

Imaging for chronic abdominal pain in adults

SUMMARY

Diagnostic imaging is often not indicated in chronic abdominal pain. In particular, undifferentiated abdominal pain is rarely an indication for a CT scan.

CT scanning is overused even when imaging is required. Other modalities may be preferable. A normal CT scan does not rule out cancer.

Alarm symptoms, including anaemia, blood in the stool, waking at night with gastrointestinal symptoms, and weight loss, should be investigated. The most appropriate modality depends on the symptoms.

Clinical information on request forms for CT scans should be specific and include the suspected condition as this helps the radiologist to determine an appropriate imaging protocol.

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Key words

abdominal pain, Crohn's disease, gallstones, imaging, irritable bowel syndrome

Aust Prescr 2015;38:49-54

Introduction

Chronic abdominal pain is common in primary care. It is defined as continuous or intermittent abdominal discomfort lasting for at least six months. It may arise from the gastrointestinal tract or adjoining organs, such as the biliary tract or pancreas, or have a gynaecological or genitourinary origin. In many cases, chronic abdominal pain is part of a functional syndrome.

CT of the abdomen is a frequently requested and performed examination for abdominal pain. In 2012-13 there were over 330 000 such Medicare services at a cost of \$146 million. Many of the scans were for non-specific abdominal pain. No data are available for the outcome of these examinations, but in view of the costs as well as the radiation burden to the individual and the community, it is important to ensure that CT of the abdomen is used appropriately. In addition, about 5% of abdominal CT scans will detect 'incidentalomas' unrelated to the patient's symptoms, but often leading to a cascade of further tests resulting in further risk, anxiety and cost.

Diagnostic imaging is often not needed in patients with chronic abdominal pain. When imaging is indicated, a CT scan may not be the ideal investigation. Ultrasound, CT and MRI all have their advantages and disadvantages. Each have their roles, which are not often interchangeable. The risks of ionising radiation with CT should always be considered, particularly in young patients. A non-ionising alternative such as ultrasound or MRI should be chosen if practicable and if it is likely to yield as much diagnostic information. However, if justified (that is, the potential benefit

outweighs the risk), CT should be performed and the patient reassured about the risks.

Ultrasound has the major advantages of safety (no ionising radiation), cost and availability and it can be repeated as often as necessary. However, it is regarded as more operator-dependent than the other modalities. MRI also uses no ionising radiation, although it has several contraindications (including metallic medical devices such as pacemakers, claustrophobia). It is also relatively expensive and access is limited, especially to GPs.

Assessing the patient

In general, clinical localisation of disease by the site of the patient's symptoms is unreliable. However, there is reasonable correlation between epigastric pain and gastroduodenal disease, right upper quadrant pain and hepatobiliary disease, and suprapubic pain and gynaecological causes.¹ It is therefore useful to categorise patients by their predominant presenting features, although there may sometimes be overlap. Categories of presenting features include:

