Assessment of back pain

The right clinical information, right where it's needed
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Back pain is the primary cause of disability in people <50 years of age. The annual incidence in the adult population is 10% to 15% with a point prevalence of approximately 30% in developed countries. Low-back pain (LBP) is second only to upper respiratory problems for physician visits each year, with a lifetime prevalence of 70% to 85%. Despite its widespread prevalence, the general prognosis of acute LBP is favourable, as 90% of patients recover without sequelae.[1] Recurrences are common, but most relapses are not disabling. A smaller subset of the population may be incapacitated from chronic LBP, defined as symptoms persistent for >6 months. Depression, job dissatisfaction, and medico-legal issues involving financial compensation predispose a patient to suffer long term.[2] [3] [4] [5] Several studies have demonstrated that the longer a patient is absent from work, the less likely he or she will return to work.[6] Furthermore, a small percentage of patients will develop persistent disabling LBP resulting in immense costs to society. Estimates approach $50 billion per year in the US.[7] [8] [9] [10] A review article found that maladaptive pain coping behaviours, non-organic signs, functional impairment, general health status, and presence of psychiatric comorbidities increased the risk of developing disabling LBP. The clinician should be aware of these risk factors when counselling and treating patients.[11]
Aetiology

Back pain is a symptom, but not a diagnosis. Various spinal structures including ligaments, facet joints, paravertebral musculature and fascia, intervertebral discs, and spinal nerve roots have been implicated as pain generators.[12] Nevertheless, even after a thorough work-up, 85% of patients with isolated back pain still do not have a definitive cause identified for their symptoms.[13]

The aetiologies can be subdivided into 3 groups: mechanical, systemic, and referred. By far, the most common cause is mechanical (97%).[12]

Mechanical

Mechanical back pain is defined as pain that is elicited with spinal motion and decreases with rest.

Lumbar strain/sprain

- The most common cause of mechanical back pain.[14]
- Strain: disruption of the muscle fibres at various locations within the muscle belly or musculotendinous junction. Patients experience intense pain for 24 to 48 hours then experience muscle spasm.
- Sprain: subcatastrophic stretch of ≥1 spinal ligaments. Some fibres are injured but the overall continuity of the ligament is maintained.

Degenerative disc and/or facets

- The pain generator is yet to be discovered, but the disc, ligaments, and facets have all been implicated.[15]
- The disc is presumed to be the primary source of pain (discogenic).[16] [17]
  - Many patients have asymptomatic degenerative discs.
  - Discogenic pain increases with flexion, sitting, and coughing/sneezing due to an increase in intradiscal pressures.
- Facet joints may cause back pain that increases with extension as the facet joints are mechanically loaded.[18]
- The facet capsule has been demonstrated anatomically to contain nociceptive fibres.[19] [20] [21]
- The sacroiliac joint also has been implicated in low back pain.[22]

Herniated nucleus pulposus (HNP)

- Natural history is of clinical improvement in most patients with only 10% requiring surgical intervention.[23] [24]
- Leg pain is usually greater than back pain with pain radiating into the lower extremity in a dermatomal distribution.
- Leg pain may be reproduced with a straight-leg raise or a contralateral straight-leg raise.
- Leg pain may be reproduced with a femoral stretch, which may suggest upper lumbar disc herniation.[25]
- Back pain may occur as a result of referred pain from a corresponding tear in the annulus fibrosus.

Spinal stenosis

[Fig-1]

[Fig-2]
Assessment of back pain

Overview

• A narrowing of the anatomical dimensions of the spinal canal secondary to disc osteophyte formation and facet/ligamentum flavum hypertrophy.
• Patients may manifest back pain that is often referred to as neurogenic secondary to mechanical constriction of the lumbar nerve roots.[26]

Spondylolysis and/or spondylolisthesis

• General population has a pars interarticularis defect incidence of 3% to 6%,[27] [28] [29] but most are asymptomatic.
• Patients have pain in the lower back with occasional radiation to the posterior thigh. Pain is aggravated by extension.
• If spondylolisthesis is severe, an exaggerated lordosis, heart-shaped buttock, or midline step off of the spinous processes may be present.
• Patients have pain with single-leg hyperextension test.[30] Patient stands on 1 leg while extending the other leg. If pain is reproduced on the side of the extended leg, the test is positive.

