

Diagnostic Imaging Pathways - Iliac Fossa Pain (Acute Right)

Population Covered By The Guidance

This pathway provides guidance for the imaging of adult patients with right iliac fossa pain or suspected acute appendicitis, as well as the many mimickers of appendicitis.

Date reviewed: May 2015

Date of next review: 2017/2018

Published: May 2015

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 2015
 Please note that this pathway is subject to review and revision

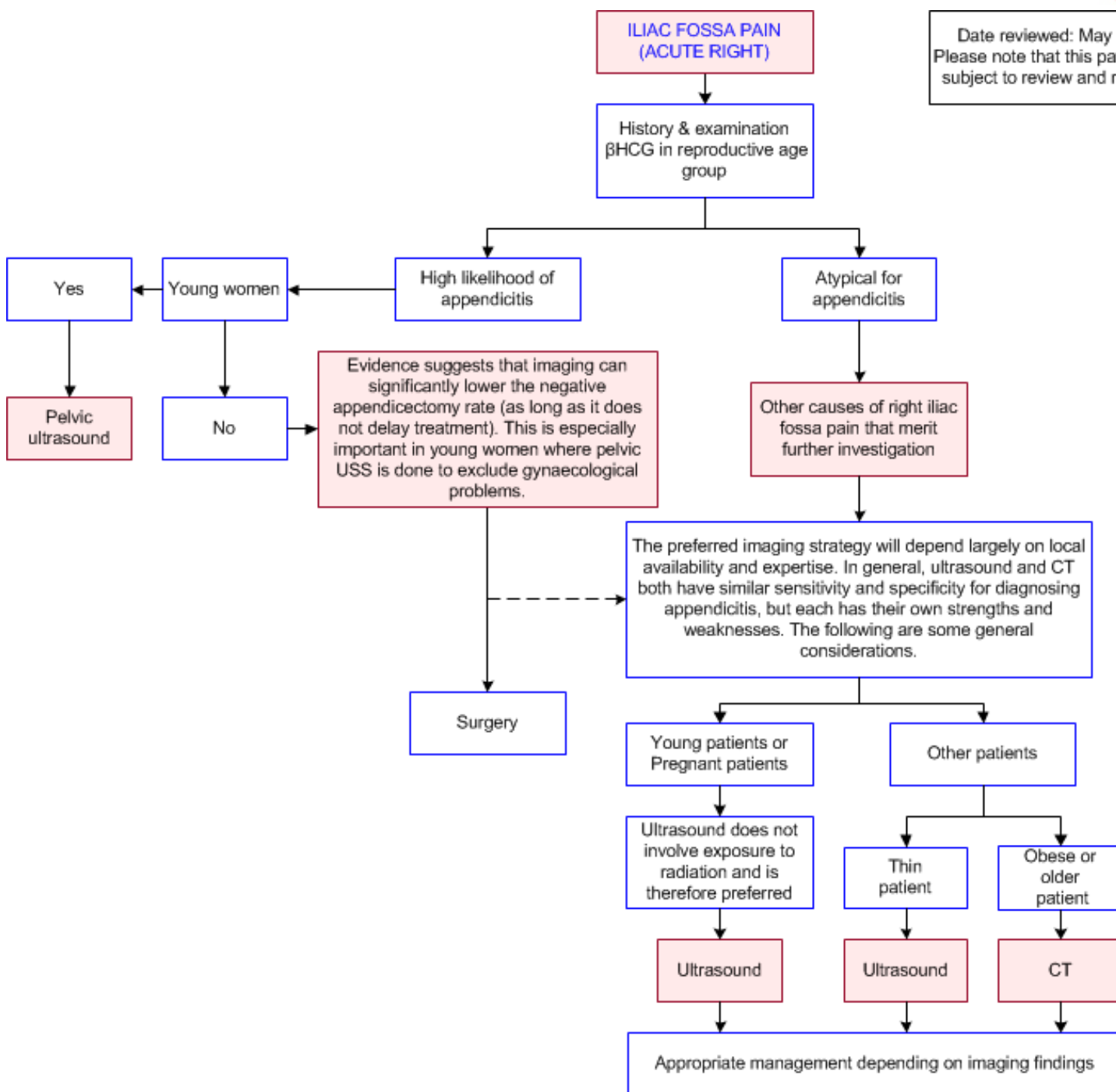


Image Gallery

Note: These images open in a new page

1a

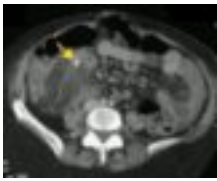


Acute Appendicitis

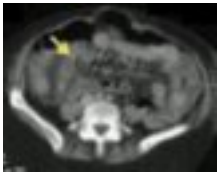
Image 1a (Ultrasound): Dilated, non-compressible appendix with an echogenic appendicolith.

1b

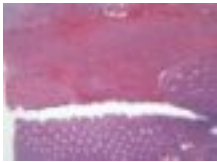
Image 1b and 1c (Computed Tomography): Dilated appendix with appendicolith (arrow).



