Expert Review  Examination of the Gastrointestinal System

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Abstract
Examination of the gastrointestinal system is an important skill for medical students and doctors. This article presents a comprehensive, concise and evidence-based approach to this examination which is consistent with The Principles of Clinical Examination [1]. We describe the signs of common and important diseases of the gastrointestinal system and, based on a review of the literature, the precision and accuracy of these signs is discussed.

Word count: 7099 (excluding abstract and references)

Keywords: abdominal examination, gastrointestinal system, acute abdomen, abdominal distension, splenomegaly, hepatomegaly, rebound tenderness, ascites, shifting dullness, clubbing, abdominal aortic aneurysm.

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Introduction
The method used for examination of the gastrointestinal system is well-established and has a traditional structure based around the sequence of inspection, palpation, percussion and auscultation. This article describes how to perform the examination of the gastrointestinal system using a method appropriate for medically stable patients. The routine described here is therefore suitable for standard clinical practice as well as medical school and post-graduate OSCEs. Examination of the acutely unwell patient is beyond the scope of this article and is the subject of a forthcoming Expert Review.

Literature Review
The following textbooks of clinical examination were reviewed:

Macleod’s Clinical Examination [1]
Browse’s Introduction to the Symptoms and Signs of Surgical Disease [2]
Textbook of Physical Diagnosis - History and Examination [3]
Sapira’s Art and Science of Bedside Diagnosis [4]

A Systematic Guide to Physical Diagnosis [6]

The MedLine database was searched via the PubMed interface using the Medical Subject Headings (MeSH) ‘digestive system’ and a selection of keywords, including ‘acute abdomen’, ‘abdominal distension’, ‘splenomegaly’, ‘hepatomegaly’, ‘rebound tenderness’, ‘ascites’, ‘shifting dullness’, ‘clubbing’, and ‘abdominal aortic aneurysm’. The inclusion of such keywords had been found to produce a more satisfactory range of hits than using the term ‘digestive system’ alone. This search was combined with the MeSH ‘physical examination’ as an exploded major heading. The following limits were imposed – ‘Publication date from 1991 to 2009’, ‘Human’, ‘English’. As an additional check, all the terms were then entered into the diagnosis clinical queries filter relating to ‘diagnosis’ in a ‘broad, sensitive search’.

A search of the EMBASE database via the OVID interface was performed in a similar manner, followed by a search of the Cochrane Library and a review of all relevant articles in the Journal of American Medical Association series of Rational
Clinical Examinations \cite{7}. The earliest of these high-quality articles had been published in 1991; it was felt that this justified limiting all other literature searches to the period between 1991-2009.

Preparation

![Image](https://placeholdit.imgix.net/~text?txtsize=20&txt=Figure%201%20The%20abdomen%20divided%20into%20the%20nine%20regions%20by%20two%20longitudinal%20lines%20(right%20and%20left%20midclavicular%20lines)%20and%20two%20transverse%20planes%20(subcostal%20and%20interspinous%20planes).%20The%20hypogastric%20region%20may%20alternatively%20be%20called%20the%20suprapubic%20region.)

Figure 1 The abdomen divided into the nine regions by two longitudinal lines (right and left midclavicular lines) and two transverse planes (subcostal and interspinous planes). The hypogastric region may alternatively be called the suprapubic region.

Ensure that your hands are clean and warm with short nails. The patient should be as relaxed as possible and the examination should ideally take place in a warm, private and well-lit room. Introduce yourself to the patient and obtain informed consent. If a per rectum (PR) and/or genital examination is to be performed a chaperone should be offered, but this is not necessary for the abdominal examination unless requested by the patient. Please refer to separate JCE Expert Reviews for descriptions of PR \cite{8} and genital examinations \cite{9}.

At the start of the examination, position the patient supine on the examination couch with the backrest at 45°. Later in the examination, when the abdomen itself is being examined, we suggest that the bed should be flattened with the patient’s head flat on the bed and their arms relaxed by their side (figure 2). This repositioning lowers the thoracic cage and relaxes the anterior abdominal wall muscles. Other starting positions have been proposed \cite{1, 2, 7}.

The patient would ideally be exposed ‘from nipples to knees’ with a sheet to cover the genitals and groin until exposure is necessary. However, in routine clinical practice less extensive exposure may be adequate.

![Image](https://placeholdit.imgix.net/~text?txtsize=20&txt=Figure%202%20The%20patient%20in%20the%20supine%20position%20with%20one%20pillow%20for%20comfort.)