Compression fracture

[Fig-3]

• May occur without recognised trauma and patients should have a medical work-up performed for the evaluation of osteoporosis, osteomalacia, and malignancy, depending on the fracture mechanism.
• Work-up for osteoporosis is key for future prevention.
• May be associated with a radiculopathy secondary to neuroforaminal encroachment from vertebral body height loss.
• Most commonly treated non-operatively.
• If a compression fracture occurs through a low-energy mechanism one should find metabolic reasons for the fracture, and osteoporosis should be aggressively treated to prevent further fractures.

Systemic

Systemic aetiologies are much less common (1%) than mechanical back pain,[12] but these causes usually warrant further work-up and signal possible urgent referral to a spine surgeon. Tumour and infection are the more common causes of systemic aetiologies of LBP. The term 'inflammatory spondyloarthritis' incorporates several inflammatory conditions with similar features (mostly axial spondyloarthritis including ankylosing spondylitis, or psoriatic arthritis). Axial and peripheral joints can be affected.

Systemic aetiologies include:

• Infection
  • Untreated discitis, osteomyelitis, or epidural abscess can lead to sepsis, progressive kyphotic deformity, and/or neurological deficit.
• Malignancy
  [Fig-4]

[Fig-5]

• Inflammatory spondyloarthropathy (ankylosing spondylitis, psoriatic arthritis, enteropathic arthritis, etc)[31] [32]
• Connective tissue disorder.
Refered

Sources are typically non-spine related and include intra/retroperitoneal pathologies. Much like systemic causes, these aetiologies are less common (2%) than mechanical back pain.[12]

- Aortic aneurysm
- Acute pancreatitis
- Acute pyelonephritis
- Renal colic
- Peptic ulcer disease.
Urgent considerations

(See Differential diagnosis for more details)

Cauda equina syndrome

A presumed diagnosis of cauda equina syndrome necessitates an urgent work-up. Bowel or bladder dysfunction, bilateral sciatica, and saddle anaesthesia may be symptoms of severe compression of the cauda equina. The aetiology is usually a large central herniated disc or a pathological or traumatic fracture. A complete history and physical examination should identify impending neurological compromise and the need for emergent referral to a spinal surgeon.

Other pathologies requiring an urgent work-up include back pain associated with infection or tumour. High-risk patients, such as those on immunosuppression, those taking corticosteroids, and those with a history of intravenous (IV) drug use, presenting with back pain should prompt the physician to perform imaging studies. Patients with unrelenting pain despite recumbency, systemic ailments (i.e., fevers, chills, general malaise, history of malignancy, unexplained weight loss), and profound neurological deficits warrant urgent advanced imaging studies such as MRI or CT. Lastly, imaging is indicated in patients with trauma, especially minor trauma in older adults, those with osteoporosis, and those on chronic treatment with corticosteroids.[33]

Red flags

- Herniated nucleus pulposus (HNP)
- Vertebral discitis/osteomyelitis
- Malignancy
- Aortic abdominal aneurysm
Step-by-step diagnostic approach

Although the causes are numerous, a thorough history and physical examination helps elucidate the diagnosis in most patients.

History

The primary purpose of the initial encounter is to evaluate whether the symptoms suggest a more serious underlying condition.[34]

Red flags in the history to warrant additional diagnostic imaging include:[35] [36]

- Systemic ailments, including fever, chills, night sweats, and/or unexplained weight loss (infection/malignancy)
- Profound or progressive neurological deficit
- Trauma/high-speed injury
- Pain that is refractory to medicine/injections
- Older age
- Prolonged corticosteroid drugs
- Presence of contusion or abrasions over the spine.