1c



2



Acute Appendicitis

Image 2 (H&E, x2.5): Histological section showing acute suppurative appendicitis. There is ulceration of the mucosa associated with haemorrhage and a dense transmurular infiltrate of neutrophils and mononuclear inflammatory cells.

3a



Ectopic Pregnancy

Image 3a (Ultrasound): Direct demonstration of ectopic foetus (between callipers).

3b

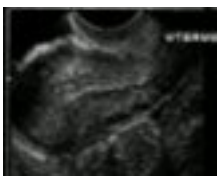
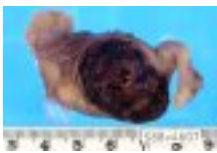


Image 3b (Ultrasound): Empty endometrial cavity.

4a



Ectopic Pregnancy

Image 4a and 4b (HE, x20). Resection of fallopian tube with an ectopic tubal pregnancy. The histological section shows ulceration of the tubal epithelium, haemorrhage and chorionic villi (arrows) which confirm the presence of products of conception.

4b



5



Crohn's Disease

Image 5 (Computed Tomography with intravenous contrast): Thickened loops of small bowel with stranding of the mesentery.

6



Crohn's Disease

Image 6: Segmental small bowel resection showing deep linear/serpiginous mucosal ulceration (blue arrow) and a thickened bowel wall with stricture formation (green arrow).

Teaching Points

- In suspected acute appendicitis, imaging can significantly reduce the negative appendicectomy

rate but must not delay treatment

- Both ultrasound and CT are accurate for the diagnosis of appendicitis
- Ultrasound is generally preferable as the first investigation in young patients because
 - There is no ionizing radiation
 - It can detect gynaecological causes of acute pain in young female patients

Pelvic Ultrasound

- Has a sensitivity and specificity of approximately 75-90% and 78-100% respectively for the diagnosis of acute appendicitis [1-5](#)
- Performed using the graded compression technique, which involves applying anterior compression to reduce the depth of the abdominal cavity between the appendix and the transducer [1](#)
- Features of appendicitis on ultrasound include [6](#)
 - An outer appendix diameter of 6mm or larger
 - Positive sonographic McBurney sign
 - Non compressibility of the appendix
 - Echogenic periappendiceal inflammatory fat change
- Advantages
 - Non-invasive and involves no exposure to ionizing radiation
 - Rapid and inexpensive
 - Can diagnosis an alternate cause for abdominal pain
 - If necessary can be used with transvaginal ultrasound to provide information regarding the uterus, adnexa and ovaries in young women with right lower quadrant / pelvic pain [16](#)
- Disadvantages
 - Lower sensitivity and specificity for perforated appendicitis [7](#)
 - Less accurate with obese patients and those with a retrocaecal appendix [8](#)
 - Operator dependent

Other Causes of Acute Right Iliac Fossa Pain

Common causes

- Tubo-ovarian pathology and ectopic pregnancy in females
- Mesenteric adenitis
- Right sided diverticulitis
- Inflammatory bowel disease
- Epiploic appendagitis
- Omental torsion / infarction
- Renal colic

Tubo-ovarian pathology includes

- Pelvic inflammatory disease (salpingitis, tubo-ovarian abscess)
- Ovarian cyst accident (ruptured ovarian cyst, haemorrhage, ovarian or fallopian tube torsion)
- Endometriosis
- Ectopic pregnancy

Computed Tomography (CT)

- Has a sensitivity and specificity of approximately 76-100% and 83-97% respectively for the diagnosis of acute appendicitis [5,9,10,11,12](#)
- The scanning technique has varied between studies with some using no contrast agents and others using one or more of oral, intravenous and rectal contrast. The optimum technique is uncertain [13,14](#)
- Advantages
 - Generally considered to be more accurate than ultrasound in obese patients
 - Can diagnose an alternate cause for abdominal pain
- Disadvantages
 - Can be difficult to identify the appendix [15](#)
 - Can be more difficult to diagnose a perforated appendix
 - Exposure to ionizing radiation
 - Risk of contrast reaction if used

Imaging in Patients With High Likelihood of Appendicitis

- The clinical diagnosis of appendicitis is unreliable, and atypical presentations are frequent. Delayed diagnosis is associated with an increased rate of perforations and post-operative complications. This must be balanced against the negative appendectomy rate, which is higher in pre-menopausal females compared to males due to acute gynaecological conditions [17,18](#)
- Evidence suggests that preoperative imaging of suspected appendicitis is associated with a significantly lower rate of negative appendectomies, without delaying the time-to-surgery, or the perioperative complication rate [17,18,19](#)

References

Date of literature search: May 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](#)