Figure 2 The patient in the supine position with one pillow for comfort

General Inspection

Begin the examination with a global inspection of the patient and his/her surroundings. Look for localised and systemic signs of gastrointestinal disease and signs of diseases in other systems. Take note of the surroundings and of any medical equipment in the vicinity. If this cannot be done discreetly explain what you are doing to the patient to avoid embarrassment. Any sign is potentially relevant at this stage of the examination and a full list is beyond the scope of this article. Signs of diseases in other systems, for example tachypnoea, may be an indication for additional formal examination of other systems, such as the respiratory or cardiovascular system, at the end of the examination. The key point here is that the iterative process of differential diagnosis begins right from the start of the examination. If your patient is on an intensive care unit with severe jaundice you have already gathered very important diagnostic information before the formal examination has begun. Likewise if he/she is on a surgical assessment unit showing signs of pain and fever, or in a GP’s waiting room looking relaxed and comfortable then the differential diagnosis is quite different.

Look specifically for systemic signs (i.e. those manifest in sites other than the abdomen) of gastrointestinal disease such as jaundice, pallor and hepatic encephalopathy. Jaundice and pallor are most accurately assessed in natural light \cite{7}. The sensitivity and specificity of inspection for anaemia (haematocrit < 30%) and jaundice (bilirubin > 3.0 mg/dL) has been reported as approximately 70% in a prospective study of 49 patients and 88 clinicians \cite{10}. Abnormal skin pigmentation may also be caused by haemochromatosis \cite{7} or chronic cholestasis both of which are pertinent to this examination. Hepatic encephalopathy is an important diagnosis. This
should be considered if the patient who seems to have a cognitive deficit - a more detailed assessment of cognition is beyond the scope of this article. Observe the patient’s movements and posture; those with peritonism tend to lie very still, whereas those with colicky, intermittent spasmodic pain roll around and appear restless [2].

**Hands**

Position yourself to the patient’s right.

Begin by inspecting the nails. Look for finger clubbing which may be associated with the conditions shown in table 1 (for the correct method see Examination for Finger Clubbing [11]). Look for leukonychia (white nails) which is a sign of hypoalbuminaemia and may be due to chronic liver disease. Look for kolononychia (spoon-shaped nails) which is caused by iron deficiency or haemochromatosis [12] and consider doing the ‘water drop test’. In reality this test is often performed ‘mentally’ rather than physically but the concept is that in kolononychia a drop of water will be retained on the concave finger nail rather than slide off.

<table>
<thead>
<tr>
<th>Hepatic cirrhosis</th>
<th>Coeliac disease</th>
<th>Ulcerative colitis</th>
<th>Crohn’s disease</th>
<th>GI lymphoma</th>
</tr>
</thead>
</table>

Table 1 Gastrointestinal causes of clubbing [1]

**Figure 3** The examiner uses both hands to support the patient’s hand while inspecting the palms

Supinate the patient’s hands to observe the palms (figure 3). Pale palmar creases may signify anaemia, whilst palmar erythema (red palms) can be caused by chronic liver disease [13]. Look for signs of thickening of the palmar fascia especially of the little and ring fingers which is a sign of Dupuytren’s contracture. The cause of Dupuytren’s contracture is unknown but it has multiple associations including alcoholism, smoking, epilepsy, diabetes, repeated trauma, and family history [2].

**Wrist**

Take the radial pulse. See Examination of the Cardiovascular System for the correct method [14].

Next, ask the patient to hold their arms out in front of them, elbows extended, and wrists cocked back for approximately ten seconds (figure 4). Look for a tremor which may be caused by alcohol withdrawal. Then, maintaining this position, ask them to fully dorsiflex their wrists and hold that position for approximately thirty seconds whilst you closely observe. It is best to give these instructions whilst demonstrating the position at the same time [7]. Look for asterixis (‘liver flap’) – jerky flexion and extension movements of the wrist and small joints of the hands [9] caused by the metabolic effects of liver dysfunction and hypercapnia. Occasionally the arms, neck, tongue, jaws and eyelids are also involved [7].

**Arms**

Measure the blood pressure at this stage if indicated.