Patients should also be asked about intravenous drug use, immunocompromise, and history of cancer. Intravenous drug use or an immunocompromised state increases the risk of osteomyelitis of the spine and the possibility of epidural abscess. Metastasis to the spine needs to be excluded if a patient has a history of cancer and back pain. Patient’s age can also help in narrowing the differential, as older patients are at high risk of developing metastasis to the spine and spinal stenosis. It’s also important to be aware that the diagnosis of spondyloarthritis is sometimes missed or delayed.[37] Back pain due to inflammatory spondyloarthritis (more commonly starting before the age of 35 years) may be present alone or with other features, such as symptoms and signs of enthesitis, dactylitis, uveitis, or psoriasis. There may be a family history of psoriasis or spondyloarthritis, or a history of recent genitourinary infection.

Physical examination

In the physical examination, the patient’s ability to ambulate and gait should be observed. In addition, the patient’s spinal range of motion should be tested[38] and the spine palpated to localise any tenderness. A thorough neurological examination should then be performed. Specific manoeuvres include:

- A positive straight-leg raise or contralateral straight-leg raise indicates a possible herniated nucleus pulposus (HNP). A straight-leg raise is performed with the patient supine and the hip flexed gradually with the knee extended. Pain that is reproduced below 60° of hip flexion on the ipsilateral side is considered a positive straight-leg raise and is more sensitive. Reproduced pain on the contralateral side indicates a positive contralateral straight-leg raise and is more specific. Pain that occurs above 60° is usually secondary to hamstring tightness.[39] [40] [41] All patients with disc herniation do not exhibit the classic straight-leg raise. Because of the absence of a straight-leg raise and dermatomal pain, the clinician should not assume the patient is not suffering from a disc herniation.[42] Furthermore, for upper lumbar disc herniation, a femoral stretch or contralateral femoral stretch can be performed. This test is typically performed with the patient prone. The knee is flexed, and then the leg is extended. If it reproduces the leg pain, it is considered positive.[25]
Assessment of back pain

**Diagnosis**

- Specific neurological deficits, such as weakness, spasticity, or hyper/hyporeflexia, should be noted. These suggest more profound neurological compression; prompt referral to a spinal surgeon is indicated for further evaluation and management.[35]
- Decreased rectal tone is an important examination finding, as it suggests sacral root encroachment from significant intraspinal compression.[35]
- A vascular examination is important in differentiating vascular versus neurogenic claudication. Vascular claudication typically worsens with ambulation in any position and is relieved immediately by rest. Neurogenic claudication worsens with ambulation in an extended posture and improves with forward flexion of the lumbar spine.[35] Patients with claudication may have concomitant vascular and spinal pathologies.

**Laboratory tests**

Routine laboratory studies are not necessary in the evaluation of back pain unless the physician is concerned about the possibility of malignancy or infection (i.e., non-mechanical back pain, fever, chills, night sweats, and/or weight loss). In these cases FBC, ESR, C-reactive protein (CRP), and blood cultures are typically obtained. Though non-specific in nature, these values should not be elevated in the setting of mechanical back pain and may indicate to the physician that a systemic process such as infection or inflammation is occurring if the results are abnormal. A urinalysis and culture should also be ordered when considering the possibility of pyelonephritis or renal colic.

**Imaging**

High-risk patients, such as those on immunosuppression, those taking corticosteroids, and those with a history of intravenous (IV) drug use, presenting with back pain should prompt the physician to perform imaging studies. Patients with unrelenting pain despite recumbency, systemic ailments (i.e., fevers, chills, general malaise, history of malignancy, unexplained weight loss), and profound neurological deficits warrant urgent advanced imaging studies such as MRI or CT. Lastly, imaging is indicated in patients with trauma, especially minor trauma in older adults, those with osteoporosis, and those on chronic treatment with corticosteroids.[33]

Most patients with low back pain with or without sciatica do not routinely require imaging when presenting in a non-specialist setting.[34] They should be reassured that their symptoms will respond to conservative treatment. If symptoms persist longer than 6 to 8 weeks, plain x-rays should be obtained at that time, as most patients with benign low-back pain aetiology should have improved.[40][43][44][45][46]

