

Diagnostic Imaging Pathways - Pancreatitis (Acute)

Population Covered By The Guidance

This pathway provides guidance on the use of imaging to investigate adult patients with suspected acute pancreatitis, including confirming the diagnosis, investigating for underlying etiology and assessing for associated complications.

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Quick User Guide

Move the mouse cursor over the **PINK** text boxes inside the flow chart to bring up a pop up box with salient points.

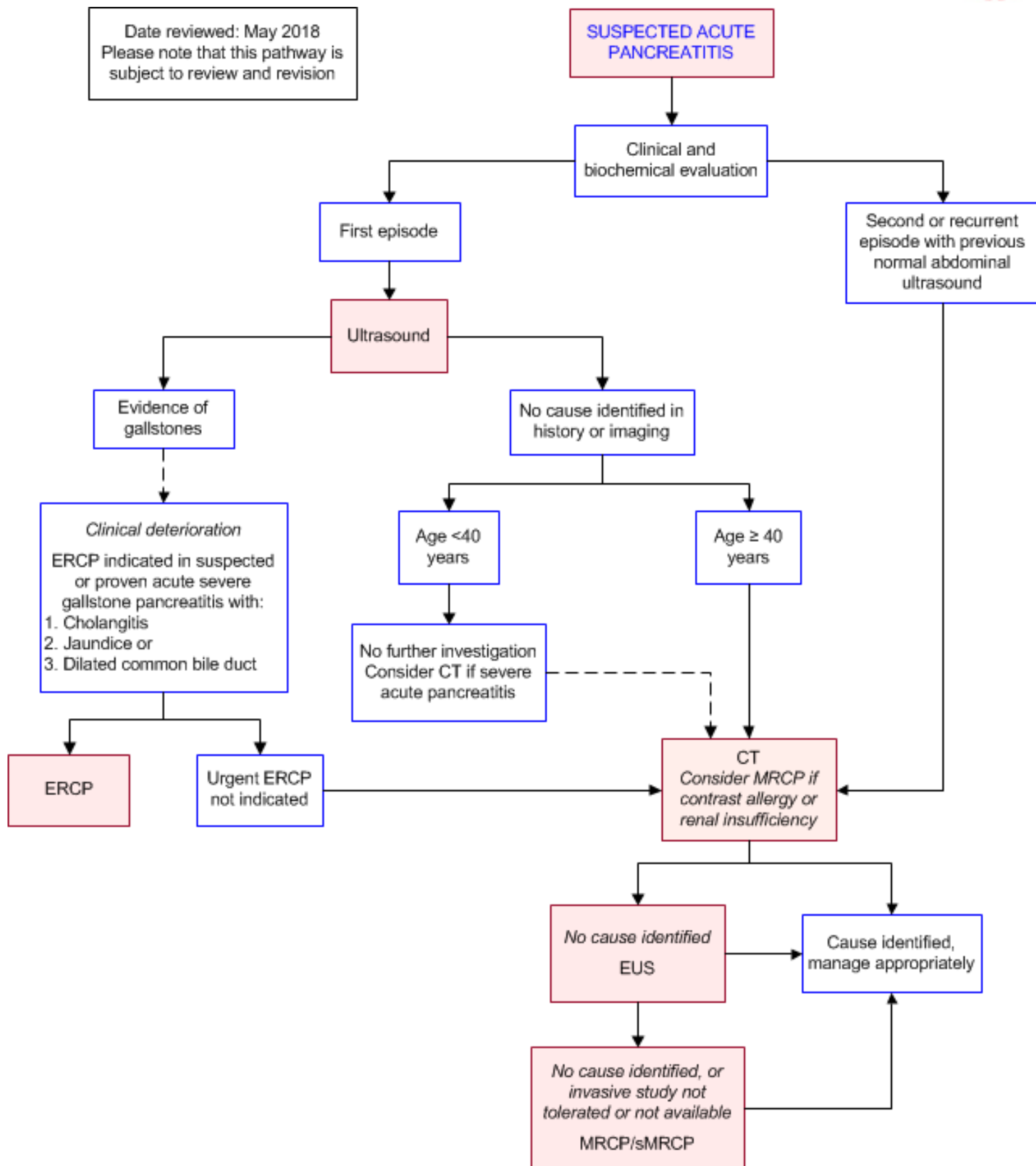
Clicking on the **PINK** text box will bring up the full text.