**Face**

Ask the patient to look straight ahead. Gently pull down the lower eyelid to look for conjunctival pallor which is a sign of anaemia. Whilst the sclera is still exposed and under ambient white or natural light, inspect the eyes for the yellow colour of jaundice. This sign results from the conjunctiva, not in fact the sclera, being stained by bile pigment, nevertheless it is commonly referred to as scleral icterus. In Wilson’s disease, an autonomic recessive copper storage disorder, you may see Kayser-Fleischer rings, where excess copper is deposited in
Descemet's membrane to form brownish-green rings at the periphery of the cornea [7]. These rings are best viewed with a slit lamp. Finally look for xanthelasma, yellow periorbital plaques due to lipid deposition, which are common in chronic cholestasis [7].

Now ask the patient to open their mouth. Check for angular cheilitis (also known as angular stomatitis - inflammatory lesions at the corners of the mouth that are associated with iron deficiency) [1] and shine a torch inside checking for obvious ulceration, which may be due to an underlying medical condition such as Crohn's disease, coeliac disease or reactive arthritis. Ask the patient to stick out their tongue; this may appear pale and smooth in atrophic glossitis caused by iron deficiency; or beefy, red and raw in folate and vitamin B12 deficiency [1]. You may also be able to detect alcohol or the distinctive sweet smell of fetor hepaticus on the patient's breath [7]. The latter is commonly found in ketosis or severe liver disease, and is caused by the accumulation of volatile aromatic substances in the body.

**Neck and Chest**

Stand behind the patient (figures 5a & 5b) and palpate for lymphadenopathy in the neck and supraclavicular region (see the Examination of the Respiratory System for a detailed description of technique [15]). If palpation from behind is not possible, or not convenient, then palpation from the front is acceptable. Try to elicit Troisier's sign, the presence of a palpable metastatic scalene lymph node in the left supraclavicular fossa. The enlarged node itself is called Virchow's node, and can be caused by gastric and pancreatic cancer [1].

**Abdominal Examination**

**Scratch Marks, Bruising and Spider Nivae**

This is a good point to inspect the skin of the arms and trunk, especially the abdomen, for scratch marks (pruritis is a feature of cholestatic liver disease), bruising (due to impaired clotting factor production in liver failure) and spider naevi (see below). You may prefer to choose another point in the examination to look for these signs or they may have been detected in the initial global inspection but they should be looked for twice - once when in close proximity to the patient.

Spider naevi are telangiectatic lesions which fill from a central feeding vessel. Compression of the central arteriole with the head of a pin makes the radiating 'spider legs' fade completely. More than five spider naevi are abnormal and may be caused by excess oestrogen as a result of reduced oestrogen metabolism in chronic liver disease. In men, excess oestrogen can also produce gynaecomastia.

**Inspection of the Abdomen**

Ensure that the patient is completely supine for this part of the examination. Inspect the abdomen for scars, stomas, striae, sinuses, and fistulae. Striae are irregular areas of skin (bands, stripes or lines) and may be caused by abnormal collagen formation (Cushing’s syndrome, Ehlers-Danlos syndrome) or rapid stretching of the skin (pregnancy, obesity), whilst sinuses and fistulae are abnormal connections to the skin surface, often resulting from a deep infection, or infection of a surgical tract e.g. following laparoscopic surgery. Note the presence of any stomas. Pay particular attention to the site of the stoma, the contents of the stoma bag, and whether the stoma is spouted or flush with the skin. This may help you identify the type of stoma (table 2).
If the abdomen looks distended, ask the patient if this is normal for them. The umbilicus is a useful clue as it is usually sunken in obesity, and flat or everted in other conditions such as ascites. Decide whether the distension is generalised (Table 3) or caused by a localised mass [1].

Ask the patient to look to the side and cough. Then ask them to raise their head up from the bed by just a few degrees and hold that position for a few seconds before relaxing back into the supine position. A patient with peritonism will find these movements very difficult due to severe pain and the rise in intra-abdominal pressure may accentuate or reveal abdominal wall hernias. The diagnosis of peritonism is usually obvious from early in the examination because the patient looks clinically unwell, shows signs of severe pain and tries to avoid any movements of the abdomen. So it may be appropriate to use this manoeuvre earlier in the examination as soon as the diagnosis is suspected.