More advanced imaging, such as MRI or CT, should be reserved if neurological compromise, infection, or tumour is considered, as degenerative and disc abnormalities are found in many asymptomatic patients, causing over-diagnosis and unwarranted patient anxiety.[40][43][44][45][46][47][48] These studies should be ordered after discussion with a spinal surgeon or by the spinal surgeon in most cases to prevent ordering of unnecessary tests. But in general, if patients have non-mechanical back pain or neurological compromise, an MRI is the preferred study. If a patient has metal in their spine or is unable to undergo an MRI, a CT myelogram is usually warranted. MRI scan of the sacroiliac joints is not generally required but recommended when inflammatory spondylitis is suspected as the cause of back pain but the clinical examination and first-line investigation of plain x-ray has not established the diagnosis.[49]

In trauma situations, the standard AP pelvis and cervical spine radiographs should be obtained. If patients have back pain, AP and lateral radiographs of the lumbar spine should be ordered. Furthermore, neurological compromise, gross spinal deformities, or manual step-off on spinal palpation also warrant CT to understand
the bony anatomy. Of note, spinal precautions should be taken when moving trauma patients until the spine is cleared by the trauma or spinal surgeon. If any abnormalities are noted on imaging, a spinal surgeon should be consulted for further management.
## Differential diagnosis overview

### Common
- Lumbar muscular strain/sprain
- Herniated nucleus pulposus (HNP)
- Spinal stenosis
- Compression fracture
- Degenerative disc disease or facet arthropathy

### Uncommon
- Spondylolysis and/or spondylolisthesis
- Vertebral discitis/osteomyelitis
- Malignancy
- Inflammatory spondyloarthropathy
- Connective tissue disease
- Aortic abdominal aneurysm
- Pancreatitis
- Pyelonephritis
- Renal colic
- Peptic ulcer disease
### Differential diagnosis

#### Common

**◊ Lumbar muscular strain/sprain**

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<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
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<tr>
<td>sharp intense pain for 1 to 2 days; muscle spasm; most patients recover within 3 months[1]</td>
<td>benign physical examination, diagnosis is one of exclusion</td>
<td>»<strong>none</strong>: clinical diagnosis Most patients with low back pain with or without sciatica do not routinely require imaging when presenting in a non-specialist setting.[34]</td>
<td>»<strong>plain x-rays</strong>: no abnormalities (e.g., spondylolisthesis) or fractures are normally seen If a patient does not respond to conservative treatment in 6 to 8 weeks, an x-ray should be obtained to rule out other pathologies not considered at the initial visit.</td>
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**◊ Herniated nucleus pulposus (HNP)**

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<td>radiating lower extremity pain in a dermatomal distribution; history of bowel or bladder dysfunction, bilateral sciatica, and saddle anaesthesia may be symptoms of severe compression of the cauda equina</td>
<td>positive straight-leg raise or contralateral straight leg (reproduced below 60° of hip flexion);[39] positive femoral stretch test may suggest upper lumbar disc herniation[25]</td>
<td>»<strong>MRI</strong>: herniated disc If patients present with symptoms of severe neurological deficits or symptoms consistent with cauda equina, MRI should be obtained.</td>
<td>»<strong>plain x-rays</strong>: no abnormalities are normally found on plain x-rays Useful to rule out other pathologies including tumour, infection or fracture.</td>
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Common

◊ **Spinal stenosis**

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<td>intermittent pain radiating to the thigh or legs, worse with prolonged standing, activity, or lumbar extension; pain is typically relieved by sitting, lying down, and/or lumbar flexion; patient may describe intermittent burning, numbness, heaviness, or weakness in their legs, unilateral or bilateral radicular pain, motor deficits, bowel and bladder dysfunction, and back and buttock pain with standing and ambulation</td>
<td>patients walk with a forward flexed gait; patients with vascular claudication have diminished pulses and typical skin changes, such as mottled discoloration, thinning and shiny skin</td>
<td><strong>MRI</strong>: spinal stenosis; hypertrophy of the facet joints and/or ligament flavum with corresponding decrease in spinal canal diameter dimension</td>
<td><strong>plain x-rays</strong>: degenerative arthritis; diffuse osteophyte formation normally seen with an accompanying degenerative spondylolisthesis or scoliosis Useful to rule out other pathologies. Spinal stenosis is typically diagnosed by MRI and clinical diagnosis, not a plain x-ray finding.</td>
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◊ **Compression fracture**