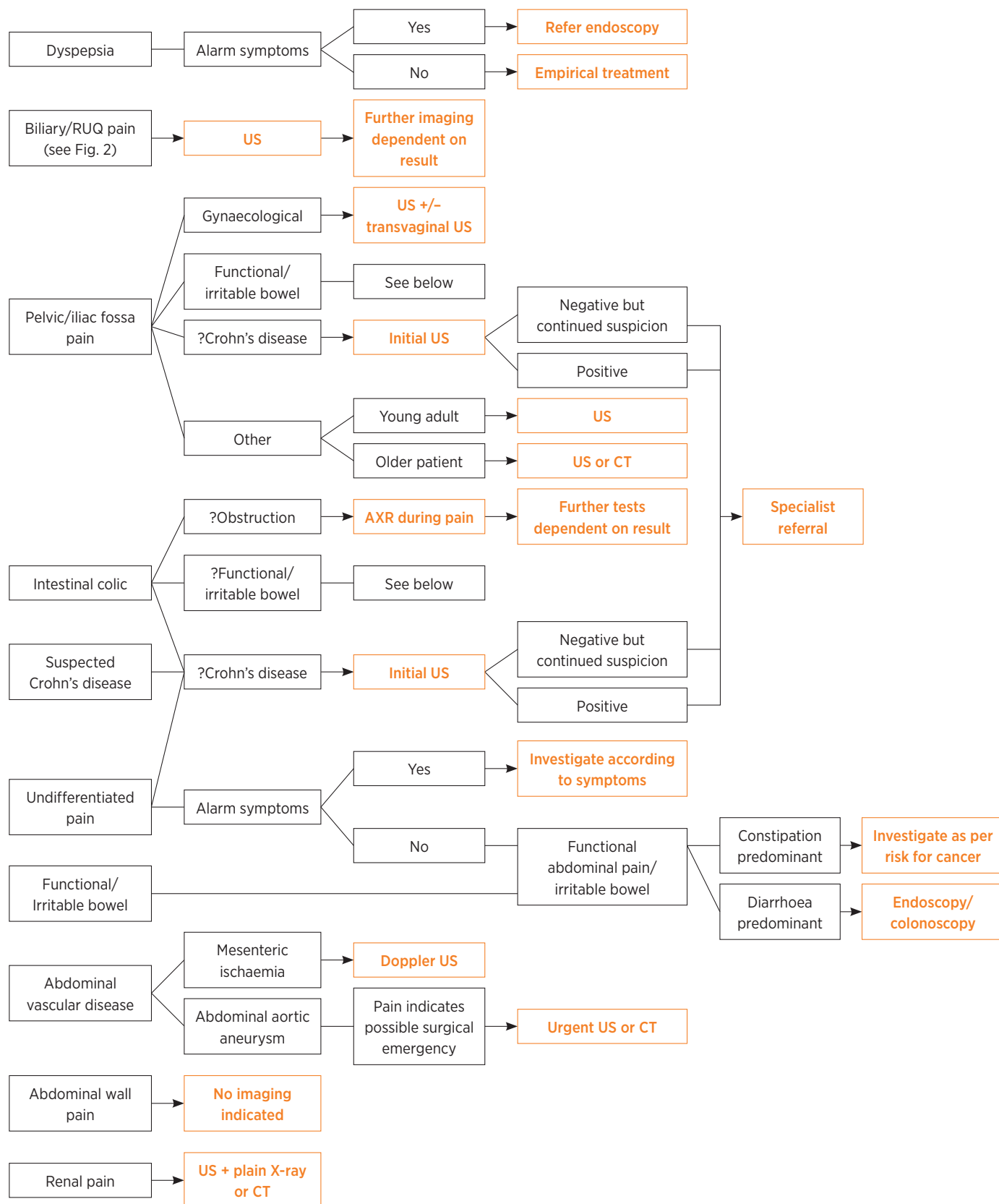
- undifferentiated abdominal pain
- intestinal colic
- symptoms suggesting Crohn's disease
- pelvic or iliac fossa pain, causes of which include gynaecological disease, Crohn's disease and functional syndromes
- dyspepsia
- biliary symptoms or right upper quadrant pain
- renal tract symptoms.

Each of these requires a different approach to diagnostic imaging (see Fig. 1).

DIAGNOSTIC TESTS

Imaging for chronic abdominal pain

Fig. 1 Imaging for chronic abdominal pain in adults



RUQ right upper quadrant US ultrasound AXR abdominal X-ray

Based on 'Diagnostic imaging pathways – abdominal pain (chronic)' at www.imagingpathways.health.wa.gov.au

Undifferentiated chronic abdominal pain

The major causes of undifferentiated abdominal pain are the functional gastrointestinal disorders.² However, inflammatory bowel disease, coeliac disease and mechanical obstruction may need to be excluded. Functional gastrointestinal disorders that may present with pain include irritable bowel syndrome and functional abdominal pain syndrome.

Irritable bowel syndrome

Irritable bowel syndrome is common, affecting about 7% of adults. Although often thought of as a diagnosis of exclusion, a positive diagnosis can be made using symptom complex criteria such as the Rome criteria.^{3,4}

A systematic review of imaging in irritable bowel syndrome concluded that although radiological imaging is frequently used to evaluate patients, there is a striking lack of strong evidence to support this.⁵ Based on the current evidence, further investigations including radiological imaging should only be done in patients who have alarm symptoms, to rule out other structural abnormalities that may mimic irritable bowel syndrome. Early referral to a specialist may be more beneficial than embarking on imaging.

