Diagnostic Imaging Pathways - Cholecystitis (Suspected Acute)

Population Covered By The Guidance

This pathway provides guidance for appropriate imaging investigation of adult patients with acute right upper quadrant pain or suspected acute cholecystitis.

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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	5-0 mSv
	High	>10 mSv

Pathway Diagram

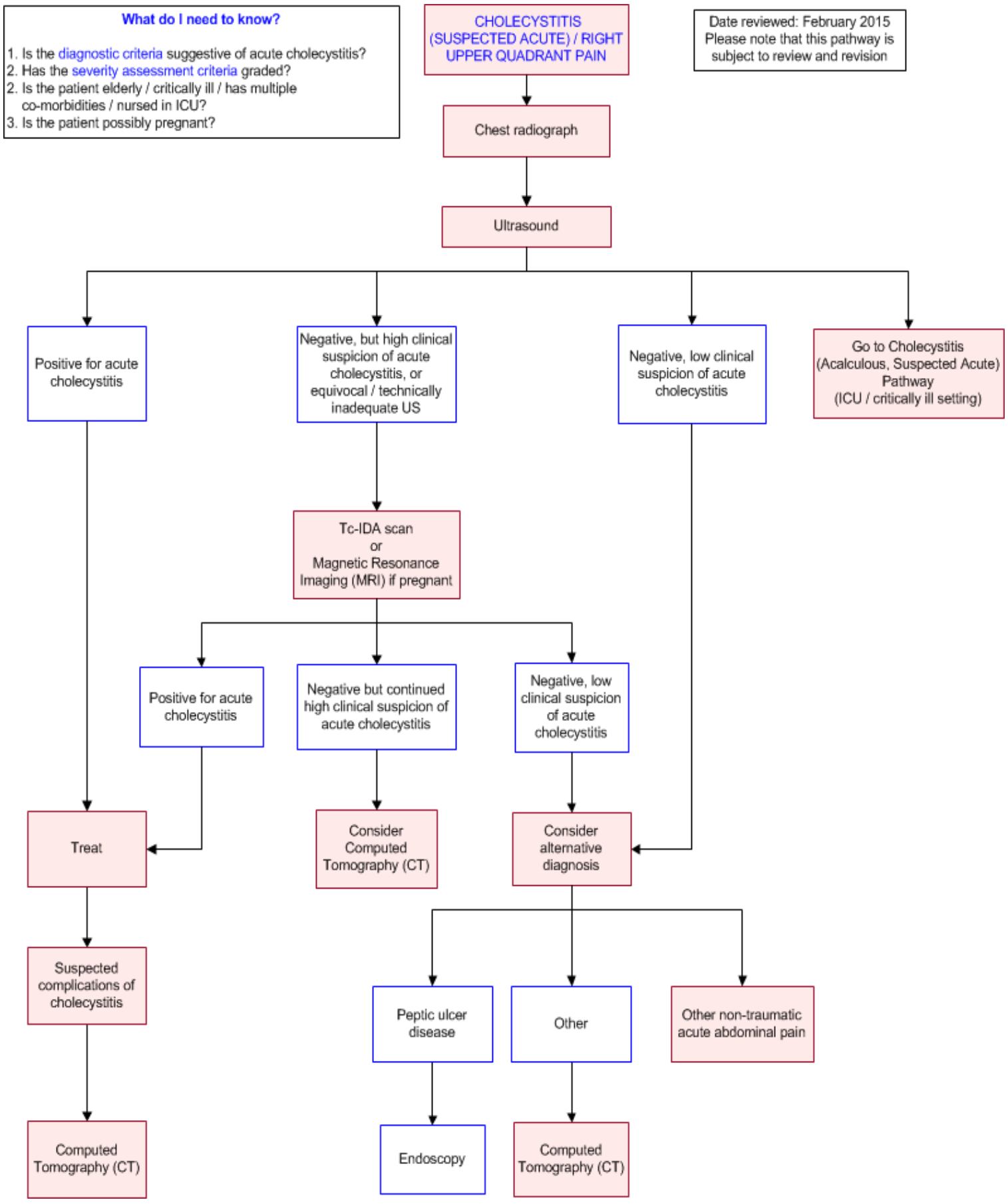


Image Gallery

Note: These images open in a new page

1

Acute Cholecystitis

Image 1 (Ultrasound): Grossly thickened gallbladder wall (12.8mm measured between callipers, normally up to 2-3mm) with calculi (arrow) within the gallbladder and pericholecystic fluid.

2

Acute cholecystitis

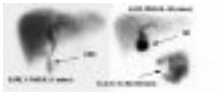
Image 2: Cholecystectomy showing acute cholecystitis with gallbladder wall oedema, vascular congestion and purulent exudate (blue arrow) caused by a massive cholesterol stone.

3

Acute Cholecystitis

Image 3 (H&E, x2.5): Histological section of severe acute cholecystitis showing extensive ulceration of the mucosa, haemorrhage, oedema and a dense transmural infiltrate of neutrophils and mononuclear inflammatory cells.

4



Normal HIDA Scan

Image 4 (HIDA Scan): Normal scan with visualisation of the gallbladder (GB) indicative of a patent cystic duct. The common bile duct (CBD) is also clearly identified.

Teaching Points

- Acute cholecystitis is the commonest cause of acute right upper quadrant (RUQ) pain, but other conditions such as peptic ulcer disease, pancreatitis and acute hepatitis can mimic acute cholecystitis
- Abdominal radiographs (AXR) in suspected acute cholecystitis are of no value 1
- A chest radiograph may be performed to exclude a thoracic cause of pain
- Ultrasound is the preferred primary imaging test in suspected acute cholecystitis 2