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<td>typically history of trauma, although acute event not always recalled; pain at rest and at night, previous history of fractures (e.g., distal radius, hip or other vertebral compression fractures)</td>
<td>tenderness to palpation over the midline; increased kyphosis, normal neurological examination unless there is retropulsion of bone into the neural elements, such as in burst fractures</td>
<td><strong>plain x-rays</strong>: wedging of the vertebral bodies, typically anteriorly; kyphotic deformity; only the anterior half of the vertebral body is involved in compression fractures Consider referral to spine surgeon if pain is refractory to medical management and bracing.</td>
<td><strong>bone scan or MRI</strong>: can demonstrate if the fracture is acute or chronic to help guide appropriate treatment Acute fractures can be treated with bracing, temporary bed rest, calcitonin, and/or kyphoplasty or vertebroplasty. Chronic compression fractures should be treated as musculoskeletal back pain.</td>
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## Degenerative disc disease or facet arthropathy

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<td>symptoms worsen with forward flexion, coughing/sneezing, or heavy lifting; facet mediated pain is typically worse with extension</td>
<td>decreased range of motion due to pain and mild tenderness on palpation; pain is reproduced with flexion in discogenic pain and extension with facet arthropathy</td>
<td>plain x-rays: degenerative arthritis and diffuse osteophyte formation If patient does not respond to conservative treatment in 6 to 8 weeks, an x-ray should be obtained to rule out other pathologies not considered at the initial visit.</td>
<td>MRI: degenerative disc disease: loss of disc height, end plate collapse, and usually decreased T2 signal in the disc; facet arthropathy: hypertrophy of the facet and possible T2 signal in the joint May suggest disc height loss, annular tears, end plate collapse, and/or facet arthropathy. Anular tears such as high-intensity zone (HIZ) found on MRI has been implicated as a marker for discogenic back pain, but other studies have demonstrated many asymptomatic patients also have HIZ on MRI. However, a negative contrast discogram HIZ may rule out discogenic back pain, but it is not recommended all patients with back pain undergo a discogram.[50]</td>
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*DIAGNOSIS*

Common degenerative disc disease or facet arthropathy
## Uncommon

### Spondylolysis and/or spondylolisthesis

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<td>most are asymptomatic; pain in the lower back with occasional radiation to the posterior thigh and aggravated by extension</td>
<td>exaggerated lordosis, heart-shaped buttock, or midline step-off of the spinous processes may be present; pain with single-leg hyperextension test.</td>
<td><strong>plain x-rays</strong>: linear lucency in the pars interarticularis If patient does not respond to conservative treatment in 6 to 8 weeks, an x-ray should be obtained to rule out other pathologies not considered at the initial visit.</td>
<td><strong>MRI</strong>: acute stress reaction in the pars interarticularis; fracture Typically, confirmatory.</td>
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### Vertebral discitis/osteomyelitis

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<td>infection should be considered for patients with a history of fever, weight loss, and non-mechanical back pain (i.e., pain that occurs even without motion, particularly at rest and at night); hx of intravenous drug use, immunosuppression, or diabetes</td>
<td>generalised appearance of malaise; fever; localised tenderness present particularly with percussion; neurological findings absent</td>
<td><strong>FBC</strong>: elevated WBC count, particularly the neutrophil count Will need to rule out other sources of infection, such as urinary and respiratory system. <strong>ESR</strong>: elevated Will need to rule out other sources of infection, such as urinary and respiratory system. <strong>C-reactive protein</strong>: elevated Will need to rule out other sources of infection, such as urinary and respiratory system. <strong>blood cultures</strong>: <em>Staphylococcus aureus</em> and <em>Streptococcus</em> common</td>
<td><strong>plain x-rays</strong>: may demonstrate endplate/vertebral body destruction with resultant spinal deformity <strong>MRI</strong>: reveals increased T2 signal intensity that localises to the disc space and vertebral body May suggest the presence of a fluid collection such as an epidural abscess that may be associated with the discitis/osteomyelitis. [Fig-6]</td>
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### Uncommon

