Non-specific low back pain

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Non-specific low back pain has become a major public health problem worldwide. The lifetime prevalence of low back pain is reported to be as high as 84%, and the prevalence of chronic low back pain is about 23%, with 11–12% of the population being disabled by low back pain. Mechanical factors, such as lifting and carrying, probably do not have a major pathogenic role, but genetic constitution is important. History taking and clinical examination are included in most diagnostic guidelines, but the use of clinical imaging for diagnosis should be restricted. The mechanism of action of many treatments is unclear, and effect sizes of most treatments are low. Both patient preferences and clinical evidence should be taken into account for pain management, but generally self-management, with appropriate support, is recommended and surgery and overtreatment should be avoided.

Epidemiology and natural history

Non-specific low back pain is defined as low back pain not attributable to a recognisable, known specific pathology (eg, infection, tumour, osteoporosis, fracture, structural deformity, inflammatory disorder, radicular syndrome, or cauda equina syndrome). Low back pain became one of the biggest problems for public health systems in the western world during the second half of the 20th century, and now seems to be extending worldwide.[1,2] Data from the USA show that the proportion of physician visits attributed to back pain has changed little in the past decade,[3] but the cost has increased substantially.[4]

Most people will experience back pain at some point in their life. Individuals who do not seek medical attention do not differ substantially from those who do seek care in terms of the frequency or intensity of low back pain experienced.[5] Although the proportion of health-care resources used for low back pain is large, few people with the problem seek health care.[6,7] Picavet and colleagues[6] reported that less than a third of patients with low back pain had consulted their family doctor in the previous year, and Wieser and colleagues[7] reported that 22·8% had sought outpatient medical care (11·6% had consultations with a family doctor, and 6·4% with a specialist) in the previous 4 weeks. Women and patients with a history of low back pain are more likely to seek care, and perceived disability is more strongly associated with care-seeking than is pain intensity;[8] socioeconomic factors do not seem to be important.[9] Some potentially relevant psychosocial predictors of care-seeking, such as beliefs or psychological distress, have not been investigated in depth. The lifetime prevalence of low back pain is reported to be as high as 84%, and best estimates suggest that the prevalence of chronic low back pain is about 23%, with 11–12% of the population being disabled by it.[10]

Prevalence estimates vary depending on the definition of low back pain used. Ozguler and colleagues[11] recorded that prevalence in the previous 6 months was 8% when low back pain was defined as requiring sick leave, whereas when it was defined as pain lasting at least a day, prevalence was 45%. Risk factors also differed with the definition of low back pain used, making comparisons between studies difficult.

All age groups are affected by low back pain. For decades it was suggested that children and adolescents did not experience low back pain unless they had a serious and sometimes life-threatening disorder. However, findings from many epidemiological studies (56 were included in a review by Jeffries and colleagues[12]) report that the prevalence of low back pain, at least in teenagers, is similar to that in adults. Only a few teenagers reported being free of any pain symptoms in the period before the survey,[13,14] and some were in pain for a long time.[15] However, in this age-group, low back pain seems to have little effect on quality of life[14] unless the pain is highly recurrent or present in other locations, or both.[16] Findings from a UK survey showed that the annual consultation prevalence for low back pain was 417 per 10 000 registered patients. The lowest rate was recorded in the 0–14 year age-group (30 per 10 000) and the highest in the 45–64 year age-group (536 per 10 000).[17] Similar data were reported for France by Plénet and colleagues.[18] Elderly people are also affected by low back pain; results from a large

