

# Acute back pain

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## Abstract

Back pain will affect 60–80% of the population in industrialized countries. The majority of back pain (90%) will settle in 6 weeks. For most patients, keeping active and optimal pain control with regular simple analgesics will suffice. This article describes how to identify ‘red flags’ indicative of serious spinal pathology in patients with back pain, how to assess for markers of chronicity (‘yellow flags’) and when to refer for further investigation and specialist input.

**Keywords** acute back pain; lumbar radiculopathy; simple back pain; vertebral wedge fracture

Low back pain affects 60–80% of the population of industrialized countries and accounts for a significant number of lost working days. Ninety per cent of back pain is self-limiting and will settle within 6–8 weeks regardless of treatment.<sup>1</sup> Acute back pain is defined as pain that has failed to settle within 6–12 weeks from onset. The aims of the evaluation of a patient with back pain are to identify potentially serious causes of back pain (‘red flags’), markers of chronicity (‘yellow flags’) and those patients with radicular or inflammatory pain. Most patients will have simple low back pain and here the aims are to preserve function and control pain (Table 1).

## Pathophysiology of back pain

The physiological cause of back pain cannot be established definitively in up to 85% of patients.<sup>2</sup> However, pain has a wide variety of qualities and arises through a number of different types of sensory innervation.<sup>3</sup> Deep somatic pain has its source in the vertebral column, the muscles, tendons, ligaments and fascia supplied by the sinuvertebral nerves and the unmyelinated pain fibres of the posterior primary rami of spinal nerves. Examples include neurogenic pain, for example femoral neuropathy, resulting from the involvement of the sensory portion of the peripheral nerve; and referred pain, which can arise from viscera sharing segmental innervation with the lumbosacral spine.

Radicular pain is characteristic of a herniated disc or spinal stenosis and occurs as a result of inflammation of the nerve or any process that reduces blood flow to the proximal spinal nerves. The distinguishing features are described in Table 1. Ninety-eight per cent of clinically important disc herniations occur at L4/5 and L5/S1.<sup>4</sup>

Finally, psychogenic pain is perceived at the level of the cerebral cortex. Patients displaying this type of pain typically

describe pain that fails to follow anatomical patterns and may have yellow flags (markers of chronicity) (Table 1).

## Causes and investigations

The differential diagnosis of back pain is wide (Table 2) and it is vital that a careful history is obtained and a careful examination performed. The history should assess the:

- sensory dimension, that is the intensity, location and character of the pain.
- affective dimension, that is the emotional component of pain and how pain is perceived.
- impact of the pain, that is the effects on function and participation in society.<sup>5</sup>

The history should also identify back pain red flags (markers of serious spinal pathology) and explore for the presence of yellow flags (Table 1). Most patients do not require investigation, but all patients with potentially serious causes of back pain (red flags) and those with osteoporotic wedge fractures require screening blood tests and imaging as outlined below. Not all patients with radicular pain require diagnostic imaging. Specific indications for magnetic resonance imaging (MRI) and other imaging investigations are discussed below and in Table 1.

## Serious causes of back pain

A potentially serious cause of back pain, especially malignancy (primary or secondary) or infection (infective discitis, epidural abscess and rarely tuberculosis), should be considered in patients complaining of systemic upset, for example weight loss, night sweats and night waking with pain (Table 1).

Patients presenting with rapid onset of neurological signs, saddle anaesthesia or bladder/bowel abnormalities require same-day referral to an appropriate specialist and, potentially, admission, to exclude cord or cauda equina compression (usually due to tumour or central disc prolapse). MRI should be performed urgently to elucidate the cause of the symptoms, provided there are no contraindications. Where there is significant cord or cauda equina compression, neurological recovery will be compromised if decompression is delayed. National Institute for Health and Clinical Excellence (NICE) guidance on metastatic spinal cord compression advises that:

- patients with neurological signs suggestive of cord compression in the context of known neoplasm be referred immediately for assessment; and that
- patients with symptoms suggestive of cord compression but with no clinical signs be discussed with the appropriate specialist within 24 hours.<sup>6</sup>