Abdominal wall hernias include umbilical, incisional and spigelian hernias. Examination of inguinal and femoral hernias is beyond the remit of this article, but is covered in detail in Examination of Groin Hernias [28]. Umbilical hernias resulting from incomplete closure of the abdominal wall during foetal development and are often noted at birth as a protrusion at the umbilicus. Umbilical hernias may also appear later in life, particularly after pregnancy, because this region is an area of weakness in the abdominal wall. Incisional hernias, meanwhile, result from abdominal surgery that causes a defect in the abdominal wall. Lastly, a spigelian hernia is a rare type of hernia that occurs parallel to the midline of the abdomen, along the edge of the rectus abdominus muscle through the spigelian fascia.

### Table 3 Causes of generalised abdominal distension [1]

<table>
<thead>
<tr>
<th>Cause</th>
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<tbody>
<tr>
<td>Fat (obesity)</td>
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<tr>
<td>Fluid (ascites)</td>
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<tr>
<td>Flatus (obstruction/ileus)</td>
</tr>
<tr>
<td>Faeces (constipation)</td>
</tr>
<tr>
<td>Fetus (pregnancy)</td>
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<tr>
<td>Flipping big tumour (I)</td>
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</table>

Dilated surface veins on the abdominal wall indicate portal hypertension or vena caval obstruction. ‘Caput medusa’ is the name given to distended veins flowing away from the umbilicus. Such signs of collateral circulation have more than 90% specificity for detecting cirrhosis, but are not sensitive [13]. Peristaltic bowel movements may occasionally be visible if there is bowel obstruction.

### Palpation

Before palpating the abdomen ensure the patient is in the optimal position with their head relaxed on the couch and the the arms relaxed alongside the body. This ensures that the abdominal wall muscles are relaxed and not tense. Placing a pillow underneath the patient’s knees may also help [1], although this slightly reduces access to the abdomen [2]. Ideally you should sit or kneel to the right of the patient at the same level as the patient, although standing may be adequate. Whilst palpating your hand and forearm should be in the same horizontal plane as the front of the patient’s abdomen (figure 6) [2].

The aim of palpation is to detect tenderness, masses and organomegaly. Before beginning, ask the patient if they have any pain, and if so ask him/her to point to where the pain is maximal.

![Figure 6](image_url) The patient rests both arms alongside their body whilst the examiner palpates the abdomen at the same level at the patient

All movements of your hand should occur at the metacarpophalangeal joints and the hand should be moulded to the shape of the abdominal wall [7]. Palpate gently but deliberately and ask him/her to report any tenderness as you go - avoid jerky or rapid movements. In the presence of pain, start as far away as possible from its maximal site, then move systematically through the nine regions of the abdomen (figure 1) lightly palpating each one in turn to a depth of approximately one centimetre until you reach the site of maximal pain. If the patient has no pain then simply choose an arbitrary starting point and palpate in a logical sequence. Always remember to watch the patient’s face for discomfort. Once the entire abdomen has been palpated superficially repeat the palpation using deeper movements, feeling specifically for masses and organomegaly.
Typical location | Spouted or flush? | Contents of bag
--- | --- | ---
Ileostomy | Right iliac fossa | Spouted | Liquid small bowel contents
Colostomy | Left iliac fossa | Flush | Faecal matter
Urostomy | Either side of the umbilicus | Spouted | Urine (bag may have a tap to allow contents to drain)

Table 2. Abdominal stomas [1]

Tenderness is an important sign [1] and maybe associated with guarding. Try to distinguish between voluntary guarding (conscious contraction of the abdominal musculature in apprehensive patients anticipating a potentially painful clinical examination) and involuntary guarding (localized peritoneal inflammation causing reflex contraction of overlying abdominal muscles upon palpation). Differentiating between voluntary and involuntary guarding can be achieved by engaging the patient in conversation to divert their attention whilst palpating, which would reduce voluntary but not involuntary guarding. Generalised peritonitis - inflammation of the whole peritoneal cavity - causes widespread tenderness elicited by minimal pressure. The abdominal wall muscles are held rigid [7] (‘board-like’) and breathing becomes increasingly thoracic [1].

Rebound tenderness is said to be present when the sudden withdrawal of manual pressure causes more pain than its application. This is a specific sign of peritonism. The presence of rebound tenderness can be tested by gently pressing the hand quite deeply against the abdomen, holding it for a few seconds, then rapidly removing it; however, light percussion (looking for ‘percussion tenderness’) may cause less distress to the patient in these circumstances [2]. Rebound tenderness is classically seen in acute abdominal pathology such as appendicitis, so may not be an appropriate test in all patients. Interestingly, a study of paediatric patients found that this was the only component of the abdominal examination showing moderate (as opposed to poor) inter-examiner reliability [16]. Another study found that the positive predictive value of rebound tenderness for peritonism was 88%, compared with 58% for ‘the cat’s eye symptom’ (pain on driving over a bump in the road) and 56% for the cough sign (pain on coughing) [17].