Search strategy and selection criteria

We searched the Cochrane Library and Medline for reports published in English, French, Spanish, or German, with the terms "low back pain", "backache", "lumbar pain", "lumbago", "non-specific" in successive combination with the terms "epidemiology OR incidence OR prevalence", "clinical expression OR classification", "pathogenesis OR pathophysiol*", "outcomes", " treatment OR management OR prevention". The searches covered the years 2007–10. We searched the reference lists of articles identified by this search strategy, particularly the reference lists of systematic reviews and meta-analyses, and selected those we judged relevant, including review articles and book chapters, as well as frequently referenced and highly regarded older publications, especially those that were relevant to the understanding and management of patients with low back pain by clinicians. For specific aspects of the Seminar (eg, current and future directions, pathogenic mechanisms, genetics) we used isolated studies, whereas for risk factors and management we relied as much as possible on meta-analyses or systematic reviews.

community-based sample surveyed twice in 2 years showed that, at both timepoints, almost half the patients sampled reported some kind of disabling back pain in the previous 2 weeks.[19] About 10% of those surveyed reported disabling low back pain most or all of the time. The effect of low back pain on wellbeing or health related quality of life and functioning in this age-group is substantial,[20] even in those reporting low pain intensity and disability;[21] nonetheless, fewer than half of elderly people with low back pain seek care.[22]

Reports often state that most patients with acute low back pain recover reasonably quickly and that only about 10–15% develop chronic symptoms. However, an inception cohort study in Australia[23] showed that about a third of patients had not recovered fully after 1 year. In a subset of patients whose pain still persisted at 3 months, only about 40% recovered within 12 months.[24] Results of large-scale epidemiological studies show that one of the main characteristics of low back pain is recurrence,[24,25] although comparisons between studies are sometimes difficult because of the different definitions of recurrent low back pain.[26]

Most episodes of low back pain are self-limiting and are not related to serious diseases. The clinician's initial aim is to distinguish the small proportion of patients with specific underlying conditions—and sometimes life threatening disorders—or nerve root pain, from the vast majority with non-specific mechanical low back pain.[10]

Pathogenesis and risk factors for non-specific low back pain

Nociceptive factors have a major role in acute pain conditions. Various structures in the spine could constitute the origin of pain in accordance with their innervation, but the clinical interpretation of abnormalities is not possible on the basis of anatomical data alone.[27] In chronic pain, psychosocial dimensions become relevant, and are important to explain how people respond to back pain.[28]

Non-specific low back pain is, by definition, a symptom of unknown cause (ie, a symptom for which we are currently unable to reliably indentify the pathology). However, many factors have been identified as possible causes of the pain or as being able to affect its development and subsequent course. Findings from cross-sectional studies on large population samples have reported a significant association between low back pain and degeneration of the lumbar discs seen with clinical imaging; for example, the odds ratios (OR) for disc space narrowing and the presence of low back pain in men is 1·9 (95% CI 1·4–2·8)[29] and OR greater than 2 have been reported for disc degeneration (OR 2·18; 1·4–3·4) and for herniation (OR 2·07; 1·4–3·1).[30] Nonetheless, a systematic review with meta-analysis concluded that, at the individual level, none of the lesions identified by MRI could be established as the cause of low back pain[31] because such MRI abnormalities are very common in people who are asymptomatic, do not coincide with the development of low back pain, and do not predict the response to evidence-based therapy for non-specific low back pain.

A possible pathophysiological role for tumour necrosis factor α (TNFα) in low back pain was suggested by findings from a prospective case-control study in which, throughout 6 months of observation, the proportion of TNFα positive individuals was consistently and significantly higher in the low back pain group than in the control group.[32] Other experimental research suggests that nerve growth factor extracted from degenerative nucleus pulposus might have a role in pain transmission, because nerve growth factor promotes axonal growth and induces substance P production.[33] The clinical implications of these findings need further clarification.

Mechanical factors have long been thought to have a causal role in low back pain. However, eight systematic reviews with the Bradford-Hill causation criteria concluded that it was unlikely that occupational sitting,[34] awkward postures,[35] standing and walking,[36] manual handling or assisting patients,[37] pushing or pulling,[38] bending and twisting,[39] lifting,[40] or carrying[41] were independently causative of low back pain in the populations of workers studied.