Patients with secondary neoplasms causing cord compression will be managed initially with high-dose dexamethasone (normally in an oral dose of 16 mg daily given in divided doses) whilst awaiting a therapeutic decision from the appropriate multidisciplinary team (which should include specialists in oncology, neurosurgery and radiology). In some circumstances surgery may be possible but radiotherapy is usually the treatment of choice. Whilst awaiting treatment or investigation, patients with severe pain or neurological symptoms and those with proven metastatic spinal cord compression should be nursed flat with the spine in a neutral position. Log-rolling techniques or

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## Symptoms and signs suggestive of the main categories of back pain

Simple back pain	Radicular pain	Inflammatory pain	Serious causes of back pain (red flags)
<ul style="list-style-type: none"> <li>Approximately 90% of those with acute back pain</li> <li>Presentation 20–55 years</li> <li>Pain in lumbosacral area, buttocks and thighs</li> <li>Mechanical pain</li> <li>Patient well</li> </ul> <p><i>Markers of chronicity (yellow flags)</i></p> <ul style="list-style-type: none"> <li>A belief that back pain is harmful or potentially severely disabling</li> <li>Fear avoidance behaviour and reduced activity levels</li> <li>Tendency to low mood and withdrawal from social interaction</li> <li>Expectation of passive treatments rather than a belief that active participation will help</li> <li>Problems or dissatisfaction at work</li> <li>Problems with claims or compensation or time off work</li> <li>Overprotective family or lack of support</li> </ul> <p><i>Indication for MRI</i></p> <ul style="list-style-type: none"> <li>Should be avoided but some patients need reassurance of MRI before they are able to move on with treatment; it should be performed only when maximum conservative management has failed</li> <li>Where conservative measures have failed and a referral for an opinion on spinal fusion is being considered<sup>22</sup></li> </ul>	<ul style="list-style-type: none"> <li>5% of those with acute back pain</li> <li>Unilateral leg pain worse than low back pain</li> <li>Radiates to foot or toes</li> <li>Numbness and paraesthesia in same distribution</li> <li>Straight leg raising reproduces pain</li> <li>Localized neurological signs</li> </ul> <p><i>Indications for MRI</i></p> <ul style="list-style-type: none"> <li>Progressive neurology</li> <li>No improvement after 6 weeks conservative management</li> </ul> <p>NB MRI should usually be performed only if the patient is a candidate for invasive intervention such as surgery or nerve root injection</p>	<ul style="list-style-type: none"> <li>1% of those with acute back pain</li> </ul> <p><i>History</i></p> <ul style="list-style-type: none"> <li>Morning stiffness for &gt;30 min for 6 or more weeks</li> <li>Pain improves with exercise but not rest</li> <li>Alternating buttock pain</li> <li>Waking during second half of the night with pain</li> <li>History of psoriasis</li> <li>History of inflammatory bowel disease</li> <li>History of uveitis</li> <li>Family history of seronegative spondyloarthropathy</li> </ul> <p><i>Examination</i></p> <ul style="list-style-type: none"> <li>Limited chest expansion (&lt;3 cm)</li> <li>Psoriatic nail changes</li> <li>Limitation of movement in sagittal and frontal planes</li> <li>Peripheral arthritis</li> <li>Enthesitis</li> </ul> <p><i>Indication for MRI</i></p> <ul style="list-style-type: none"> <li>History and examination consistent with an inflammatory cause</li> </ul>	<ul style="list-style-type: none"> <li>&lt;1% of those with acute back pain</li> <li>Presentation under age of 20 or onset over 55</li> <li>Non-mechanical pain</li> <li>Thoracic pain</li> </ul> <p><i>Red flags for spine fracture</i></p> <ul style="list-style-type: none"> <li>Major trauma (e.g. accident or fall from a height)</li> <li>Minor trauma in patient with osteoporosis</li> </ul> <p><i>Red flags for cancer or infection</i></p> <ul style="list-style-type: none"> <li>History of carcinoma, corticosteroids, HIV, immunosuppression, IV drug abuse, recent infection</li> <li>Unwell, weight loss</li> <li>Widespread neurological loss or deficit</li> <li>Structural deformity</li> </ul> <p><i>Red flags for cauda equina compression</i></p> <ul style="list-style-type: none"> <li>Saddle anaesthesia</li> <li>Recent-onset bladder dysfunction</li> <li>Recent-onset faecal incontinence</li> </ul> <p><i>Indications for MRI</i></p> <ul style="list-style-type: none"> <li>Suspected cauda equina syndrome</li> <li>Progressive neurology</li> <li>Wedge fracture where cancer suspected</li> <li>Suspected infection</li> </ul>

**Table 1**

turning beds and a slipper pan should be used until spinal and neurological stability have been secured. Patients require adequate analgesia and if this is insufficient those with breast, prostate cancer or myeloma should be offered bisphosphonates.<sup>6</sup> Other causes of cord compression should be referred immediately to a neurosurgeon.