**◊ Vertebral discitis/osteomyelitis**

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<td>To identify a haematogenous source.</td>
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**◊ Malignancy**

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<td>history of malignancy (breast, lung, prostate, thyroid, kidney), age &gt;50 years, back pain at night and at rest; may have neurological deficits if tumour destruction is extensive and causes neurological compression</td>
<td>generalised systemic symptoms including fevers/chills, weight loss, and malaise; focal tenderness and/or neurological deficits may be present depending on tumour size and location</td>
<td>plain x-rays: may demonstrate lysis of the vertebral body or posterior elements Bony metastases may cause destruction of the pedicle resulting in the 'winking owl' sign.</td>
<td>[Fig-7]</td>
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<td>[Fig-8]</td>
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<td>»MRI: either a lytic or blastic lesion with varying T2 signal intensity; lesion typically does not cross the end plate, but soft tissue extension may be present Important to differentiate findings from that of an infection. Typically infections cross the disc space, whereas tumour destructions rarely cross the intervertebral disc. Extent of destruction and neural compression should be observed.</td>
<td>[Fig-5]</td>
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<td>»CT: lytic destruction of the vertebral body with possible soft</td>
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## Uncommon

### Malignancy

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<td>◊ Malignancy</td>
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<td>tissue extension; blastic lesions possible Extent of bony destruction observed.</td>
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### Inflammatory spondyloarthropathy

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<td>◊ Inflammatory spondyloarthropathy</td>
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<td>male predominance in ankylosing spondylitis, early-morning stiffness, nocturnal back pain, fatigue, weight loss, diffuse non-specific pain radiating bilaterally to buttocks; pain improves after physical activity; may have FHx of arthritis or psoriasis; hx of inflammatory bowel disease may be suggestive of enteropathic arthritis</td>
<td>axial spondyloarthropathy or ankylosing spondylitis: stiffness of spine with kyphosis, limited range of movement of lower spine, tenderness on palpation; extra-articular signs (e.g., psoriasis, uveitis) may be present</td>
<td>»plain x-ray sacroiliac joints: erosion of sacroiliac joint (squaring of lumbar vertebrae) and later narrowing and fusion (bamboo spine) is suggestive of ankylosing spondylitis Often normal in early disease. Imaging of other symptomatic sites (e.g., hands and feet with suspected psoriatic arthritis) may be indicated.[37] [Fig-9]</td>
<td>»MRI: spondylitis; fractures Not generally required. If indicated, National Institute for Health and Care Excellence (NICE) guidelines recommend to include short T1 inversion recovery, T1 (both views), cervical, thoracic and lumbar (whole spine, sagittal view), and sacroiliac joints (coronal oblique view).[37] [Fig-10]</td>
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</table>

»FBC: WBC count may be elevated

»C-reactive protein (CRP): may be normal or elevated

»ESR: may be normal or elevated

»HLA-B27: may be positive or negative Not diagnostic but may be helpful in aiding decisions on further investigations or referral.\[37\]
### Uncommon

#### Connective tissue disease

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| arthritis, polyarthritis, systemic symptoms of fever, weight loss, and fatigue | evidence of organ involvement (e.g., rash, lymphadenopathy, wheezing, oesophageal dysmotility, malabsorption, joint tenderness, joint effusion and swelling, uveitis, conjunctivitis) | » FBC: leukopenia  
» serum antibodies: elevated ANA, double-stranded DNA, anti-Smith antibodies, anticardiolipin antibodies.  
» rheumatoid factor: elevated in rheumatoid disease  
» ESR: elevated Non-specific sign of inflammation. | » chest x-ray: normal; mediastinal lymphadenopathy; interstitial lung disease; pericardial effusion  
» plain x-ray of spine: may be evidence of rheumatoid arthritis |