Findings from a meta-analysis that included cross-sectional and longitudinal studies show that people who are overweight or obese have an increased risk of low back pain, with the strongest association for care-seeking for low back pain, and for chronic low back pain.[42] In cohort studies, only obesity was associated with an increased incidence of low back pain for a day or more in the previous 12 months (OR 1·53, 95% CI 1·22–1·92). Research evidence to suggest that disuse and physical deconditioning are directly associated with chronic low back pain, in either a causal or consequential manner, is scarce.[43]

Cohort studies reveal a slight association between back pain and smoking status (OR for the increased incidence of low back pain in smokers is about 1·3; 1·11–1·55), even when controlling for anxiety or mood disorders;[44] however, the underlying mechanisms remain obscure. The role of genetic factors has been widely discussed. Twin studies[45,46] show that both low back pain and disc degeneration have a genetic background. Heritability estimates range from 30% to 46% for various types of back pain problem.[47] Up to a quarter of the genetic effects on pain are attributed to the same genetic factors that affect disc narrowing.[47] Several other genetic effects have been reported through genes implicated in pain perception, signalling, psychological processing, and immunity.[48,49] Interleukin-1 gene cluster polymorphisms are associated with Modic changes and might have a pathogenic role.[50] Genotype has also been reported to be associated with the outcome of surgery for degenerative disc disease.[51]

One element that can obscure the pathogenic role of some risk factors is the presence of a non-linear relation

with low back pain, as has been shown, for example, in the case of physical activity. A U-shaped relation—with a sedentary lifestyle and the pursuit of strenuous activities both associated with a greater risk of chronic low back pain—was reported in a Dutch population-based study.[52]

Many practitioners, unhappy with the established tradition of labelling almost all low back pain cases as non-specific, maintain that different underlying causes (eg, facetogenic, discogenic, or sacroiliac) exist and can be identified. In a study of various disciplines,[53] 93% of clinicians reported that they treated patients differently in accordance with their own diagnoses. However, evidence to suggest that the characteristics that purportedly define subgroups can be identified with good accuracy, or that a specific type of management is available for each subgroup, is insufficient.[54,55]

The published work usually distinguishes acute, subacute, and chronic categories of low back pain on the basis of the duration of the episode. The respective cut-offs are typically less than 6 weeks, 6–12 weeks, and more than 12 weeks.[56] However, a distinction based solely on the duration of symptoms might not be sufficient. Some researchers categorise low back pain on the basis of various combinations of timeframe, site, symptoms, duration, frequency, severity, and exclusions.[57] Grades to describe a combination of pain intensity and disability have been proposed.[58] The overall effect of low back pain in terms of care-seeking and health-related quality of life is low, at least in teenagers[14] and adults not seeking health care,[59] but higher grades or more chronic states of pain are typically associated with greater unemployment rates, pain-related functional limitations, depression, use of opioid analgesics, pain-related doctor visits, and poorer self-rated health.[58]

In about 10–15% of patients, acute low back pain develops into chronic low back pain. The chronic state represents the greatest challenge because it tends not to improve with time and consumes most resources.[60] More than 10 years ago, so-called yellow flags were introduced to identify patients at risk of developing chronic symptoms and long-term disability, including low back pain-related work-loss.[61] Yellow flags include inappropriate attitudes and beliefs about back pain (eg, that back pain is indicative of serious damage or disease, or that passive treatments are the solution), inappropriate pain behaviour (eg fear-avoidance behaviour and reduced activity levels), and work-related and emotional difficulties. Results of a systematic review by Chou and Shekelle[62] showed that the most helpful baseline predictors of persistent disabling low back pain included maladaptive pain coping behaviours (median likelihood ratio [LR] 2·5; range 2·2–2·8), non-organic signs (median LR 3·0; 1·7–4·6), functional impairment (median LR 2·1; 1·2–2·7), low general health status (median LR 1·8; 1·1–2·0), and the presence of psychiatric comorbidities (median LR 2·2; 1·9–2·3); by contrast, low levels of fear avoidance (median LR 0·39; 0·38–0·40) and of functional impairment (median LR 0·40; 0·10–0·52) predicted recovery at 1 year. Findings from other reports suggest that, within 3 weeks of the onset of non-specific low back pain, low recovery expectations can identify people at risk of a poor functional outcome up to 6 months later (OR ranging from 1·18 [95% CI 1·03–1·35] to 2·86 [95% CI 1·73–4·73]).[63]

