# Clinical review

## Diagnosis and treatment of low back pain

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Low back pain is a considerable health problem in all developed countries and is most commonly treated in primary healthcare settings. It is usually defined as pain, muscle tension, or stiffness localised below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica). The most important symptoms of non-specific low back pain are pain and disability. The diagnostic and therapeutic management of patients with low back pain has long been characterised by considerable variation within and between countries among general practitioners, medical specialists, and other healthcare professionals.[1 2 w1] Recently, a large number of randomised clinical trials have been done, systematic reviews have been written, and clinical guidelines have become available. The outlook for evidence based management of low back pain has greatly improved. This review presents the current state of science regarding the diagnosis and treatment of low back pain.

### Summary points

- Most episodes of acute low back pain have a favourable prognosis, but recurrences within a year are common
- Diagnostic triage focuses on excluding specific pathology and nerve root pain
- Imaging might be indicated only in patients with red flag conditions
- Evidence mostly favours active compared with passive treatments in acute and chronic low back pain
- Evidence based guidelines for the management of low back pain are available in many countries, but implementation needs more effort
- The main challenge is the early identification (for example, based on psychosocial risk factors) of patients at risk for chronicity and subsequently preventing the chronicity from occurring

### Sources and selection criteria

We used the Cochrane Library to identify relevant systematic reviews that evaluate the effectiveness of conservative, complementary, and surgical interventions. Medline searches were used to find other relevant systematic reviews on diagnosis and treatment of low back pain, with the keywords "low back pain", "systematic review", "meta-analysis", "diagnosis", and "treatment". Our personal files were used for additional references. We also checked available clinical guidelines and used *Clinical Evidence* as source for clinically relevant information on benefits and harms of treatments.[3 4]

### Who gets it?

Most of us will experience at least one episode of low back pain during our life. Reported lifetime prevalence varies from 49% to 70% and point prevalences from 12% to 30% are reported in Western countries.[w2 w3]

### How is it diagnosed?

The diagnostic process is mainly focused on the triage of patients with specific or non-specific low back pain. Specific low back pain is defined as symptoms caused by a specific pathophysiological mechanism, such as hernia nuclei pulposi, infection, osteoporosis, rheumatoid arthritis, fracture, or tumour. A study in the United States found that of all patients with back pain in primary care, 4% have a compression fracture, 3% spondylolisthesis, 0.7% a tumour or metastasis, 0.3% ankylosing spondylitis, and 0.01% an infection.[5] Non-specific low back pain is defined as symptoms without a clear specific cause—that is, low back pain of unknown origin. About 90% of all patients with low back pain will have non-specific low back pain, which, in essence, is a diagnosis based on exclusion of specific pathology.

Many healthcare professionals use a variety of diagnostic labels. For example, general practitioners may use lumbago, physiotherapists hyperextension, chiropractors or manual therapists facet joint disorder, and orthopaedic surgeons degenerative disc problems. However, at present no reliable and valid classification system exists for most cases of non-specific low back pain. In clinical practice as well as in the literature, non-specific low back pain is usually classified by the duration of the complaints.[w4] Low back pain is defined as acute when it persists for less than six weeks,

*References w1-w10 are on bmj.com.*

**Box 1: Red flag conditions indicating possible underlying spinal pathology or nerve root problems**[w9]

**Red flags**
- Onset age <20 or >55 years
- Non-mechanical pain (unrelated to time or activity)
- Thoracic pain
- Previous history of carcinoma, steroids, HIV
- Feeling unwell
- Weight loss
- Widespread neurological symptoms
- Structural spinal deformity

**Indicators for nerve root problems**
- Unilateral leg pain > low back pain
- Radiates to foot or toes
- Numbness and paraesthesia in same distribution
- Straight leg raising test induces more leg pain
- Localised neurology (limited to one nerve root)

subacute between six weeks and three months, and chronic when it lasts longer than three months. In clinical practice, the triage is focused on identification of "red flags" (see box 1) as indicators of possible underlying pathology, including nerve root problems. When red flags are not present, the patient is considered as having non-specific low back pain.