Investigation of patients with other red flag signs will vary according to their history. Simple screening tests while awaiting appointments include full blood count, erythrocyte sedimentation rate, serum C-reactive protein, renal, liver and bone biochemistry, myeloma screen, prostatic-specific antigen (in men) and plain radiographs (Figure 1).

### Vertebral wedge fracture

This can occur as a result of trauma, such as a fall, and in such circumstances the history is usually clear. In patients with osteoporosis, fractures may occur with minimal or no trauma and must be differentiated from a wedge fracture resulting from malignancy or infection (Table 1). It is essential that a careful history is obtained and a full examination undertaken, looking for risk factors for osteoporosis (corticosteroid use, previous history or family history of low-trauma fracture, predisposing medical conditions, early menopause, lifestyle factors), malignancy (especially a history

## Differential diagnosis of acute back pain

### Mechanical low back pain (97%)

- Lumbar sprain/strain (70%)
- Degenerative (10%)
- Herniated disc (4%)
- Spinal stenosis (3%)
- Osteoporotic fracture (4%)
- Spondylolisthesis (2%)
- Traumatic fracture (<1%)

### Non-mechanical spinal conditions

- Neoplasia (0.7%)
  - Multiple myeloma
  - Metastatic carcinoma
  - Lymphoma
  - Spinal cord tumours
  - Retroperitoneal tumours
  - Primary vertebral tumours
- Infection (0.01%)
  - Osteomyelitis
  - Septic discitis
  - Paraspinal abscess
  - Epidural abscess
  - Shingles

### Referred viscerogenic pain (2%)

#### Vascular

- Aortic aneurysm

#### Gastrointestinal

- Pancreatitis
- Peptic ulcers
- Colonic cancer
- Cholecystitis

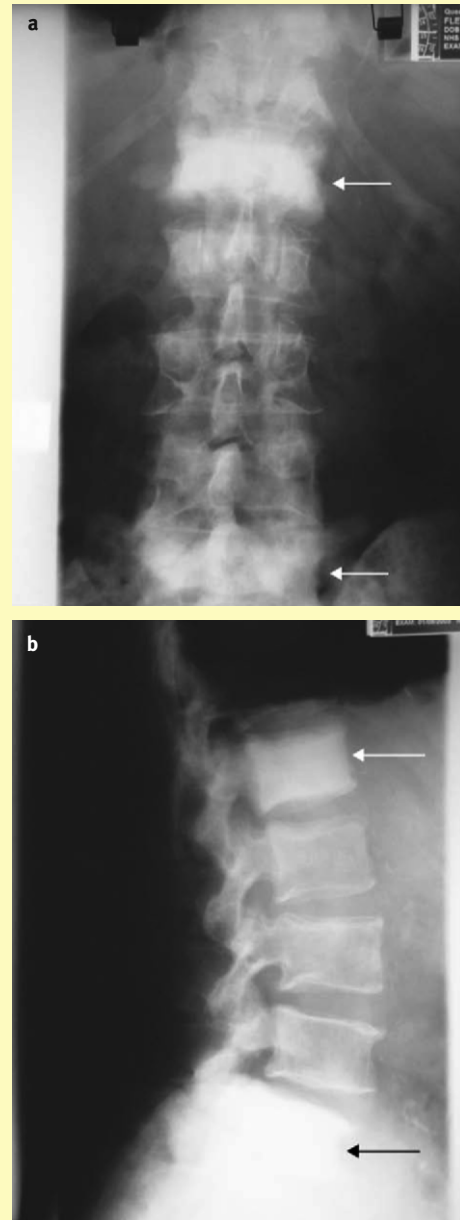
#### Genitourinary

- Endometriosis
- Tubal pregnancy
- Kidney stone
- Prostatitis
- Pyelonephritis
- Perinephric abscess

**Table 2**

of previous tumour) and infection (especially factors that may result in immunosuppression, such as human immunodeficiency virus or immunosuppressive medication).