Prevention

Generalised primary prevention does not seem to be a realistic aim in low back pain because the symptom is highly prevalent, with the strongest risk factor for future low back pain being previous low back pain[64] and with a high proportion of teenagers having already had low back pain.[12] Furthermore, most prospective studies have not been able to identify many strong and modifiable risk factors for true first time low back pain.[65] This situation is not surprising, since the cause of the problem remains obscure in most patients.

Findings from systematic reviews of trials into the prevention of low back pain show that only exercise interventions seem to be effective.[66,67] Other interventions—such as stress management, shoe inserts or insoles, back supports, ergonomics or back education, and reduced lifting programmes—are not effective.[66] Manual materials handling advice and training, with or without the use of assistive devices, does not seem to be helpful either; there is weak to moderate evidence that this training does not prevent back pain and related disability, or reduce sick leave, when compared with no intervention or alternative interventions.[68] Since many of the putative mechanical risks associated with lifting, bending, and other actions have not been verified in research studies, this finding is perhaps not unexpected. Overall, preventive measures seem to be mostly applicable to the prevention of recurrence—ie, secondary prevention.[67]

Minimisation of the effect of low back pain

Evidence-based guidelines are an important device for attempting to minimise the consequences of low back pain. However, despite the progress made in the past two decades in developing and updating guidelines, and adapting them on a national basis, uptake by health-care providers is not optimum.[69] Reasons often include organisational, physician and patient factors, the process of implementation, and guideline quality and quantity. Concern for the individual patient's needs coupled with scepticism about application of research findings to individuals are some of the most frequently presented arguments.[70]

Public health mass-media campaigns in Australia,[71] Scotland,[72] Norway,[73] and Canada[74] have been consistently successful in eliciting changes in beliefs about low back pain and its treatment, although only the campaign in Australia[71] resulted in a change in disability behaviour or work absence. The general content of each of these

mass-media campaigns was similar but the different means of delivery, subliminal messages conveyed, and groups targeted and reached (employers in addition to employees) might have affected the relative effectiveness of the campaigns. Results from two studies have shown that family doctors with high fear-avoidance beliefs themselves tend to prescribe more sick leave and bed rest for their patients with low back pain, and less frequently advise them to maintain normal physical activities.[75,76] Any attempts to elicit a change in beliefs about low back pain and its treatment should target all users of and providers within the health-care system and should include employers. This inclusive approach should prevent mixed messages from negating the positive effects of any campaigns that might otherwise lead to a better-educated patient or worker.

The overzealous application of new and expensive technology with unclear benefit in both diagnosis and treatment, and the pressure exerted from industry, has undoubtedly played an important part in the escalation of the socioeconomic problem of low back pain. The rate of lumbar surgery shows two trends: there are major differences between countries and even between regions within the same country,[77,78] and there is an increase in more complex fusion procedures with their accompanying costs and complications.[79] The first point clearly suggests that indications for lumbar surgery are not standardised or generally agreed upon. Many abnormalities seen on imaging (with the possible exception of Modic signs[80]) are equally prevalent in the asymptomatic population and merely serve as a pretext to justify overtreatment.