#### Aortic abdominal aneurysm

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| sudden onset of intermittent or continuous abdominal pain, radiating to the back; patient may collapse; older age; hx of cardiovascular disease | pulsatile abdominal mass, hypotension or hypertension, tachycardia | » abdominal ultrasound: extent and size of aneurysm | » CT of the abdomen: clearly defines aneurysm and involvement of visceral arteries  
Sensitive and specific. |

#### Pancreatitis

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| sudden onset of epigastric pain; radiates to back; may be relieved by sitting forwards; associated with nausea and vomiting; hx of alcohol use or gallstones | tachycardia, fever, jaundice, tenderness/guarding of abdomen  
| » serum lipase: can be elevated if amylase is normal  
More sensitive than amylase.  
» ultrasound: may show pancreatic inflammation, peripancreatic stranding, calcifications, or fluid collections | » ERCP: identifies stones, duct-filling defects and strictures  
Allows retrieval of stones; diagnostic as well as therapeutic if suspected biliary obstruction. |
## Assessment of back pain

### Diagnosis

#### Uncommon

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<th>◊ Pancreatitis</th>
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<td><strong>History</strong></td>
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<td>urinary symptoms of dysuria, frequency, and hesitancy; flank pain may radiate to back; fever, chills, fatigue</td>
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<td><strong>Exam</strong></td>
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<td>flank or costovertebral tenderness</td>
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<td><strong>1st Test</strong></td>
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<td>» contrast-enhanced CT: fluid collections; pseudocysts; abscess</td>
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<td><strong>Other tests</strong></td>
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<th>◊ Pyelonephritis</th>
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</thead>
<tbody>
<tr>
<td><strong>History</strong></td>
</tr>
<tr>
<td>urinary symptoms of dysuria, frequency, and hesitancy; flank pain may radiate to back; fever, chills, fatigue</td>
</tr>
<tr>
<td><strong>Exam</strong></td>
</tr>
<tr>
<td>flank or costovertebral tenderness</td>
</tr>
<tr>
<td><strong>1st Test</strong></td>
</tr>
<tr>
<td>» urinalysis: pyuria, microscopic haematuria</td>
</tr>
<tr>
<td>» urine culture: positive</td>
</tr>
<tr>
<td>» renal ultrasound: gross structural abnormalities; hydronephrosis; stones; perirenal fluid collections</td>
</tr>
<tr>
<td>Accessible and does not involve exposure to radiation or dyes.</td>
</tr>
<tr>
<td><strong>Other tests</strong></td>
</tr>
<tr>
<td>» contrast CT: altered renal parenchymal perfusion; altered excretion of contrast; perinephric fluid; non-renal disease</td>
</tr>
<tr>
<td>Rarely indicated unless patient deteriorates and/or at risk of complications.</td>
</tr>
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<table>
<thead>
<tr>
<th>◊ Renal colic</th>
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<tbody>
<tr>
<td><strong>History</strong></td>
</tr>
<tr>
<td>severe, acute flank pain that may radiate to the ipsilateral groin; associated nausea and vomiting; hx of volume depletion or stone-inducing medications (e.g., antacids, carbonic anhydrase inhibitors, sodium- and calcium-containing medications, vitamins C and D, indinavir)</td>
</tr>
<tr>
<td><strong>Exam</strong></td>
</tr>
<tr>
<td>flank or costovertebral angle tenderness; may have macroscopic haematuria</td>
</tr>
<tr>
<td><strong>1st Test</strong></td>
</tr>
<tr>
<td>» urinalysis: microscopic haematuria</td>
</tr>
<tr>
<td>Present in 90% of patients.</td>
</tr>
<tr>
<td><strong>Other tests</strong></td>
</tr>
<tr>
<td>» non-contrast CT: calcification seen in renal collecting system or ureter</td>
</tr>
</tbody>
</table>
### Uncommon