For patients with constipation-predominant irritable bowel syndrome, the need for further investigations should be based on their risk of having colorectal cancer. Those with an above average risk should undergo colonoscopy (or CT colonography, also known as 'virtual colonoscopy'). A CT scan is performed after bowel preparation and insufflation of the colon. CT colonography is widely regarded as superior to barium enema and should replace it.

Most gastroenterologists would recommend colonoscopy in patients with diarrhoea-predominant irritable bowel syndrome to exclude microscopic colitis.

Alarm symptoms

Alarm symptoms that should prompt investigation are:^{5,6}

- A. iron deficiency anaemia
- B. blood in stool
- C. awakening at night with gastrointestinal symptoms
- D. unexplained weight loss
- E. family history of colorectal cancer
- F. age at onset over 50 years.

A, B, C and E should initially be investigated by endoscopy. However, further diagnostic imaging may be required. Pain extending through to the back may be added to the list of alarm symptoms as it can indicate pancreatic disease and should be investigated by CT scanning.

Unexplained weight loss with abdominal pain may require extensive investigation by endoscopy and diagnostic imaging. CT scans can detect a pancreatic lesion or a large gastrointestinal mass, but a normal 'standard' protocol CT scan (that is, without specific bowel preparation) has limited sensitivity for pathology of the bowel.

Functional abdominal pain syndrome

Unlike irritable bowel syndrome, there is no clear relationship to eating or defecation with functional abdominal pain syndrome.⁷ The pain tends to be constant or frequent and is often associated with other somatic symptoms. Imaging is usually not required in the absence of alarm features if all other diagnostic criteria for functional abdominal pain syndrome are present.

Intestinal colic

Colic may be part of a functional syndrome but mechanical obstruction due to inflammatory or neoplastic disease may require exclusion. In patients with suspected mechanical recurrent obstruction, clinical evidence and an X-ray (obtained during an episode of pain) may distinguish small and large bowel disease and indicate the appropriate investigation. Postoperative adhesions are overall the most common cause of recurrent small bowel obstruction. However, further imaging may be required to exclude other causes such as neoplastic or inflammatory disease (e.g. Crohn's disease), especially if there is no past surgical history. This may take the form of CT enterography* or enteroclysis†, or magnetic resonance enterography or enteroclysis.

Large bowel recurrent or subacute obstructive symptoms require urgent investigation. The type of imaging partially depends on whether the patient will tolerate bowel preparation. Specialist referral is warranted.

Suspected Crohn's disease

Ultrasound is a reasonable initial test for suspected Crohn's disease.^{8,9} What follows depends on the level of clinical probability. If this is low, no further imaging may be required since the negative predictive value of ultrasound in this scenario is high. However, if the ultrasound is positive, with non-specific demonstration of thickened loops of bowel, or negative but with continuing clinical suspicion, specialist referral for ileo-colonoscopy is preferable

* enterography involves the ingestion of a large volume of oral contrast before the scan

† enteroclysis is performed by giving contrast medium through a nasojejunal tube

to CT or MRI, which may miss early or localised mucosal disease.

Following a positive diagnosis of Crohn's disease or a negative colonoscopy, but with continued clinical suspicion, CT enterography or enteroclysis, or magnetic resonance enterography or enteroclysis are indicated. When Crohn's disease has been previously confirmed, these scans are to assess the extent and location of disease and the presence of complications.

Pelvic or iliac fossa pain

Causes of pelvic or iliac fossa pain include Crohn's disease, colonic diverticular disease, functional disease and gynaecological disease. In women of reproductive age, when endometriosis or ovarian or other adnexal disease is suspected, pelvic ultrasound (including transvaginal ultrasound when appropriate) is the investigation of choice. In those who do not meet the criteria for irritable bowel syndrome or have red flags, the choice of imaging depends on the provisional clinical diagnosis. Diverticular disease is best initially investigated by CT to look for complications such as pericolic inflammation or chronic abscess. Bear in mind that uncomplicated diverticular disease is extremely common and is very often asymptomatic, and small or even moderate sized cancers cannot be excluded on CT (unless combined with CT colonography, which has a very high negative predictive value).