Assessment

Recommendations for the clinical assessment and management of low back pain have not changed notably in the past decade.[81] Diagnostic triage is used to distinguish those patients with non-spinal or serious spinal disorders from those with pain of musculoskeletal origin, by means of history and examination, with particular emphasis on so-called red flags.[82] The red flags consistently reported in the published work include weight loss, previous history of cancer, night pain, age more than 50 years, violent trauma, fever, saddle anaesthesia, difficulty with micturition, intravenous drug misuse, progressive neurological disturbances and use of systemic steroids.[83] Once serious disease has been ruled out, the next priority is to identify patients with radicular pain. All other cases are classified as non-specific[82] and the patient should be assessed for the severity of symptoms and functional limitations, and for risk factors for chronicity.[84]

Most guidelines agree on the importance and basic principles of diagnostic triage; however, few studies have been undertaken to assess its effectiveness.[10] The specificity of red flags has been criticised by some, and it has been suggested that unquestioningly following them might lead to further investigations in most patients. For example, Henschke and colleagues[85] showed that, using 25 red flag questions in a primary care setting, 80% of patients (942 of 1172) had at least one red flag; this finding contrasted with a prevalence of serious disease of 0·9% (11 of 1172). However, on the condition that a thorough assessment has been undertaken, other researchers maintain that, if there are no red flags, one can be 99% confident that serious spinal disease has not been missed.[86] The overutilisation of imaging (compared with the recommendations of guidelines) has been recognised and several causes identified. One way to reduce overuse might be to use likelihood ratios for the risk of serious spinal disorder, for example, age more than 55 years would not by itself require imaging, whereas a history of cancer would warrant immediate imaging.[87]

The basic methods used during a clinical encounter are the history and physical examination. Dermatomal radiation, more pain on coughing, sneezing or straining, positive straight leg raising, and crossed straight leg raising can be used to predict nerve root compression on MRI.[88] The history is crucial in patients with minor radicular compression. Most patients seeking surgical treatment for lumbar stenosis, for example, do not have positive physical examination findings and have subjective symptoms only, such as pain during walking.[89] However, a patient history can only go so far, since it can be difficult for the patient to distinguish between something as apparently straightforward as leg-dominant or back-dominant pain can be difficult.[90]

Four features (female sex, age >70 years, substantial trauma, and prolonged use of corticoids) are significantly associated with vertebral fracture (receiver operating characteristics area under the curve 0·834, 95% CI 0·65–1·01).[85] For malignancy, the combination of age 50 years or older, history of cancer, unexplained weight loss, and failure of conservative therapy has been reported to have a perfect sensitivity and negative likelihood ratio (1·0 and 0·0, respectively), but only moderate specificity and positive likelihood ratio (0·60 and 2·5, respectively).[91]

Clinicians frequently use the Schober test, or one of its modified versions, to measure lumbar mobility in the diagnosis of ankylosing spondylitis. Compared with radiological measurements of lumbar range of motion, the modified-modified Schober test shows moderate validity (r 0·67; 95% CI 0·44–0·84), excellent reliability (intraclass correlation 0·95; 95% CI 0·89–0·97; interclass correlation 0·91; 95% CI 0·83–0·96) and a minimum detectable change (measurement error) of 1 cm.[92] However, the reliability, and therefore validity, of the assessment of spinal and pelvic bony landmarks itself is poor.[93]

In patients with low back pain, MRI has various potential uses: predictive, diagnostic, assessment of severity, prognostic, assessment of recovery, management planning, therapeutic targeting, and occupational screening.[94] However, most guidelines advise that all imaging studies should be reserved for patients with progressive

neurological deficit, or when serious underlying causes are suspected. When used without these indications, imaging does not improve clinical outcomes. The results of a systematic review of randomised trials of patients without red flags showed that in a subset of the trials that followed up all patients for more than 6 months, or imaged all participants, no serious diagnoses were recorded.[86] Moreover, imaging can result in increased rates of surgery.[95] Imaging can reveal disc degeneration and even suggest the presence of discogenic pain; however, the absence of a pathoanatomical gold standard precludes any definitive conclusions.[96] Importantly, some imaging can be harmful because of radiation exposure (radiography and CT) and the risk of labelling patients with an anatomical diagnosis that might not be the actual cause of symptoms.[86] Diagnostic tests are often ordered because of the tensions and conflicts that physicians face as they attempt to meet conflicting role obligations within the health maintenance organisation.[97]