## What is the prognosis?

In general, the clinical course of an episode of acute low back pain seems favourable, and most pain and related disability will resolve within a couple of weeks.[6] This is also illustrated by the finding that about 90% of patients with low back pain in primary care will have stopped consulting their doctor within three months.[7] Croft suggests that in many patients low back pain symptoms fluctuate over time.[w5] Most patients with back pain will have experienced a previous episode, and acute attacks often occur as exacerbations of chronic low back pain. So recurrences are common. Pengel et al estimated the cumulative risk of at least one recurrence within a 12 month period to be 73% (95% confidence interval 59% to 88%).[w2] The severity of these recurrences, however, is usually less and does not always lead to a new visit to the general practitioner.[8 9] Only a small proportion (5%) of people with an acute episode of low back pain develop chronic low back pain and related disability.

## How useful is imaging?

Abnormalities in x ray and magnetic resonance imaging and the occurrence of non-specific low back pain seem not to be strongly associated.[10 w6] Abnormalities found when imaging people without back pain are just as prevalent as those found in patients with back pain. Van Tulder and Roland reported radiological abnormalities varying from 40% to 50% for degeneration and spondylosis in people without low back pain. They said that radiologists should include this epidemiological data when reporting the findings of a radiological investigation.[11] Many people with low back pain show no abnormalities. In clinical guidelines these findings have led to the recommendation to be restrictive in referral for imaging in patients with non-specific low back pain. Only in cases with red flag conditions might imaging be indicated. Jarvik et al showed that computed tomography and magnetic resonance imaging are equally accurate for diagnosing lumbar disc herniation and stenosis—both conditions that can easily be separated from non-specific low back pain by the appearance of red flags. Magnetic resonance imaging is probably more accurate than other types of imaging for diagnosing infections and malignancies,[12] but the prevalence of these specific pathologies is low.

## What are the most important prognostic indicators for chronicity?

Early identification of patients with low back pain at risk for long term disability and sick leave is theoretically and practically important because early and specific interventions may be developed and used in this subgroup of patients. This is of special importance because recovery for people who develop chronic low back pain and disability is increasingly less likely the longer the problems persist.

The transition from acute to chronic low back pain seems complicated, and many individual, psychosocial, and workplace associated factors may play a part. In this respect, increasing evidence indicates the importance of psychosocial factors.[w7] A recently published systematic review of prospective cohort studies found that distress, depressive mood, and somatisation are associated with an increased risk of chronic low back pain.[13]

Table 1 shows a list of individual, psychosocial, and occupational factors, which have been identified as risk factors either for the occurrence of low back pain or for the development of chronicity. "Yellow flags" have been developed for the identification of patients at risk of chronic pain and disability. A screening instrument based on these yellow flags has been validated for use in clinical practice.[14] The predictive value of the yellow flags and the screening instrument need to be further evaluated in clinical practice and research.

## How effective are commonly available treatments?

More than 1000 randomised controlled trials have been published evaluating all types of conservative, complementary, or surgical treatments for low back pain that are commonly used in primary and secondary care. The evidence on treatment of acute and chronic low back pain from Cochrane and other

**Table 1** Risk factors for occurrence and chronicity of low back pain[w10]

| Risk factors | Occurrence | Chronicity |
|---|---|---|
| Individual | Age; physical fitness; weakness of back and abdominal muscles; smoking | Obesity; low educational level; high levels of pain and disability |
| Psychosocial | Stress; anxiety; negative mood or emotions; poor cognitive functioning; pain behaviour | Distress; depressive mood; somatisation |
| Occupational | Manual material handling; bending and twisting; whole body vibration; job dissatisfaction; monotonous tasks; poor work relationships and social support | Job dissatisfaction; unavailability of light duty on return to work; job requirement of lifting for three quarters of the day |

**Box 2: Summary of recommendations of 11 national clinical guidelines for acute low back pain[21]**

**Diagnosis**

- Diagnostic triage (non-specific low back pain, radicular syndrome, specific pathology)
- History taking and physical examination to exclude red flags
- Physical examination for neurological screening (including straight leg raising test)
- Consider psychosocial factors if there is no improvement
- x Rays not useful for non-specific low back pain