The relative radiation level (RRL) of each imaging investigation is displayed in the pop up box.

SYMBOL	RRL	EFFECTIVE DOSE RANGE
	None	0
	Minimal	< 1 millisieverts
	Low	1-5 mSv
	Medium	5-10 mSv
	High	>10 mSv

Pathway Diagram

Date reviewed: May 2018
 Please note that this pathway is
 subject to review and revision



Teaching Points

Role of Imaging in acute pancreatitis

- Exclude an underlying cause (e.g. gallstones)
- Assess severity
- Detect complications
- Guide treatment of complications (e.g. fluid collection drainage)

Evaluating the Cause of Acute Pancreatitis

- The two most common causes of acute pancreatitis are gallstones and alcohol
- If these have been ruled out, then rarer causes can be considered
- Extensive or invasive investigations for other causes are not recommended for patients 40 years and younger presenting with a first episode of pancreatitis as recurrence is rare [1-3](#)
- If gallstone and alcohol-induced pancreatitis have been excluded, then CT can be considered in patients who are 40 or older to investigate for pancreatic malignancy. [2](#), [4-6](#) Only 1-2% of acute pancreatitis is caused by pancreatic cancer. In the acute phase, tumour can be masked by inflammation or necrosis but secondary signs may suggest an underlying carcinoma [7](#)
- Further investigation is advised regardless of age in patients with more than one episode of acute pancreatitis, taking into consideration the greater risk of morbidity and possible progression to chronic pancreatitis [4-6](#), [8](#)
- EUS is recommended as the first investigation in patients with pancreatitis of unknown cause and a normal abdominal ultrasound [9](#)
- If no cause is demonstrated on EUS, patients may proceed to MRCP or sMRCP. In high-risk patients, MRCP may be preferred to EUS because it is non-invasive, however the choice of test will depend on availability and local experience [10](#)
- Diagnostic ERCP has been mostly replaced by EUS and MRCP; ERCP should be considered a therapeutic intervention when required [9-13](#)

Assessing Severity and Complications of Acute Pancreatitis

- CT is recommended in severe acute pancreatitis to assess the degree of pancreatic necrosis
- It is also recommended to assess for complications such as fluid collections

Endoscopic Retrograde Cholangiopancreatography (ERCP)

- Indications include:
 - Severe pancreatitis of proven or suspected gallstone etiology
 - Presence of cholangitis
 - Presence of jaundice

Suspected Acute Pancreatitis

- Risk factors for acute pancreatitis:
 - History of alcohol abuse
 - Known biliary/gallstone disease
 - Previous acute pancreatitis
 - Recent abdominal surgery such as cholecystectomy or procedures such as ERCP
 - Certain drugs
 - Known hyperlipidemia
 - Family history of pancreatic disease
- Pancreatitis is usually a biochemical and clinical diagnosis [14](#)
- Diagnosis of acute pancreatitis (whether or not chronic pancreatitis is present) requires at least two

out of three of the following [15](#)

1. Abdominal pain strongly suggestive of acute pancreatitis
 2. Serum amylase or lipase levels of ? 3 times normal level
 3. Characteristic imaging findings on imaging (CT or MRI)
- In suspected acute pancreatitis, imaging is used to: [14](#)
 - Exclude an underlying cause (e.g. gallstones)
 - Assess severity
 - Detect complications

Computed Tomography (CT)