Management

For acute low back pain, most clinical practice guidelines agree on the use of reassurance, recommendations to stay active, brief education, paracetamol, non-steroidal anti-inflammatory drugs, spinal manipulation therapy, muscle relaxants (as second line drugs only, because of side-effects), and weak opioids (in selected cases).[84,98] Some reviews recommend topical pharmacological treatments and superficial heat application for pain relief.[99] Systemic corticosteroids are not recommended for acute low back pain.[98] Few studies have compared different pharmacological approaches for the treatment of acute low back pain, and most do not show any significant differences.[98] This finding might arise because symptoms tend to improve after a short period of time, with or without treatment.

For chronic low back pain, the use of brief education about the problem, advice to stay active, non-steroidal anti-inflammatory drugs, weak opioids (short-term use), exercise therapy (of any sort), and spinal manipulation are recommended in most guidelines.[84] Self-management strategies—for example health-promoting activities, self-monitoring of status, and decision-making[100]—are receiving increasing attention as important components in the management of low back pain. Secondary recommendations include multidisciplinary rehabilitation, adjunctive analgesics, cognitive behavioural therapy, and strong opioids. Antidepressants are presented as second line treatment for patients with persistent low back pain in some guidelines,[101] showing a small to moderate benefit,[98] although possibly no greater than placebo,[102,103] and with a high risk of side-effects.[102]

Intradiscal electrothermal therapy, percutaneous intradiscal radiofrequency thermocoagulation, and radiofrequency facet joint denervation are generally not recommended.[101] For chronic disabling cases of non-specific low back pain, intensive multidisciplinary approaches are often recommended, although these are not necessarily available everywhere. However, group cognitive behavioural interventions in a primary care setting can have a sustained effect on troublesome subacute and chronic low back pain at low cost to the health-care provider.[104]

The place for surgery in chronic non-specific low back pain (if any) is very limited and its overuse has been criticised.[105] Results from trials that compare intensive rehabilitation with spinal fusion surgery have shown similar clinical improvement for the treatments at short and long-term follow-up, but more complications and lower cost-effectiveness for surgery.[106,107] The findings of trials that assess new methods of surgical treatment, including disc replacement, show similar clinical outcomes (differences below minimally important clinical difference) to fusion and intensive rehabilitation as judged by standardised clinical outcome measures.[108,109] One of the difficulties of undertaking randomised trials that compare conservative and surgical management is the high rate of treatment group crossover,[106] often dictated by patient preferences and perceptions of the superiority of surgery. Patients with chronic pain not responding to conservative treatment should be carefully reassessed to ensure that a structural lesion that might be an indication for surgery has not been overlooked.[10] Otherwise, chronic refractory cases (ie, patients who have undergone multidisciplinary rehabilitation without any improvement) should be managed by pain specialists or with multidisciplinary programmes focused on chronic pain management.

Outcome assessment and effect sizes

The assessment of treatment outcome is very important for both research and daily clinical practice. Patient-centred outcomes are acknowledged to be more relevant than objective clinical measures (eg, range of motion, strength). Throughout the past decade, the spine-research community has generally accepted the suggestions made by a group of low back pain experts who identified six main domains relevant to the assessment of patients with low back pain: pain symptoms, function, wellbeing, work disability, social disability, and satisfaction with care.[110] Several instruments have been developed and validated for the evaluation of these dimensions, including short multidimensional instruments containing only one or two items for each domain.[111,112] These techniques are especially useful for routine clinical practice or in large-scale quality assessments. The notion of the minimal clinically important change, defined as the smallest individual change score that is important to patients, is of fundamental importance for these instruments. Awareness of the rough value of the minimal clinically important change for a specific variable, test, or measure, and knowledge of the proportion of patients in trials that have achieved such a change, moves the focus away from statistically significant group differences towards an improved understanding of