**Treatment**

- Reassure patients (favourable prognosis)
- Advise patients to stay active
- Prescribe medication if necessary (preferably at fixed time intervals):
  - Paracetamol
  - Non-steroidal anti-inflammatory drugs
  - Consider muscle relaxants or opioids
- Discourage bed rest
- Consider spinal manipulation for pain relief
- Do not advise back-specific exercises

systematic reviews has recently been updated with results of additional trials (table 2).[3 4]

## How effective are treatments in acute low back pain?

The evidence that non-steroidal anti-inflammatory drugs relieve pain better than placebo is strong. Advice to stay active speeds up recovery and reduces chronic disability. Muscle relaxants relieve pain more than placebo, strong evidence also shows, but side effects such as drowsiness may occur. Conversely, strong evidence shows that bed rest and specific back exercises (strengthening, flexibility, stretching, flexion, and extension exercises) are not effective. These interventions mentioned were equally as effective as a variety of placebo, sham, or as no treatment at all. Moderate evidence shows that spinal manipulation, behavioural treatment, and multidisciplinary treatment (for subacute low back pain) are effective for pain relief. Finally, no evidence shows that other interventions (for example, lumbar supports, traction, massage, or acupuncture) are effective for acute low back pain.[3]

**Table 2** Treatments for acute and chronic low back pain[3 4]

| Effectiveness | Acute low back pain | Chronic low back pain |
|---|---|---|
| Beneficial | Advice to stay active, non-steroidal anti-inflammatory drugs (NSAIDs) | Exercise therapy, Intensive multidisciplinary treatment programmes |
| Trade off | Muscle relaxants | Muscle relaxants |
| Likely to be beneficial | Spinal manipulation, behaviour therapy, multidisciplinary treatment programmes (for subacute low back pain) | Analgesics, acupuncture, antidepressants, back schools, behaviour therapy, NSAIDs, spinal manipulation |
| Unknown | Analgesics, acupuncture, back schools, epidural steroid injections, lumbar supports, massage, multidisciplinary treatment (for acute low back pain), transcutaneous electrical nerve stimulation, traction, temperature treatments, electromyographical biofeedback | Epidural steroid injections, EMG biofeedback, lumbar supports, massage, transcutaneous electrical nerve stimulation, traction, local injections |
| Unlikely to be beneficial | Specific back exercises | — |
| Ineffective or harmful | Bed rest | Facet joint injections |

## How effective are conservative treatments in chronic low back pain?

That exercise and intensive multidisciplinary pain treatment programmes are effective for chronic low back pain is supported by strong evidence. Some evidence supports the effectiveness of (cognitive) behaviour therapy, analgesics, antidepressants, non-steroidal anti-inflammatory drugs, and back schools and spinal manipulation. No evidence supports using other interventions (for example, steroid injections, lumbar supports, and traction). For most effective treatments, the effects are usually only small and short term. Unfortunately, many commonly used interventions lack sufficient evidence for clinically relevant long term effects.[4]

## What is the role of invasive procedures in (non-specific) chronic low back pain?

A recently published review summarised the available evidence about the efficacy of surgery and other invasive interventions for low back pain and sciatica.[15] A number of interventions, including facet joint, epidural, trigger point, and sclerosant injections, have not clearly been shown to be effective. No sound evidence is available for the efficacy of spinal stenosis surgery. Surgical discectomy may be considered for selected

**Box 3: Recommendations in the European clinical guidelines for diagnosis and treatment of chronic low back pain[22]**

**Diagnosis**

- Diagnostic triage to exclude specific pathology and nerve root pain
- Assessment of prognostic factors (yellow flags) such as work related factors, psychosocial distress, depressive mood, severity of pain and functional impact, prior episodes of low back pain, extreme symptom reporting, and patient's expectations
- Imaging is not recommended unless a specific cause is strongly suspected
- Magnetic resonance imaging is best option for radicular symptoms, discitis, or neoplasm
- Plain radiography is best option for structural deformities