- Accuracy of CT in suspected acute cholecystitis is limited but literature has shown results were similar to ultrasound 3
- Approximately 90-95% of acute cholecystitis is gallstones related, with acalculous disease accounting for 5-10% of cases. However CT is less sensitive than ultrasound in the detection of gallstones (57%-88%) 4
- Indications for CT
    - If an alternative cause is considered
    - To identify complications
    - If clinical picture becomes non-specific
- The use of magnetic resonance imaging (MRI) is limited but likely, similar accuracy to ultrasound 2
- Cholescintigraphy (Tc-IDA Radionuclide) scan is highly accurate but involves ionizing radiation, is a longer study and unreliable in severe hepatocellular disease. Used to clarify a negative, equivocal or technically difficult ultrasound if clinical suspicion of persists 2

- Early laparoscopic cholecystectomy is the therapy of choice in operable patients 5
- Image-guided percutaneous drainage of the gallbladder (percutaneous cholecystostomy), usually under ultrasound guidance has been extensively used for treating surgically unfit patients (elderly, critically ill and / or with severe comorbidities) with acute cholecystitis 6
- Complications of acute cholecystitis include 7
    - Gangrenous gallbladder
    - Gallbladder perforation
    - Pericholecystic abscess
    - Cholangitis
    - Fistula from gallbladder to bowel

Suspected Acute Cholecystitis / Right Upper Quadrant Pain

- Acute cholecystitis is the commonest cause of acute right upper quadrant pain (RUQ), but other conditions such as peptic ulcer disease, pancreatitis and acute hepatitis can mimic acute cholecystitis
- Diagnostic criteria have been defined by Japanese authors 8 recently as
  A. Clinical: Local signs of inflammation, etc.