If a mass is detected it should be assessed for the characteristics listed in table 4. To distinguish between a deep and superficial mass, ask the patient to tense their abdominal muscles by raising their head off the bed. If the mass is within the abdominal wall it will still be palpable whereas a deeper mass will not [1]. See Examination of Lumps and Bumps [18] for general advice on the examination of superficial masses.

![Tenderness](image)

<table>
<thead>
<tr>
<th>Tenderness</th>
<th>Site</th>
<th>Size</th>
<th>Surface</th>
<th>Shape</th>
<th>Edge</th>
<th>Consistency</th>
<th>Fluid thrill</th>
<th>Pulsatility</th>
<th>Mobility and movement with inspiration</th>
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Table 4 Features of a mass on palpation [7]

Palpating for the Liver and Gallbladder

Lever
Palpate for the lower border of the liver which should be palpable if it is normal sized. Begin by placing your right hand parallel to the right costal margin, in the right iliac fossa [1] or at the level of the umbilicus [2] (both of these methods allow for detection of a massively enlarged liver). Press into the abdomen with the radial border of the right hand, keep it stationary and ask the patient to take a deep breath in (figure 7). The lower edge of a grossly enlarged liver will move downwards on inspiration and ‘bump’ against the radial side of your index finger [2]. If nothing abnormal is felt, move your hand upward towards the costal margin by a few centimetres at a time, repeating the process until the costal margin or the liver edge is reached. If the liver edge is detected, describe size, surface, edge, consistency, tenderness, and pulsatility [2]. See Table 5 for causes of hepatomegaly, and [31] for evaluation of the clinical utility of palpating the liver.
Figure 7  The examiner palpates for the liver from the right iliac fossa using the radial border of the right hand.

Table 5 Causes of hepatomegaly

Chronic parenchymal liver disease
- Alcoholic liver disease
- Autoimmune hepatitis
- Viral hepatitis
- Primary biliary cirrhosis

Malignancy
- Primary hepatocellular cancer
- Secondary metastatic cancer

Right heart failure

Haematological disorders
- Lymphoma
- Leukaemia
- Myelofibrosis
- Polycythaemia

Rarities
- Amyloidosis
- Budd-Chiari syndrome
- Glycogen storage disorders

gallbladder classically becomes chronically fibrosed and thus incapable of enlargement) and is more likely to be secondary to carcinoma of the pancreas or distal cholangiocarcinoma. However, Trowbridge et al. warn that the occurrence of Courvoisier’s sign in biliary conditions other than obstructive malignancies has been reported.

Figure 8 Abdominal anatomy. (A) Liver (B) Gallbladder (C) Ascending colon (D) Spleen (E) Stomach (F) Transverse colon

Table 6

Gallbladder
The gallbladder sits just below the liver (see Figure 8) and is not normally palpable. However, it may be palpable below the right costal margin if swollen due to obstruction of the cystic duct or common bile duct. Orient your right hand perpendicular to the costal margin and palpate from medial to lateral below the right costal margin, feeling for a bulbous, focal, rounded mass which moves downwards on inspiration (Figure 9). If an enlarged, non-tender gall bladder is associated with jaundice, Courvoisier’s Law states that the underlying pathology is unlikely to be due to gallstones (as the gallbladder classically becomes chronically fibrosed and thus incapable of enlargement). However, Trowbridge et al. warn that the occurrence of Courvoisier’s sign in biliary conditions other than obstructive malignancies has been reported.
Details of study: Pooled data from several other studies Outcome: The likelihood ratio for hepatomegaly, given a palpable liver, is a modest 2.5; whereas the likelihood ratio for hepatomegaly in the absence of a palpable liver is 0.45. Conclusion: Since liver examination will yield less in patients not suspected of having liver disease, the author recommends a selective approach whereby palpation of the lower liver border should suffice in patients with low probability of liver disease; whereas more detailed palpation, such as that used to assess quality of the liver edge, should be reserved for patients with other signs of liver disease.

Details of study: Five observers were asked to perform a structured history and physical examination on 20 jaundiced patients Outcome: The authors reported moderate agreement in detecting the presence or absence of hepatomegaly (κ = 0.30) Conclusion: Palpation for hepatomegaly can be useful in the setting of jaundice.