- Contrast enhanced CT (CE-CT) is the imaging modality of choice for evaluating pancreas and the surrounding tissues [3,7](#) and is often the first radiological investigation for suspected acute pancreatitis in many institutions
- Routine CT is not indicated in mild acute pancreatitis unless there are clinical or other signs of deterioration [1,7-9](#) and there is no advantage of performing early imaging to predict the clinical severity of acute pancreatitis more than a clinical evaluation [9](#)
- 14-28% of CT scans are normal in mild pancreatitis [7,8](#)
- The ideal time for CE-CT is at least 72-96 hours after onset of symptoms for better accuracy in detecting pancreatic necrosis but in practice, patients with undiagnosed abdominal pain often have CE-CT performed on admission
- A formal pancreas protocol to assess for complications of pancreatitis is usually a three-phase CE-CT, however to assess a patient for undifferentiated abdominal pain, a single phase is generally sufficient
- If gallstone and alcohol-induced pancreatitis have been excluded, then CT can be considered in patients who are 40 or older to investigate for pancreatic malignancy. [2, 4-6](#) Only 1-2% of acute pancreatitis is caused by pancreatic cancer. In the acute phase, tumour can be masked by inflammation or necrosis but secondary signs may suggest an underlying carcinoma [7](#)
- Indications for CT scan include [14,16,21](#)
 - Diagnostic uncertainty
 - Assessment of severity and to detect complications
 - Failure to improve on treatment (>72 hrs)
 - Clinical findings suggesting a developing complication (e.g. fever, pain, hypotension, decreasing haematocrit)
 - Sudden deterioration in clinical status following an initial response to medical treatment
 - Follow-up and monitoring of established complications
 - Guidance of interventional procedures such as percutaneous fine needle aspiration and/or catheter drainage of fluid collections
- Combination of pre- and post-contrast enhancement appearances permits the assessment of the degree of pancreatic necrosis and surrounding peri-pancreatic and intra-abdominal fluid collections. The severity of disease as demonstrated on CT (CT severity index) correlates with the risk of morbidity and mortality [23](#)
- Disadvantages
 - Exposure to ionising radiation with repeat scanning
 - Exacerbation of renal impairment following the use of intravenous contrast media (unenhanced CT or MRCP may be used as an alternative)

Endoscopic Retrograde Cholangiopancreatography (ERCP)



- Diagnostic ERCP has been mostly replaced by EUS and MRCP; ERCP should be considered a therapeutic intervention when required [9-13](#)
- Mainly used to locate and remove gallstones in the common bile duct among patients with severe pancreatitis attributable to gallstones [14](#) as well as pancreatic duct stent placement and dilation [13](#)
- Other indications for ERCP in the setting of acute pancreatitis include [14](#)
 - Presence of ascending cholangitis
 - Presence of jaundice
 - Dilated common bile duct on previous imaging
- Urgent ERCP and sphincterotomy is indicated in patients with severe gallstone pancreatitis who fail to respond to treatment within 48 hours [44,45](#)
- Similarly patients with acute gallstone pancreatitis who develop ascending cholangitis stand to benefit from early ERCP and endoscopic sphincterotomy [46](#)
- ERCP is invasive and carries a significant risk of post-procedure complications of about 6%, including acute pancreatitis, haemorrhage, perforation, sepsis, strictures, bile leakage and mortality. [32, 47,48](#) Cannulation of the common bile or pancreatic duct may also be unsuccessful in a significant proportion of cases [49](#)
- ERCP is also more costly than MRCP and does not allow evaluation of the pancreatic parenchyma. [29](#) It is less sensitive than EUS for detecting masses, chronic pancreatitis, and microlithiasis. [10, 50](#) For these reasons, particularly the associated risks, diagnostic ERCP is rarely recommended [13, 24](#)

Magnetic Resonance Cholangiopancreatography and Secretin-Stimulated MRCP (MRCP/sMRCP)

- MRCP is a non-invasive investigation that gives detailed information about the hepatobiliary and pancreatic systems [36](#)
- Recommend as a second-line investigation for patients with recurrent acute pancreatitis of unknown cause to assess for pancreatic divisum, choledochocoele, anomalous pancreatobiliary junction, or annular pancreas, [37,38](#) although in some cases it may be preferable to EUS and the two should be considered complimentary investigations [24, 26](#)
- The sensitivity of MRCP for detecting CBD stones in acute pancreatitis is 93.3% compared to 66.7% for abdominal CT [39](#)
- The overall accuracy of MRCP in detecting choledocholithiasis is 85.9% compared to 74.0% for abdominal CT [39](#)
- In sMRCP, secretin is injected intravenously causing the main pancreatic duct to secrete fluid, which improves the visualisation of pancreatic ducts [40](#)
- A systematic review suggests that sMRCP has significantly higher diagnostic accuracy than MRCP and should be preferred for diagnosing of pancreatic divisum, [25](#) however it is more expensive and less widely available
- Advantages of MRCP/sMRCP:
 - No exposure to intravenous contrast or ionising radiation [38](#)
 - Non-invasive
 - Less operator-dependent than US or ERCP [41](#)
 - Less expensive than EUS [26](#)
- Disadvantages of MRCP/sMRCP:
 - Does not allow therapeutic intervention
 - Less sensitive than EUS for microlithiasis, small ampullary lesions, and ductal strictures [42,43](#)
 - Limited availability