    1. Murphy's sign
    2. RUQ mass / pain / tenderness

  B. Systemic signs of inflammation, etc.

    1. fever
    2. elevated CRP
    3. abnormal WBC count

  C. Imaging findings: imaging findings characteristic of acute cholecystitis

  A definite diagnosis can be made in the presence of

    1. one item in each A and B are positive
    2. C confirms the diagnosis when acute cholecystitis is suspected clinically

  Note: Acute hepatitis, other acute abdominal diseases, and chronic cholecystitis should be excluded
- Overall, in the setting of acute abdominal pain, CT has greater accuracy compared to ultrasonography. However in acute cholecystitis there is little data on the accuracy of CT; sensitivity and positive predictive value are probably similar 3
- Ultrasound is the preferred primary imaging test in suspected acute cholecystitis as it has high accuracy, there is no ionizing radiation, it is more easily available (particularly at point-of-care), repeatable and images are not limited to the biliary tract (cf cholescintigraphy)
- A large multicenter randomized trial of early versus delayed laparasoscopic cholecystectomy indicated that the former should become the therapy of choice for acute cholecystitis in operable patients 5

Chest Radiograph

- The use of plain abdominal X-rays (AXR) in suspected acute cholecystitis are of no value 1
- Most gallstones are non-radio-opaque. Conversely, visualization of opaque gallstones does not signify acute cholecystitis, since asymptomatic gallstones are common
- A chest radiograph may be performed to exclude a thoracic cause of pain 9

Ultrasound

- Ultrasound is the preferred primary imaging test in suspected acute cholecystitis 10,11,12, although cholescintigraphy is more accurate 2
- Published ultrasound studies show quite wide variation in accuracy, but a meta-analysis indicates a summary sensitivity and specificity for ultrasound are 82% and 81% respectively, compared to a sensitivity of 96% at a specificity of 90% for cholescintigraphy 2
- However, ultrasound is favoured over cholescintigraphy as the primary imaging test as there is no ionizing radiation, it is more easily available (particularly at point-of-care), repeatable and images are not limited to the biliary tract, and is able to visualize gallstones with high sensitivity. It is also gives morphological information and is able to assess the bile ducts
- Ultrasound has been shown to be highly accurate for acute cholecystitis when the following signs are found in combination: gall bladder wall thickening / oedema, gall bladder distension, pericholecystic fluid, gallstones and positive Murphy sign. 12,13 However, recent studies in a regional hospital show less satisfactory accuracy 14,15
- More than 90% diagnostic accuracy and varies with the morphologic criteria used 12,16,17,18
- Colour / power Doppler increases accuracy over Gray-scale sonography 16
- Advantages: allows evaluation of other abdominal structures (can identify an alternative diagnosis), provides preoperative information such as gallbladder size, stone size, gallbladder wall status and the presence of biliary dilatation 19
- The addition of a HIDA scan in the diagnostic workup significantly improves sensitivity and can add valuable information in the appropriate clinical setting 15 particularly when ultrasound is negative or equivocal and there is continued clinical suspicion of acute cholecystitis
- In acute cholecystitis, the incidence of CBD stones was 1.8%. CBD diameter at ultrasound is not sufficient to identify patients with acute cholecystitis and CBD stones 20

Treatment

- Ultrasound may predict the need for open versus laparoscopic cholecystectomy, typically in patients with severe acute cholecystitis found on ultrasound, combined with the following findings below, specifically when the duration of symptoms exceeds 3 days 21
    - Gallbladder wall thickening to >5 mm
    - Pericholecystic exudates or abscess adjacent to the gallbladder
    - Difficulty identifying anatomical structures within Calot's triangle
- A large multicenter randomized trial of early versus delayed laparasoscopic cholecystectomy indicated that the former should become the therapy of choice for acute cholecystitis (AC) in operable patients 5

Percutaneous Cholecystostomy (PC)