Evidence Box 1

Now look for Murphy’s sign of acute cholecystitis. Ask the patient to breathe out, then gently palpate the right subcostal region. Next, with your hand still in place, instruct the patient to take a deep breath in (figure 10). This pushes the abdominal contents down as the diaphragm contracts, causing the gallbladder to descend toward the examiner’s hand. When this manoeuvre elicits a painful response from the patient, it is considered a positive Murphy’s sign, provided that the same test repeated on the left side is negative. The painful response is characterised by a sudden cessation of inspiration when the gallbladder reaches the examining fingers, and this is termed ‘inspiratory arrest’. Trowbridge et al. [21] found that out of numerous clinical and laboratory findings associated with acute cholecystitis, Murphy’s sign had the highest likelihood ratio (2.8) of diagnosing the condition correctly. Another retrospective study found that in the presence of Murphy’s sign, diagnostic accuracy for acute cholecystitis was 80%, although this dropped to 34% when the sign was negative [22].

Palpating for the Spleen
The normal adult spleen lies immediately under the diaphragm in the left upper quadrant of the abdomen. It is not normally palpable, and can only be felt once it has increased in size threefold [1]. Since the spleen enlarges from under the left costal margin down and medially towards the right iliac fossa, again use your right hand to start palpation in the right iliac fossa. Palpate downwards and cephalad, ask the patient to breathe in deeply as before, and try to detect the spleen edge moving downwards against your fingertips (figure 11). Release, then move your hand diagonally upwards towards the left costal margin, repeating the same procedure inch by inch until the left costal margin is reached. Feel along the left costal margin, as the position of the spleen tip is variable. A palpable splenic edge always indicates splenomegaly, and a characteristic notch may be felt midway along its leading edge [1] that helps in differentiating the spleen from the kidney [3]. See Table 6 for causes of splenomegaly, and EB2 for evaluation of clinical utility of palpating the spleen.

Figure 10 Murphy’s sign - The examiner palpates the right subcostal region whilst the patient takes a deep inspiration.

Figure 11 – The examiner palpates for the spleen downwards and cephalad from the right iliac fossa.
Haematological disorders
Lymphoma
Leukaemia, especially chronic myeloid leukaemia
Myelofibrosis
Polycythaemia
Haemolytic anaemia

Portal hypertension

Infections
Glandular fever
Malaria
Brucellosis
Kala azar (leishmaniasis)
Subacute bacterial endocarditis

Rheumatological conditions
Rheumatoid arthritis
Systemic lupus erythematosus

Rarities
Sarcoidosis
Amyloidosis
Glycogen storage disorders

Table 6  Causes of splenomegaly

<table>
<thead>
<tr>
<th>Table 6 Causes of splenomegaly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question: How accurate is physical examination in detecting splenomegaly?</td>
</tr>
<tr>
<td>Reference: Halpern et al. 1974 [24] Population: 214 patients Details of study: Authors attempted to estimate the size of the liver and spleen by scintiphotography, then correlated data with the clinical finding of physicians Outcome: Of the 92 cases of splenomegaly, only 26 (28%) were detected by physical examination. False positive results occurred infrequently, in three (1.4%) patients. Conclusion: Since palpation of the spleen has a low sensitivity, it is most useful to rule in the diagnosis of splenomegaly among patients in whom there is a clinical suspicion of at least 10%. It cannot definitively rule in or rule out splenomegaly in normal, asymptomatic patients.</td>
</tr>
</tbody>
</table>

Evidence Box 2

Palpating for the Kidneys
The kidneys lie retroperitoneally in the paravertebral gutter of the abdominal cavity (figure 12). To palpate the patient’s right kidney, place your left hand behind the patient’s right loin between the twelfth rib and the iliac crest. Then place your right hand on the right side of the abdomen just below the level of the anterior superior iliac spine [2]. Palpate the loin between your hands as the patient breathes in and out; if the kidney is easy to feel it is either enlarged or abnormally low, as normal kidneys are usually impalpable except in very thin patients. This technique is called ballotting [7].

To feel the left kidney, lean across the patient and place your left hand around the flank into the left loin, then place your right hand on the abdomen and try to palpate the kidney between both hands (figure 13) [7]. Some clinicians advocate moving to the patient’s left side to palpate the left kidney [7]; however, as this will not always be possible due to arrangement of furniture, we recommend becoming acquainted with the former method.