In addition to screening blood testes listed above, investigations in patients in whom an osteoporotic crush fracture is suspected should include serum vitamin D<sub>3</sub>, plasma parathyroid hormone and (in men) serum testosterone. Spinal X-rays are required when the history is suggestive of a vertebral wedge fracture. Where malignancy is possible or there is neurological deficit, MRI of spine should be requested. Where pain is not limited to the back, an isotope bone scan may be a more appropriate way to exclude widespread bony metastases. Bone densitometry may not be required in patients aged 75 or above if the responsible physician considers it inappropriate or unfeasible, but should be considered in younger patients once other causes have been excluded.<sup>7</sup>



**Figure 1** This patient presented with severe back pain, worsening over a 6-week period, with associated night waking. Blood tests revealed an elevated serum alkaline phosphatase, PSA and ESR. AP (fig 1a) and lateral (fig 1b) lumbar spine plain radiographs show classic changes of the sclerotic metastases in L1 and L5 typical of prostatic carcinoma. Whilst plain X-rays are not recommended in the setting of radicular or mechanical back pain, they can be helpful in making the diagnosis in some patients presenting with red flags. PSA, prostate-specific antigen; ESR, erythrocyte sedimentation rate; AP, anteroposterior. Arrows indicate sclerotic vertebrae.

Management of the patient with osteoporotic wedge fracture should include analgesia according to the World Health Organization pain ladder (Table 3). Many will be immobile and should be given thromboembolic prophylaxis if hospitalized. Calcitonin (either nasal or subcutaneous) can be used as a pain adjunct. The mechanism of action of calcitonin may be related to the elevation of  $\beta$ -endorphin concentration.<sup>8</sup> Although bisphosphonates have

**WHO pain ladder**

Step 1	Non-opioid analgesic ± pain adjuvant
Step 2 – pain persisting or severe	Opioid for mild to moderate pain ± non-opioid ± adjuvant
Step 3 – pain persisting or severe	Opioid for moderate to severe pain ± non-opioid ± adjuvant

**Table 3**

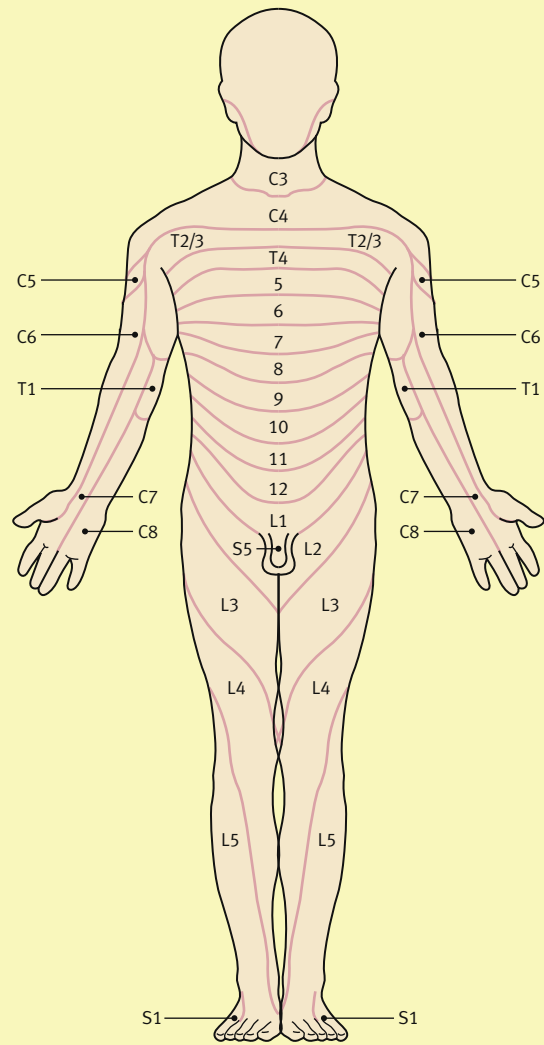
been used to control pain in metastatic cancer, studies of their effect on pain in acute vertebral osteoporotic fracture are limited.<sup>8</sup> Patients aged 75 or above should be given appropriate osteoporosis prophylaxis (most often a bisphosphonate, calcium and vitamin D) without the need to perform bone densitometry. Younger patients should have modification of risk factors and treatment in accordance with NICE guidance, depending on the dual-energy X-ray absorptiometry (DEXA) result.<sup>7</sup> Vertebroplasty and kyphoplasty should be considered where full medical management has failed to relieve the symptoms of pain.<sup>9</sup>