what the results mean for individual patients. Values for the minimal clinically important change for improvement of around 30% change in an individual's score have been suggested for several instruments that measure pain and disability.[113] Some researchers maintain that the clinical importance of an intervention cannot be assessed without reference to the costs and inconveniences of that intervention, such that clinical importance should not only be outcome-specific but also intervention-specific.[114] This notion has led to the introduction of the sufficiently important difference—ie, the smallest amount of patient-valued benefit that an intervention would require to justify associated costs, risks, and other harms.[115] Although such a benefit-harm trade-off could be valuable for assessment of the value of treatment within the context of scientific studies and randomised trials, such elaborate evaluations of the costs, inconveniences, harms, and likely benefits of a treatment on an individual patient basis might not be feasible in routine clinical practice. Moreover, it is known that patients often change their expectations when rating the so-called worthwhile change before and after treatment.[116]

The effect sizes for most low back pain treatments compared with placebo are low for both acute and chronic low back pain.[117] For example, for placebo-controlled trials of analgesics, almost half had point estimates of effects less than 10 on a 100-point scale, and a further 40% only 10–20 points. In another review,[118] the effect sizes for non-steroidal anti-inflammatory drugs (0·51) and manipulation (0·40) for acute low back pain were small, as were those of acupuncture (standardised mean difference [SMD] 0·61), behavioural therapy (SMD 0·57), exercise therapy (SMD 0·52), and non-steroidal anti-inflammatory drugs (relative risk 0·61) for chronic low back pain. In a meta-analysis of randomised controlled trials, Artus and colleagues[119] showed wide heterogeneity in the extent of improvement with different conservative treatments, and they called for the exploration of factors other than the specific treatment that might also affect symptom improvement. Wand and O'Connell[120] suggested, among other hypotheses, that disparate treatments might show similar effectiveness because they could all work through the same mechanism, eg, by affecting cortical function. Notably, the results of many specific treatments (eg, back strengthening exercises) that are designed to address a specific problem (eg muscular weakness or atrophy) turn out to show effectiveness unrelated to the extent of any specific physiological or anatomical changes (eg, of back strength or muscle size); the effects are, instead, related to concomitant changes in beliefs, attitudes, and coping mechanisms. This finding would tend to support the notion of an overall effect taking place at higher neurological levels. Wand and O'Connell[120] hypothesised that greater treatment effect sizes than are currently recorded might be detected if the various interventions were delivered in a way that focused more on central processes. This idea provides an avenue for further research in the challenge to improve the effectiveness of treatment.

Panel 1: Key messages for low back pain

- Low back pain is a problem worldwide with a lifetime prevalence of 84%.
- All age groups are affected, but the impact on quality of life is lower in adolescents than in adults.
- The outcome of acute spells is obscured by frequent relapses.
- The predictors of outcome are similar for acute and chronic low back pain and are mostly psychosocial or belief-related in nature; however, most of the variance in outcome remains unexplained.
- Traditional mechanical factors probably don't have a major pathogenic role.
- Genetic constitution is important.
- Evidence for the use of sub-grouping in the diagnosis, classification, or management of non-specific low back pain is limited.
- Restrictive use of imaging is recommended.
- The recommended history taking and clinical examination process (diagnostic triage) has had little formal scientific assessment of its validity regarding diagnosis and outcome; however, it is supported in most guidelines.
- The mechanism of action of many treatments remains unclear and the effect sizes of most treatments are low (0·4–0·6).
- Exercise (no specific type) has some effect in secondary prevention—ie, the prevention of recurrence.
- Self-management, together with appropriate support, is encouraged.
- There is no major place for surgery, and overtreatment is a concern.
- Many good quality national guidelines for assessment and treatment are available.
- In the management of low back pain, patients' views and preferences should be considered in addition to clinical evidence.