Dyspepsia

Dyspepsia is defined as a symptom complex of epigastric pain or discomfort thought to originate in the upper gastrointestinal tract. It may include heartburn, acid regurgitation, excessive burping or belching, increased abdominal bloating, nausea, a feeling of abnormal or slow digestion, or early satiety.

Diagnostic imaging has little place in the modern investigation of dyspepsia other than to exclude (by ultrasound) biliary disease as an alternative or concomitant diagnosis, or pancreatic disease if there is clinical suspicion (pain extending through to the back, weight loss, jaundice or abnormal liver function or recent onset of diabetes). CT is indicated for suspected pancreatic disease.

In the absence of red flags, management of dyspepsia is usually with empirical treatment. If red flags are present, or if the patient fails to respond to empirical treatment, investigation is usually by endoscopy.

Red flags indicating early evaluation include:

- age over 55 years and recent onset of symptoms
- daily constant pain
- weight loss
- non-steroidal anti-inflammatory drug use

- vomiting
- a past history of gastric ulcer or gastric surgery
- anaemia
- dysphagia
- gastrointestinal bleeding.

Functional dyspepsia is essentially a diagnosis of exclusion of organic disease.²

Right upper quadrant pain or biliary-type pain

Ultrasound is the first choice of investigation for biliary symptoms or right upper quadrant pain (Fig. 2). It is very accurate at diagnosing or excluding gallstones so if the ultrasound is negative, alternative diagnoses should be considered. If the bile ducts are dilated on an ultrasound scan in the presence of pain, and especially if there are abnormal liver function tests (with or without gallbladder calculi) indicating biliary obstruction, cholangiography and specialist referral are suggested. Biliary obstruction will potentially require surgical or endoscopic intervention.

Cholangiography, initially performed non-invasively with CT cholangiography (if the serum bilirubin is less than twice the upper limit of normal), or magnetic resonance cholangio-pancreatography (MRCP) (independent of the serum bilirubin) are both very accurate at determining the cause of biliary obstruction. In young patients MRCP is preferred because it does not involve ionising radiation.

If the initial ultrasound shows alternative pathology to account for symptoms, such as a peri-ampullary or pancreatic mass, a CT scan and specialist referral are indicated. Functional causes of biliary-type pain also occur,² but organic lesions need to be excluded.