Figure 12  Abdominal anatomy. Transverse section at L1 level: (A) Liver (B) Gallbladder (C) Stomach (D) Transverse colon (E) Jejunum (F) Spleen (G) Left colic (splenic) flexure (H) Neck of pancreas (I) Abdominal aorta (J) L1 vertebral body (K) Inferior vena cava (L) Right kidney (M) Left kidney

Insert figure 13  The examiner palpates for the patient’s left kidney, placing one hand underneath the patient’s left loin whilst the other is placed on the abdomen
**Evidence Box 3**

**Palpating for the Aorta**

The aortic pulse is palpable in thin individuals, but is usually impalpable in muscular or obese patients. Palpation of the aorta is primarily to detect an abdominal aortic aneurysm (AAA) which may be asymptomatic but rupture of which can have a very high mortality [25]. Ensuring that the patient’s abdominal muscles are relaxed, place both hands flat above the umbilicus. Position yourself so that the fingers of each hand point toward the epigastrum and the ulnar borders of each hand run alongside the patient’s left and right costal margins respectively. Include a generous amount of abdominal skin between the index fingers and, if you find it easier, probe for one side of the aorta at a time (figure 14) [26]. The aorta may be felt as a pulsatile mass which characteristically exhibits lateral as well as vertical expansion [3]. It may be possible to palpate a non-aneurysmal aorta in slim patients, and this should not be confused with an aneurysm. Indeed, it is the width and not the presence or intensity of the pulsation that suggests the diagnosis of an AAA [25]; aortas estimated to be wider than 2.5 cm warrant further investigation, usually ultrasound [25]. Note that even grossly enlarged aneurysms may not be palpable due to body habitus; in this situation the absence of a palpable aneurysm does not rule out an AAA and therefore further investigation may be necessary.

See **EB3** for evaluation of the clinical utility of palpating for a non-ruptured abdominal aortic aneurysm.

**Figure 14 – The examiner uses both hands, parallel to the costal margins, to palpate for the aorta**

**Percussion**

Routine examination of the abdomen should include percussion. The whole abdomen should be percussed to demonstrate the presence of bowel gas (resonant) and solid or fluid-filled structures (dull). Percussion can also be used to map out a tender area identified during palpation.
To gain maximum information from percussion, a good technique is important. Use your non-dominant hand as a base; most frequently, the dorsal aspect of the middle third phalanx is struck (figure 15). This finger should be firmly placed on the skin, away from bony prominences. Use the middle finger of your free hand to deliver a series of two blows in each position, with equal force. Blows must be delivered by bending the wrist only.

Figure 15 The examiner percusses by striking the firmly applied middle phalanx of the middle finger of the left hand with the middle finger of the right hand

Confirm your findings from palpation by percussion. In particular for the liver, remember that a palpable liver edge does not always signify an enlarged liver. Percussion is performed to estimate liver margins and therefore to determine liver size. Percussion should be performed first at the right midclavicular line, and subsequently at the midsternal and anterior axillary lines. To locate the upper border, percuss from above the right nipple down towards the right costal margin. To locate the lower border, percuss from a level below the umbilicus up towards the right costal margin. The upper border is percussed using heavy percussion to eliminate the resonant quality produced by overlying segment of lung, whilst the lower border is percussed using light percussion to ensure inferior extent is not underestimated due to the liver’s close apposition to the anterior abdominal wall. The normal upper border of the liver should be in the fifth intercostal space, whilst that of the lower border is at the right costal margin. Non-hepatomegaly causes of a palpable liver edge may be detected upon percussion at the upper border of the liver, and include hyperinflated lung pushing the liver down (emphysema or asthma), or interposition of the transverse colon between the liver and the diaphragm. Other examples of a palpable liver edge not resulting from hepatomegaly are the presence of a palpable caudate or Riedel’s lobe or a thin body habitus with a narrow thoracic cage.

To percuss for the spleen, begin percussion in the right iliac fossa and proceed diagonally in a straight line toward the left costal margin. Remember that retroperitoneal structures and masses are resonant to percussion due to overlying bowel; thus, an enlarged kidney will be resonant to percussion, whereas an enlarged spleen will not. Note that, whereas some clinicians prefer to palpate the whole abdomen before percussing, Browse advises that each organ should be assessed with both palpation and percussion before moving onto the next organ. Both methods are perfectly acceptable.