**Radicular pain**

Radicular pain, suggestive of disc prolapse with nerve root compression, is suggested by the symptoms described in Table 1 and signs in Table 4. Figure 2 illustrates the distribution of sensory dermatomes. In the absence of red flags, other investigations may not be necessary. Plain X-rays should not be performed routinely. Bed rest is not recommended. Sixty-five per cent of patients who continue with activities of daily living (ADL) can expect to improve after 2 weeks and 87% after 12 weeks.<sup>9</sup> The role of physiotherapy is unclear, but patients often benefit from physiotherapy input to encourage activity. Specialist referral should be undertaken if the symptoms do not settle within 6 weeks or where there is a neurological deficit.<sup>10,11</sup> Neurosurgical input is indicated where further investigations (most often with MRI) show evidence of nerve root compression consistent with the clinical signs.

**Inflammatory pain**

A diagnosis of inflammatory back pain cannot be made until the symptoms have been present for more than 6 weeks. Presenting

**Distribution of sensory dermatomes****Figure 2**

features are outlined in Table 1. Further discussion is beyond the scope of this article and is discussed elsewhere in *Medicine*.

**Simple back pain**

Most patients with low back pain have simple back pain. Investigations are not normally required and radiology is not recommended. Careful communication at initial presentation is

**Clinical findings associated with lumbar nerve root entrapment**

Nerve root	L4	L5	S1
Pain radiation	Lateral and anterior thigh, front of shin	Lateral leg	Posterior leg
Numbness	Anterior thigh	Lateral calf	Posterior calf and sole, lateral border of foot
Motor weakness	Knee extension	Dorsiflexion of great toe and foot	Plantar flexion of great toe and foot
Reflexes	Decreased knee jerk	None reliable	Decreased ankle jerk

**Table 4**

vital. The use of medical jargon that has the potential to frighten the patient should be avoided. Reassure the patient that pain does not equal harm and ensure that adequate analgesia is provided to allow them to stay active and return to their usual activities, including work. Where possible, patients should be provided with a copy of *The Back Book*, which allays many popular myths associated with back pain and provides practical measures for self management.<sup>12</sup> If pain continues at 6 weeks, the patient should be assessed for markers of chronicity (yellow flags; see Table 1). Referral to a multidisciplinary pain team should be considered where a large number of yellow flags are detected.<sup>13</sup>

## Management

Back pain is usually managed in the outpatient setting, but those with signs and symptoms suggestive of cauda equina compression need urgent admission. Patients with other red flags need to be seen rapidly and admission may be considered if urgent investigations are required.<sup>11</sup> Patients with significant functional impairment as a result of pain, especially if they are frail and elderly, may require hospitalization for pain control. All patients should receive evidence-based information on low back pain, which should include an estimate of the duration of symptoms and advice on remaining active.

## Pharmacological management

Simple analgesics such as paracetamol should be prescribed initially and analgesia escalated according to the WHO pain ladder (see Table 3). Pain killers should be taken by the clock as opposed to on an 'as required' basis. Where weak opioids are used measures should be taken to avoid iatrogenic effects such as constipation.

Before starting a non-steroidal anti-inflammatory drug (NSAID) cardiac, renal and gastrointestinal (GI) toxicity risk profiles should be assessed. Risk of GI toxicity is increased five to six times with increasing age, 10 times with higher NSAID dosage, four to five times with a past history of gastroduodenal problems, five times with concurrent use of corticosteroids and aspirin, and 10–15 times with concurrent use of anticoagulants.<sup>14</sup> The presence of *Helicobacter pylori* infection increases the risk of a duodenal ulcer by a factor of 17.5.<sup>15</sup> When an NSAID is required, ibuprofen (of all the non-selective NSAIDs) has one of the best profiles with regard to GI risk, but may negate the cardioprotective effects of aspirin. Naproxen may have the best profile with regard to cardiac risk but should be used in conjunction with a proton pump inhibitor (PPI) as on its own it is more likely than ibuprofen to cause GI toxicity.<sup>16,17</sup> The safest approach is to undertake an individual risk – benefit assessment and avoid NSAID use in those at high-risk of GI or cardiac disease and in those with renal impairment. They should be used for the shortest period of time, at the lowest dosage possible, and if no benefit has been achieved by 2–4 weeks they should be discontinued.