**Treatment**

*Recommended*—Cognitive behaviour therapy, supervised exercise therapy, brief educational interventions, and multidisciplinary (biopsychosocial) treatment, short term use of non-steroidal anti-inflammatory drugs and weak opioids.
*To be considered*—Back schools and short courses of manipulation and mobilisation, noradrenergic or noradrenergic-serotoninergic antidepressants, muscle relaxants, and capsicum plasters.
*Not recommended*—Passive treatments (for example, ultrasound and short wave) and gabapentin. Invasive treatments are in general not recommended in chronic non-specific low back pain.

patients with sciatica due to lumbar disc prolapse that do not respond to initial conservative management. The role of fusion surgery for chronic low back pain is under debate.[16] Recent randomised clinical trials comparing fusion surgery with conservative treatment showed conflicting results.[17–19] Recommendations that fusion surgery should be applied in carefully selected patients are difficult to follow because no clear and validated criteria exist to identify these patients in advance.

## Does (early) psychosocial intervention prevent chronicity?

Although evidence certainly shows the contribution of psychosocial factors to the development of chronic low back pain and disability, less is known about the efficacy of interventions aimed at patients identified with increased risk due to these factors. A recently published clinical trial did not find positive effects of a specifically designed intervention to be applied by general practitioners for patients with acute or subacute low back pain.[20] The intervention focused on the identification of psychosocial prognostic factors—discussing these factors with the patient, setting specific goals for reactivation, and providing an educational booklet. Compared with usual care, however, no differences were found on any outcome measure during a year long follow-up. Also, in currently available clinical guidelines, no clear recommendations are given regarding the optimal treatment of patients at risk (due to their psychosocial profile) once they have been identified. The development and evaluation of interventions aimed at prevention of chronicity is of utmost importance in the coming years.

## What do guidelines recommend?

In many Western countries, clinical guidelines have been issued for the management of low back pain. In general, recommendations are similar across guidelines. Box 2 summarises the main recommendations for diagnosis and treatment for acute low back pain from 11 countries.[21] For chronic low back pain, far fewer guidelines are available. Box 3 shows the recommendations from the recently issued European clinical guidelines for chronic low back pain.[22] It must be noted, however, that these recommendations are made by a single guideline committee.

## Promising developments

### Identifying subgroups of patients more amenable to specific treatments

A recently published randomised clinical trial found that patients with acute or subacute low back pain had significantly better functional outcomes when they received a matched treatment compared with an unmatched treatment.[23] The authors examined all patients before treatment and assigned them to one of three groups (manipulation, stabilisation exercises, or specific exercise) thought most likely to benefit the patients. Patients were subsequently randomised irrespective of this subgroup assignment towards one of the three interventions groups with the same treatments. The analyses were focused on matched versus unmatched treatment according to their baseline subgroup assignment.

Previous studies also found better results of matched treatments in subgroups of patients with non-specific low back pain. For example, one study showed that it was possible to identify a subgroup of patients likely to benefit from spinal manipulation.[24] These types of studies may further improve the management of patients with low back pain and better tailor treatment options to the needs of individual patients. It might be recommended to further investigate which subgroups of patients with chronic low back pain (for example, based on their psychosocial yellow flags) will especially benefit from exercise therapy or cognitive behaviour therapy.

### Clinical guidelines that stimulate a more active approach to management

The accumulated evidence from randomised trials and systematic reviews regarding the value of diagnostic

**Useful websites**

Clinical Evidence (www.clinicalevidence.org)
Up to date evidence for clinicians regarding benefits and harms of treatments for a variety of disorders including low back pain

Cochrane Back Review Group (www.cochrane.iwh.on.ca)
The activities of the review group responsible for writing systematic Cochrane reviews on the efficacy of treatments for low back pain

Cochrane Collaboration (www.cochrane.org)
The organisation responsible for writing systematic reviews and meta-analyses on the efficacy of treatments which are published in the Cochrane Library

European Guidelines (www.backpaineurope.org)
The recently issued European guidelines on the prevention and treatment of low back pain

**Ongoing research**

Much research is focused on detecting relevant subgroups of patients with low back pain with a different prognosis and susceptibility to specific treatments. Special attention is given to identifying patients at risk of developing chronic pain and disability and the adequate management of these patients. A large number of randomised clinical trials are being done to assess the effectiveness of commonly available treatments for acute and chronic low back pain.

