1 mSv |
| Medium | 1-10 mSv |
| High | 10-100 mSv |

Supporting Document(s)

- [ACR Appropriateness Criteria® Overview](#)
- Evidence table under review

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The ACR Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the FDA have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.