- Contraindicated in patients with ferromagnetic prostheses (e.g. some pacemakers, cochlear implants)

Ultrasound

- Recommended on admission to help determine the etiology in all patients with suspected acute pancreatitis [14-16](#)
- Primarily used to assess the biliary tree for gallstones, duct dilatation/obstruction and to exclude other pathology [14-16](#)
- Helps distinguish fluid collections from solid inflammatory masses
- Useful for follow-up of pancreatic fluid collections if seen well on initial ultrasound [17](#)
- Limitations
 - Visualisation of the pancreas is usually sub-optimal due to overlying bowel gas from a coexistent ileus [18, 19](#)
 - Detection of intra-parenchymal and retroperitoneal fluid collections correlates poorly with pancreatic necrosis [16](#)
 - Often underestimates the presence, extent and complexity of fluid collections

Magnetic Resonance Cholangiopancreatography (MRCP) and Endoscopic Ultrasonography (EUS)

- In many centres MRCP and EUS are performed following CT scanning if gall stone pancreatitis is being suspected prior to patients undergoing invasive ERCP if needed
- MRCP is reported to have a high negative predictive value of 100% for CBD stones [11, 12](#)
- MRCP is non-invasive and has no ionising radiation risk compared to CT. It is reported to have a sensitivity of around 62% and specificity of around 98% for CBD stones [12](#)
- EUS is an invasive imaging method but is reported to have a higher diagnostic yield (51% vs 20%) compared to MRCP in a prospective study looking for causes of idiopathic pancreatitis following traditional cross-sectional imaging [11](#)
- Some studies report higher diagnostic yield for EUS and MRCP compared to ERCP in idiopathic pancreatitis [13](#)

Endoscopic Ultrasonography (EUS)

- EUS is a minimally invasive test that is recommended as the first investigation for occult microlithiasis, neoplasms and early chronic pancreatitis in patients with acute pancreatitis of unknown cause and a normal abdominal ultrasound [9,24](#)
- There are two main indications for EUS in acute pancreatitis:
 - Suspicion of a biliary cause and intermediate probability of a common bile duct stone
 - Idiopathic acute (recurrent) pancreatitis
- EUS is currently preferred as an initial investigation, followed by MRCP/sMRCP if negative, (9) because it has a higher diagnostic yield than MRCP (51% vs 20%) [25](#)
- However, the optimal sequence of investigations is still under discussion and MRCP and EUS should be considered complimentary rather than competitive [24,26](#)
- MRCP may be preferable in high-risk patients because it is non-invasive. The choice of test will also depend on availability and local experience; [10](#) in general, MRCP is more widely available and less expensive [26](#)

- Advantages:
 - The close proximity of the EUS probe to the pancreas allows higher resolution images and there is less artefact from intestinal gas compared to transabdominal US
 - Can identify:
 - Biliary stones, sludge and microlithiasis
- EUS can detect smaller stones than MRCP (0.1mm compared to 1.5 – 3mm) [10](#)
- EUS has a sensitivity of 91% to 100% and specificity of 85% to 100% to detect CBD stones [27,30](#)
 - Pancreatic divisum (PD)
- EUS is a sensitive test for diagnosing PD and is superior to CT and MRCP [31](#)
- In a retrospective cohort study the sensitivity of EUS for PD was 86.7%, significantly higher than CT (15.5%) or MRCP (60%) [32](#)
 - Peri-ampullary tumors or pancreatic cancer
- EUS is highly specific for diagnosing pancreatic cancer with a negative predictive value of 100% [33](#)
- The sensitivity of EUS to identify pancreatic masses as small as 2-3 cm is very high (about 95%) [34](#)
 - Early chronic pancreatitis
- EUS can detect early chronic pancreatitis in patients initially diagnosed with idiopathic acute recurrent pancreatitis [35](#)
- Disadvantages:
 - Inability to perform some therapeutic interventions such as sphincterotomy and stent placement in the pancreatic duct
 - Operator dependent with high inter-observer variability
 - Invasive: requires sedation and endoscopy
 - Cost [26](#)
 - Limited availability

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Date of literature search: December 2017 - May 2018

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