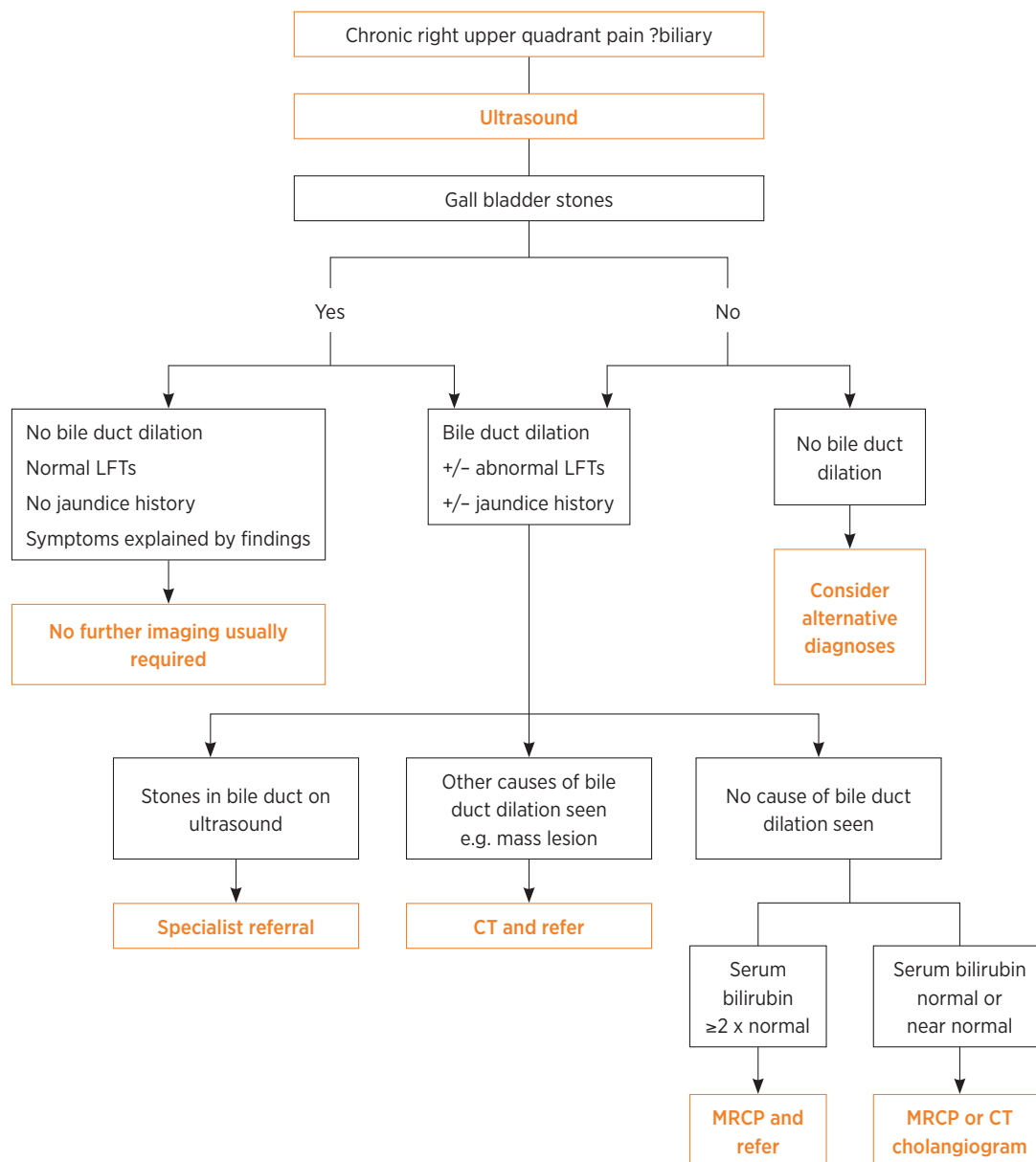
Renal tract symptoms

Pain from the renal tract may be experienced as loin or flank pain. A non-enhanced low-ionising radiation dose CT is indicated if there is an acute exacerbation of pain to exclude ureteric calculi. In younger patients, the combination of a plain X-ray (kidneys-ureters-bladder, KUB) and ultrasound will rule out renal obstruction, intra-renal calculi and renal masses. If the pain is referred to the scrotum, a negative ultrasound of the scrotum should lead to an ultrasound of the whole renal tract. If a renal mass is found, this should be investigated with a multiphase CT scan (CT-IVU, effectively the modern CT equivalent of the conventional intravenous urogram, which is now rarely indicated).

Other conditions

Chronic pain may be caused by vascular conditions such as mesenteric artery stenosis (so-called

Fig. 2 Chronic right upper quadrant pain



LFT liver function test

MRCP magnetic resonance cholangio-pancreatography

Based on 'Diagnostic imaging pathways – upper quadrant pain (chronic right)' at www.imagingpathways.health.wa.gov.au

'mesenteric angina'). This is initially best investigated with Doppler ultrasound. Abdominal aortic aneurysms rarely cause pain until they are large (and usually palpable), and pain is a signal for urgent referral as it may be a sign of imminent leakage.

Chronic abdominal wall pain is an under-recognised condition most commonly due to anterior cutaneous nerve entrapment syndrome. It is characterised by pain that is localised to a highly specific area of the abdomen and is diagnosable by Carnett's test[†].¹⁰

No imaging is indicated for chronic abdominal wall pain and patients usually respond to conservative

[†] Carnett's test involves tensing the muscles of the abdominal wall. The test is positive when the patient's pain is unchanged or worsens, and is indicative of somatic pain arising in the abdominal wall. A negative test (the pain being decreased) is more likely when the pain arises within the abdomen (visceral pain).