Patients' expectations are known to influence the outcome of treatment, with expectations being fulfilled the main determinant.[121] The impact of expectations on subjective outcome is related to the placebo effect insofar as expectations can both mediate and modulate placebo effects.[122] The placebo effect is a genuine psychobiological event attributable to the overall therapeutic context, consisting of patient and clinician factors and factors associated with the treatment context, such as the nature of the treatment and the patient-clinician relationship.[122]

For each patient, the clinician has to make individualised decisions about treatment. As already mentioned, a trade-off is sometimes necessary in relation to benefits, risks, and costs of treatment,[98] taking into account both patient

Panel 2: **Some of the newest lines of clinical investigation being undertaken for low back pain**

Genetics

- Adaptation of treatments to genetic factors that affect pharmacokinetics or pharmacodynamics.[49,126]
- Personalisation of individual pain therapy through epigenetic approaches[127] or genetic guidance.[128]

Pharmacotherapy

- Peripherally acting opioids.[129]
- Utilisation of the chronopharmacology of specific drugs.[130]
- New biological treatments such as specific nerve growth factor inhibitors.[131,132] Tanezumab has been tested in osteoarthritis although concerns are being raised about its possible association with rapidly progressive osteoarthritis and osteonecrosis.

CNS

- Improvement of the understanding of events in the CNS.[121,133,134]

Management

- Patient empowerment and self-management.[100]
- Improvement of adherence to guidelines.[135]
- Subgrouping with, for example, the STarT Back tool.[136]

New imaging techniques

- Molecular imaging techniques.[137]
- Kinetic magnetic resonance imaging.[138]
- Specific sequences or spectroscopy.[139]

preferences and evidence-based knowledge. In this respect, and until such times as improved treatment effect sizes are achievable, the absence of a notable difference in effectiveness between many evidence-based treatments for low back pain could be turned to its advantage; it opens up the palette of options available, allows consideration of patient preferences and access to facilities, and allows management to be suited to the budget of the health-care provider. These factors are especially relevant because one of the most important reasons for non-adherence to guidelines is perceived patient preferences.[70]

The high economic and social burden of low back pain is at least partly the result of the widespread use of non-effective or non-cost-effective interventions. Position statements[123] call for a back to basics approach, including the need for improved understanding of basic pain mechanisms, independent and scientifically rigorous trials of treatments, and a stronger regulatory stance towards the approval and post-marketing surveillance of new drugs and devices for low back pain. These concerns relate to both medication[124] and surgery.[105]

A reappraisal of our approach to the problem of low back pain is needed not only in terms of treatment but also in relation to work issues and the benefits system. In countries with high social protection, low back pain is frequently linked to work-loss and reduced productivity. Both absenteeism and presenteeism (ie, being at work but with reduced productivity) are substantially greater in people with negative beliefs about low back pain[125] than in those with a more positive attitude, and therefore these attitudes continue to represent a worthwhile target for intervention. Other key points in relation to low back pain are summarised in panel 1.

Conclusion

Our knowledge about low back pain has greatly increased in the past few decades and the trend continues with, for example, the development of studies oriented towards genetics and molecular events. Some of the newest lines of scientific and clinical investigation that are being undertaken in relation to low back pain are shown in panel 2. Unfortunately, these investigations have not yet translated into practical solutions, particularly for people with chronic low back pain. In all probability, the conclusion of a report by Pransky and colleagues[140] best describes the foreseeable future:

"One thing is certain for this common, vexing condition—both clinicians and patients will continue to face the challenge of a wide array of possible treatment and management options and of making choices that will optimise outcomes while reducing the burden of low back pain on individuals and society".

Nonetheless, the health-care community should be encouraged by the fact that we already know so much about this elusive condition that is affected by a host of genetic, physical, psychological, environmental, cultural, and societal factors.

Contributors

All authors prepared the outline and contributed to the literature search and writing of the Seminar. FB and AFM developed the search strategy.

Conflicts of interest

We declare that we have no conflicts of interest.

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