Stronger analgesics such as morphine are rarely required in the acute setting, and should be instituted only for chronic use under specialist supervision, after full psychosocial assessment.

## Pain adjuncts

Amitriptyline and gabapentin are useful for nerve root pain. Gabapentin has the advantage of a rapid onset of action.

Benzodiazepines may be beneficial for muscle spasm, but should be prescribed only as a short-term measure and the need for such treatment should be frequently reviewed.<sup>13</sup>

## Non-pharmacological measures

### Acute management

In the acute phase the most important treatment is pain control and maintenance of mobility and function. Patients should be encouraged to stay at work if possible. Movement and exercise are vital to the rehabilitation process, to prevent muscle atrophy. Pain can decrease exercise tolerance, hence the need for adequate analgesia. Patients should understand that some increase in muscle pain following exercise might be experienced, that rehabilitation may take many weeks, and that the principles of exercise and joint protection should be continued lifelong. Evidence to support physiotherapy during the first 6 weeks of an episode of simple back pain is weak.

Involvement of occupational therapy/social services is appropriate for elderly patients, as the impact of back pain on ADLs can be lessened by adequate joint protection, appropriate aids and increase in social service support if necessary. If this is not provided in the early phase, hospital admission with its attendant risks may result.

### Chronic management

Unfortunately, the evidence for many types of physical and manipulation therapy is lacking. Back schools based on a biopsychosocial approach may provide short-term improvements and there is some evidence from the UK BEAM trial to support the use of short courses of manipulation/mobilization in conjunction with exercise.<sup>18,19</sup> The Alexander technique is a method which works to change movement habits in everyday activities has been shown in one trial to significantly improve pain and functioning at 6 months when compared with exercise and massage in people with chronic and recurrent back pain.<sup>20</sup>

A more recent study from Keele University demonstrated that stratification of patients with simple low back pain to low-, medium- and high-risk groups and tailoring treatment accordingly resulted in no inferiority for low-risk patients despite minimal intervention when compared to controls. For the medium-risk group (receiving a structured physiotherapy programme) and high-risk patients (who also received psychological intervention) there was significant improvement in physical and emotional functioning, quality-of-life measures and reduction in days off work when compared to the control group.<sup>21</sup>

Non-pharmacological therapies for non-specific low back pain recommended by NICE include an exercise programme, a course of manual therapy or a course of acupuncture. Laser treatment, interferential treatments, therapeutic ultrasound, transcutaneous nerve stimulation (TENS), lumbar supports and traction are not recommended.

For pain that persists beyond 6 weeks, The European Guideline<sup>13</sup> recommends cognitive – behavioural therapy, supervised exercise therapy, brief education interventions and multidisciplinary (bio-psycho-social) treatment for chronic back pain. It does not recommend traction, electrotherapy, ultrasound, interferential treatment, lumbar supports, spinal manipulation therapy or other passive treatments, such as TENS, although this is often used for

radicular pain. Further information can be found in the NICE guideline on management of chronic low back pain.

### Conclusion

The prevalence of back pain is growing in the western world. Most patients can be managed with simple measures and do not require further investigation. ♦

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### FURTHER READING FOR HEALTH PROFESSIONALS

- CKS guidance. [http://www.cks.nhs.uk/back\\_pain\\_low\\_without\\_radiculopathy](http://www.cks.nhs.uk/back_pain_low_without_radiculopathy) (last accessed 3.08.2012). (Comprehensive up-to-date guidance on assessment and management of back pain, 2009.
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### FOR PATIENTS

- Pain support website. <http://www.painsupport.co.uk>. (Excellent resource for patients having to deal with chronic pain).

### Practice points

- Most back pain is self-limiting and does not require further investigation
- Patients with markers of serious pathology (red flags) should be referred for further investigation
- Analgesia should be optimized to encourage continued activity
- Physiotherapy is not helpful during the first 6 weeks of an episode of back pain
- Where back pain does not settle in 6 weeks markers of chronicity (yellow flags) should be assessed