- Image-guided percutaneous drainage of the gallbladder, usually under ultrasound guidance has been extensively used for treating surgically unfit patients with acute cholecystitis 6
- Patients falling into this category are elderly, critically ill and / or with severe comorbidities. PC is a relatively safe procedure in these high-risk patients
- For calculous cholecystitis, however, there are no prospective trials of PC versus urgent cholecystectomy in these patients. A recent Cochrane database systematic review concluded that the role of PC could not be determined due to the lack of adequately powered randomized controlled trials. 22 A randomized controlled trial is currently underway of PC versus laparoscopic cholecystectomy in acute cholecystitis in high risk patients (the "CHOCOLATE" trial); results are awaited
- Of those patients who proceed to delayed cholecystectomy following PC, there is a high rate of conversion from laparoscopic to open cholecystectomy. 23 However, PC may be definitive treatment with delayed cholecystectomy being unnecessary 24,25,26

Suspected Complications of Cholecystitis

- Patients with acute cholecystitis may develop complications such as gangrenous, perforated or emphysematous cholecystitis
- Worrisome ultrasound findings for complicated cholecystitis include the following below, where CT may add useful information in such patients 7
    - Intraluminal findings (sloughed mucosa, haemorrhage and / or abnormal gas)
    - Gallbladder wall abnormalities (striations, asymmetrical wall thickening, abnormal gas, loss of sonoreflectivity and / or contrast enhancement)
    - Pericholecystic changes (echogenic fat, pericholecystic fluid and / or abscess formation)

Computed Tomography (CT)

- Data on the accuracy of CT in suspected acute cholecystitis is limited but in one comparative study versus ultrasound, the results were similar 3
- CT findings of acute cholecystitis include gallbladder wall thickening, gallbladder distention, pericholecystic fat stranding, subserosal oedema, mucosal enhancement, transient focal enhancement of the liver adjacent to the gallbladder and pericholecystic fluid collection 27,28,29
- Complicated acute cholecystitis can be diagnosed, including pericholecystic abscess and gas collection within gallbladder 28
- Approximately 90-95% of acute cholecystitis is gallstones related, with acalculous disease accounting for 5-10% of cases
- CT is less sensitive than ultrasound in the detection of gallstones (57%-88%) 4
- CT in acute right upper quadrant (RUQ) pain is best used as a secondary test if
    - The diagnosis of acute cholecystitis is unconfirmed or equivocal on initial US (± cholescintigraphy), and an alternative diagnosis is being considered
    - If complications such as gangrenous gallbladder, perforation and pericholecystic abscess or fistula formation are suspected
    - When the clinical picture is non-specific, as it can detect other intra-abdominal inflammatory processes and when complications of acute cholecystitis are suspected

Cholescintigraphy (Tc-IDA Radionuclide Scan)

- Highly accurate in the diagnosis of acute cholecystitis 2,17,18
- Used to clarify a negative, equivocal or technically difficult ultrasound in the presence of continued clinical suspicion of acute cholecystitis 19
- The hallmark of acute cholecystitis (calculous as well as acalculous) is persistent gall bladder non-visualisation 30 minutes post-morphine or on the 3-4 hour delayed image 19
- False positives can occur in 30
    - Alcoholics
    - Intensive care unit (ICU) patients
    - Patients fasting for a prolonged period
    - Cystic fibrosis
    - Chronic cholecystitis
- Morphine augmentation reduces false positives and is superior to delayed imaging 31,32,33
- The drawbacks of cholescintigraphy are 19
    - Ionizing radiation
    - Longer examination time (than ultrasound or CT)
    - Unreliable in severe hepatocellular disease or at serum bilirubin levels >340-500 mmol/L
    - Inability to diagnose extra-biliary causes of acute right upper quadrant abdominal pain
    - Inability to provide anatomical information

Magnetic Resonance Imaging (MRI)

There have been few studies of MRI in suspected acute cholecystitis. Those available suggest accuracy is similar to ultrasound. 2 However, the role of MRI in the acute setting is limited

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Date of literature search: February 2015

The search methodology is available on request. Email

References are graded from Level I to V according to the Oxford Centre for Evidence-Based Medicine, Levels of Evidence. Download the document

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