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management and injection of a local anaesthetic. Similarly, neuropathic pain, for example post-herpetic pain, does not require imaging.

Request forms for imaging

Clinical information on request forms for CT scans should be specific. 'Abdominal pain ?cause' is unhelpful. Even if a CT scan is indicated, the radiologist will be unable to determine the required scanning protocol.

For example, although a request for suspected renal colic and a request for suspected mesenteric angina indicate an abdominal CT scan, the imaging protocol is quite different. The former requires a low-radiation dose non-intravenous contrast (unenhanced) CT, whereas the latter will often require a multiphase scan (pre-contrast, arterial and portal venous phase post-contrast).

'Rule out cancer' is also not helpful on a request form. A normal CT scan does not rule out cancer and may

well give a false sense of security to the patient and their doctor.

Conclusion

Diagnostic imaging in adults with chronic abdominal pain is overused. Even when imaging is indicated, CT scanning is often not the investigation of choice. All imaging investigations should be justified – a responsibility shared by the referrer and the imaging specialist. Providing adequate clinical information to the radiologist is essential to enable the correct modality and the correct protocol to be performed, and to enable proper interpretation of the significance of the test results. ◀

Richard Mendelson is the Editor-in-Chief of 'Diagnostic Imaging Pathways', the clinical decision support tool and educational resource for diagnostic imaging supported by the Government of Western Australia.

REFERENCES

1. Yamamoto W, Kono H, Maekawa M, Fukui T. The relationship between abdominal pain regions and specific diseases: an epidemiologic approach to clinical practice. *J Epidemiol* 1997;7:27-32.
2. Rome Foundation. Guidelines--Rome III diagnostic criteria for functional gastrointestinal disorders. *J Gastrointest Liver Dis* 2006;15:307-12.
3. American College of Gastroenterology task force on irritable bowel syndrome, Brandt LJ, Chey WD, Foxx-Orenstein AE, Schiller LR, Schoenfeld PS, et al. An evidence-based position statement on the management of irritable bowel syndrome. *Am J Gastroenterol* 2009;104 Suppl 1:S1-35.
4. Drossman DA, Dumitrascu DL. Rome III: New standard for functional gastrointestinal disorders. *J Gastrointest Liver Dis* 2006;15:237-41.
5. O'Connor OJ, McSweeney SE, McWilliams S, O'Neill S, Shanahan F, Quigley EM, et al. Role of radiologic imaging in irritable bowel syndrome: evidence-based review. *Radiology* 2012;262:485-94.
6. Whitehead WE, Palsson OS, Feld AD, Levy RL, VON Korff M, Turner MJ, et al. Utility of red flag symptom exclusions in the diagnosis of irritable bowel syndrome. *Aliment Pharmacol Ther* 2006;24:137-46.
7. Clouse RE, Mayer EA, Aziz Q, Drossman DA, Dumitrascu DL, Mönnikes H, et al. Functional abdominal pain syndrome. *Gastroenterology* 2006;130:1492-7.
8. Horsthuis K, Bipat S, Bennink RJ, Stoker J. Inflammatory bowel disease diagnosed with US, MR, scintigraphy, and CT: meta-analysis of prospective studies. *Radiology* 2008;247:64-79.
9. Dong J, Wang H, Zhao J, Zhu W, Zhang L, Gong J, et al. Ultrasound as a diagnostic tool in detecting active Crohn's disease: a meta-analysis of prospective studies. *Eur Radiol* 2014;24:26-33.
10. Costanza CD, Longstreth GF, Liu AL. Chronic abdominal wall pain: clinical features, health care costs, and long-term outcome. *Clin Gastroenterol Hepatol* 2004;2:395-9.

FURTHER READING

Government of Western Australia Department of Health. Diagnostic imaging pathways. A clinical decision support tool and educational resource for diagnostic imaging. 2014. www.imagingpathways.health.wa.gov.au [cited 2015 Mar 3]

Quality use of abdominal imaging. In: Health News and Evidence. NPS MedicineWise. 2014. www.nps.org.au/publications/health-professional/health-news-evidence/2014/abdominal-imaging [cited 2015 Mar 3]