- [1.](#) Puylaert JBCM. **US evaluation using graded compression.** Radiology. 1986;158:355-60. (Level II evidence). [View the reference](#)
- [2.](#) Puylaert JBCM, Rutgers PH, Lalissang RI, et al. **A prospective study of ultrasonography in the diagnosis of appendicitis.** N Engl J Med. 1987;317:666-9. (Level III evidence)
- [3.](#) Abu-Yousef MM, Bleicher JJ, Maher JW, et al. **High-resolution sonography of acute appendicitis.** AJR Am J Roentgenol. 1987;19:53-8. (Level III evidence)
- [4.](#) Franke C, Böhner H, Yang Q, Ohmann C, Röher H. **Ultrasonography for diagnosis of acute appendicitis: results of a prospective multicenter trial.** World J Surg. 1999;23:141-6. (Level IV evidence)
- [5.](#) Poortman P, Lohle PNM, Schoemaker CMC, et al. **Comparison of CT and sonography in the diagnosis of acute appendicitis: a blinded prospective study.** AJR Am J Roentgenol. 2003;181:1355-9. (Level II evidence). [View the reference](#)
- [6.](#) Lee JW. **Sonography of acute appendicitis.** Semin Ultrasound CT MR. 2003;24:83-90. (Review)



- article)
7. Borushok KF, Jeffrey RB, Laing FC, Townsend RR. **Sonographic diagnosis of perforation in patients with acute appendicitis.** AJR Am J Roentgenol. 1990;154:275-8. (Level III evidence)
 8. Birnbaum B, Wilson S. **Appendicitis at the millenium.** Radiology. 2000;215:337-48. (Review article)
 9. Malone AJ, Wolf CR, Malmed AS, Melliere BF. **Diagnosis of acute appendicitis: value of unenhanced CT.** Am J Radiol. 1993;160:763-6. (Level III evidence)
 10. Lane MJ, Katz DS, Ross BA, et al. **Unenhanced helical CT scan for suspected acute appendicitis.** Am J Radiol. 1997;168:405-9. (Level III evidence)
 11. Rao PM, Rhea JT, Novelline RA, et al. **Helical CT technique for the diagnosis of acute appendicitis: prospective evaluation of a focused appendix CT examination.** Radiology. 1997;202:139-44. (Level II evidence). [View the reference](#)
 12. Schuller JG, Shortsleeve MJ, Goldenson RS, et al. **Is there a role for abdominal computed tomographic scans in appendicitis.** Arch Surg. 1998;133:373. (Level III evidence)
 13. Lane MJ, Liu DM, Huynh MD, et al. **Suspected acute appendicitis: nonenhanced helical CT in 300 consecutive patients.** Radiology. 1999;213:341-6. (Level II evidence). [View the reference](#)
 14. Wijetunga R, Doust B, Bigg-Wither G. **The CT diagnosis of acute appendicitis.** Semin Ultrasound CT MR. 2003;24:101-6. (Review article)
 15. Fuchs JR, Schlambert JS, Shortsleeve MJ, et al. **Impact of abdominal CT imaging on the management of appendicitis: an update.** J Surg Res. 2002;106:131-6. (Level III evidence)
 16. O'Malley ME, Wilson SR. **Ultrasonography and computed tomography of appendicitis and diverticulitis.** Semin Roentgenol. 2001;36(2):138-47. (Review article)
 17. Rosengren D, Brown AF, Chu K. **Radiological imaging to improve the emergency department diagnosis of acute appendicitis.** Emerg Med Australas. 2004;16:410-6. (Level III evidence)
 18. van Breda Vriesman AC, Kole BJ, Puylaert JB. **Effect of ultrasonography and optional computed tomography on the outcome of appendicectomy.** Eur Radiol. 2003;13:2278-82. (Level III evidence)
 19. Lahaye MJ, Lambregts DMJ, Mutsaers E, Essers BAB, Breukink S, Cappendijk VC, et al. **Mandatory imaging cuts costs and reduces the rate of unnecessary surgeries in the diagnostic work-up of patients suspected of having appendicitis.** Eur Radiol. 2015;25(5):1464-70. (Level III evidence). [View the reference](#)

Information for Consumers

Information from this website	Information from the Royal Australian and New Zealand College of Radiologists' website
<p>Radiation Risks of X-rays and Scans</p> <p>Computed Tomography (CT)</p> <p>Ultrasound</p>	<p>Computed Tomography (CT)</p> <p>Iodine-Containing Contrast Medium</p> <p>Radiation Risk of Medical Imaging During Pregnancy</p> <p>Radiation Risk of Medical Imaging for Adults and Children</p>

[Ultrasound](#)

Copyright

© Copyright 2015, Department of Health Western Australia. All Rights Reserved. This web site and its content has been prepared by The Department of Health, Western Australia. The information contained on this web site is protected by copyright.

Legal Notice

Please remember that this leaflet is intended as general information only. It is not definitive and The Department of Health, Western Australia can not accept any legal liability arising from its use. The information is kept as up to date and accurate as possible, but please be warned that it is always subject to change

File Formats

Some documents for download on this website are in a Portable Document Format (PDF). To read these files you might need to download Adobe Acrobat Reader.



[Legal Matters](#)