A dull area may also draw attention to a mass missed upon palpation. Check any circumscribed mass for a fluid thrill by placing a hand on both sides of the mass, then quickly flexing the metacarpophalangeal joints of one hand, whilst feeling for a vibration or ‘thrill’ on the other side with the other hand.

Examing for Ascites
Now try to ascertain whether the patient has ascites (free fluid in the abdominal cavity). Bear in mind that in most cases, ascites is associated with abdominal distension which you may already have detected on inspection. Percuss from the midline away from you to the flank furthest away, noting any change from resonant to dull. If no such change is present, move on to examine for a succussion splash (below). If a change from resonant to dull is heard upon percussion, examine for shifting dullness in the following manner. Keep your finger on the site of dullness in the flank and ask the patient to roll towards you onto their side. Wait at least 10 seconds to allow any free fluid to move under the influence of gravity, then percuss again continuing to move in the same direction. If the area is now resonant, you have demonstrated ‘shifting dullness’ as the ascitic fluid became dependent. McLeod and Browse both suggest an alternative method of testing for ‘shifting dullness’, but this involves marking the patient’s abdomen with a pen and
would not be expected in an OSCE scenario \(^1\), \(^2\). According to the data from several studies pooled by Swartz, shifting dullness is the most sensitive sign for ascites (83-88%); specificity is 56% \(^3\).

Obvious ascites may also produce a generalised fluid thrill \(^2\) or fluid wave \(^3\). This can be elicited by flicking a finger of your right hand against the right side of the abdomen, whilst feeling for a ripple against the left palm on the other side. Before doing so you must ask the patient (or an assistant) to place the ulnar edge of their hand vertically at the umbilicus to prevent transmission of the impulse through the abdominal wall fat and skin \(^2\). Swartz found that presence of a prominent fluid wave was the most specific sign (82-92% specificity) for ascites \(^3\). Ascites has been found to have a specificity of over 90% for detecting cirrhosis \(^13\).

**Succussion Splash**
Lastly, if you suspect gastric outflow obstruction you can try holding the patient at the hips and shaking the abdomen from side to side. Audible splashing sounds, a succussion splash, usually indicate that the stomach is distended with a mixture of fluid and gas \(^2\). A succussion splash more than 4 hours after eating or drinking is said to indicate delayed gastric emptying as seen in pyloric stenosis \(^1\). This manoeuvre can be uncomfortable for the patient, however, and should only be performed when there is clinical suspicion of delayed gastric emptying.

**Auscultation**

**Auscultation for Bowel Sounds**
First place the diaphragm of the stethoscope to the right of the umbilicus \(^1\) and listen for bowel sounds. If no sounds are heard, auscultate all four quadrants to make sure no sounds are missed and to localise specific sounds \(^4\). Normal bowel sounds are low-pitched gurgles occurring every 5-10 seconds, although frequency varies widely. Only conclude that they are absent after listening for 2 minutes \(^4\) (some clinicians contend that 5 minutes of continuous listening is required \(^4\)). Absence of bowel sounds indicates that peristalsis has ceased, implying paralytic ileus or peritonitis. Mechanical intestinal obstruction increases the volume and frequency of bowel sounds, which are often described as having a high-pitched, tinkling quality.

**Auscultation for Bruits**
A bruit is an abnormal blowing or swishing sound resulting from blood flowing through a narrow or partially occluded artery. Place the diaphragm above the umbilicus to listen for an aortic bruit. Then place the diaphragm 2-3 cm above and lateral to the umbilicus to listen for renal artery bruits. You may also listen over the liver for bruits occurring in hepatoma or acute alcoholic hepatitis \(^1\), or for friction rubs caused by inflammation of the peritoneal surface of organs by tumour, infection or infarct \(^4\).

**Hernias**
In any abdominal examination it is important to assess for groin hernias. For a full description of how to examine for groin hernias, refer to Examination of Groin Hernias \(^28\).

**External Genitalia**
It may be appropriate at this point to examine the external genitalia but this is the subject of a separate Expert Review: Examination of External Genitalia \(^9\).

**Examination Per Rectum (PR)**
Digital rectal examination may be indicated. See Per Rectal Examination \(^8\) for a full account.

**Completing the examination**
Finally, inform the patient that the examination is over, and ask them if they would like help with getting dressed or sitting-up, and thank them for their cooperation.

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None declared.
References