**A patient's perspective**

Back pain entered my life four years ago during a holiday and hasn't left since. It is always disturbing my daily life, often barely noticeable, but at times severe. I went to see a specialist and had a computed tomography scan, but the doctors say there's nothing seriously wrong with my back. When I am in pain I try to do some exercises that a physiotherapist taught me. I love to walk and try to hang on to my daily routine. The pain gets worse if I don't keep moving. I only go to see my general practitioner when I think I need painkillers.

I am a widow and live alone. My children are supportive, but sometimes I sit on the side of my bed and cry because of the pain and the fact that I can hardly get up to go to the toilet. I do enjoy life a lot, but I find living with periods of pain and limitations pretty hard at times. I think life will be easier once I move to a place without stairs and with some personal help when I need it most.

Mrs Mooren-Baars, aged 76 years, Breille

**A patient's perspective**

I can't even remember exactly when my backaches started. It must have been about 20 years ago, when I was teaching kindergarten. That kind of work is hard on your back: everything happens close to the floor. I had a check-up with a specialist who, after taking x ray scans, told me that my back was weak. I understood that I needed to take better care of my back, so I went to a physiotherapist, who taught me some exercises to strengthen my back.

My backache comes and goes. I hardly ever see my general practitioner when the pain returns: I am convinced that the best way to get rid of back pain is to keep moving and to do my exercises. Recently my backache returned while I was making my grandchild's bed. I immediately started doing my exercises again as I fervently wanted to play in our local tennis competition, but I was afraid to move. So the pain got worse. My general practitioner told me to get going again, that turned out to be good advice.

I know that the best treatment for my backache is to do my exercises daily, even when my back is fine. But that is a hard advice to follow for a woman with an active life like mine.

Mrs Veenhof-Orvan, aged 61 years, Breille

and therapeutic interventions has now been incorporated in clinical guidelines. A few initial surveys have shown that these guidelines are being followed to some extent, but there is still room for improvement, especially in those countries and settings in which a large discrepancy exists between recommendations in guidelines and actual management in clinical practice. Measures should be taken to minimise this gap. Simply developing and publishing evidence based guidelines and subsequently disseminating these guidelines may not be effective enough to change practice. Implementation seems essential in changing clinical practice. Several trials have evaluated implementation of guidelines and its effect on patient and process outcomes.[25 w8] These trials show modest effects at best. More intensive multifaceted interventions might be needed to achieve further progress in this area.

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## Walk the line

A recent outpatient giving a contorted and unclear history provided a challenge in determining the benefit he might have from surgery. My boss smartly and simply suggested we follow that age old practice to "take a walk."

I was reminded this Mother's Day how the simplest things can often tell us the answer to the question we should have asked.

Reel back four years to when I arrived at night to stay at my family house on an island. My parents, both in their 70s, had been working hard all day, one of them scaling trees, and unsurprisingly they looked tired. The next day I suggested a walk. Oddly it was met with a lack of enthusiasm. We started out along the flat coastal road, but 10 metres later, at the first hint of an incline, my normally fit mother stopped. In the sunlight her face was a sickeningly familiar shade of grey. In the ensuing discussion the history of severe chest pain the day before was revealed. Twenty minutes later the general practitioner's electrocardiograph confirmed the obvious, and one hour later we were in a helicopter. Too late for thrombolysis, the angiogram revealed there was nothing to be done.

How often would a short walk tell you something about a patient or a relative? How often do the complexities and availability of investigations distort us from the simplest course? Sometimes the more complex a problem the simpler the answer. Indeed the answer to the question may lie just a few strides away.

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