◊ **Peptic ulcer disease**

<table>
<thead>
<tr>
<th>History</th>
<th>Exam</th>
<th>1st Test</th>
<th>Other tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>epigastric, burning pain; radiates to back; usually occurs in association with meals; may be relieved by antacids; haematemesis or melaena in advanced disease</td>
<td>epigastric tenderness, may be melaena on rectal examination</td>
<td>upper GI endoscopy: detects site of bleeding and ulceration</td>
<td>Most sensitive and specific test. Enables sampling for Helicobacter pylori and biopsy to exclude malignancy.</td>
</tr>
</tbody>
</table>

### Diagnostic guidelines

#### Europe

**Spondyloarthritis in over 16s: diagnosis and management**

*Published by:* National Institute for Health and Care Excellence  
*Last published:* 2017  
*Summary:* Recommendations regarding diagnosing and managing suspected or confirmed spondyloarthritis in adults who are 16 years or older.

**Low back pain and sciatica in over 16s: assessment and management**

*Published by:* National Institute for Health and Care Excellence  
*Last published:* 2016  
*Summary:* Recommendations regarding assessing and managing low back pain and sciatica in people aged 16 and over.
Europe

EULAR recommendations for the use of imaging in the diagnosis and management of spondyloarthritis in clinical practice

Published by: European League Against Rheumatism
Last published: 2015
Summary: Generally x-ray of the sacroiliac joints is recommended as the initial imaging to diagnose sacroiliitis as part of axial spondyloarthritis. MRI of the sacroiliac joints is recommended if the diagnosis of axial spondyloarthritis is still suspected but cannot be confirmed following clinical examination and conventional radiography.

Recognising inflammatory back pain

Published by: British Health Professionals in Rheumatology
Last published: 2011

North America

ACR Appropriateness Criteria: chronic back pain - suspected sacroiliitis/ spondyloarthropathy

Published by: American College of Radiology
Last published: 2016
Summary: Recommendations regarding the most appropriate imaging for people with suspected sacroiliitis/spondyloarthropathy.

Oceania

Emergency care: acute pain management manual

Published by: National Health and Medical Research Council (Australia)
Last published: 2011
Key articles


References


Assessment of back pain


Assessment of back pain

Images

**Figure 1:** MRI of spinal stenosis: (A) demarcates the normal sagittal diameter of the spinal canal. (B) demarcates severe narrowing of the spinal canal

*Courtesy of Dr K. Singh; used with permission*

**Figure 2:** MRI of spinal stenosis: arrow points to the moderately stenotic spinal canal caused by hypertrophic facets and ligament flavum

*Courtesy of Dr K. Singh; used with permission*

**Figure 3:** X-ray of a compression fracture: a lateral x-ray of an L2 compression fracture (A). Wedging of the vertebral body is seen

*Courtesy of Dr K. Singh; used with permission*
Figure 4: X-ray of tumour: lymphoma (A) destroying the L5 vertebra

Courtesy of Dr K. Singh; used with permission
Assessment of back pain

Figure 5: MRI of lymphoma: arrowhead indicates a soft-tissue mass protruding into the spinal canal. Arrow points to the tumour protruding anterior to the L5 vertebral body

Courtesy of Dr K. Singh; used with permission

Figure 6: MRI of osteomyelitis: T11-T12 disc space is involved with discitis (A). There is bony involvement of both vertebrae indicated by high T2 signal of the vertebral bodies. Arrow indicates a normal healthy vertebral disc

Courtesy of Dr K. Singh; used with permission
Figure 7: The 'winking owl' sign (arrow): asymmetrical appearance of spine on plain radiographs caused by destruction of the pedicle

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Figure 8: Spine x-ray: the 'winking owl' sign (asymmetrical appearance caused by destruction of the pedicle)

Courtesy of Dr D. Parks; used with permission
Figure 9: Plain x-ray showing bilateral sacroiliitis in a patient with ankylosing spondylitis


Figure 10: Coronal STIR (short tau inversion recovery) magnetic resonance image showing unilateral (right) sacroiliitis

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