Academy of PHYSICAL MEDICINE

Research Paper Review

This review is published with the permission of Research Review Service (www.researchreviewservice.com)

Lancet Low Back Pain Series – Part 1: Evidence-Based Call to Action

Papers Reviewed:

1. Buchbinder R, van Tulder M, Oberg B et al. Low back pain: a call for action. Lancet 2018 Mar 20. pii: S0140-6736(18)30488-4. doi: 10.1016/S0140-6736(18)30488-4. [Epub ahead of print].

2. Hartvigsen J, Hancock MJ, Kongsted A et al. What low back pain is and why we need to pay attention. Lancet 2018 Mar 20. pii: S0140-6736(18)30488-4. doi: 10.1016/S0140-6736(18)30480-x. [Epub ahead of print].

ANALYSIS

Reviewed by Dr. Demetry Assimakopoulos

Author Affiliations

Cabrini-Monash Department of Clinical Epidemiology, Cabrini Institute and Monash University, Malvern Victoria, Australia; Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, The Netherlands; Department of Sports Science and Clinical Biomechanics, University of Southern Denmark, Odense, Denmark; Nordic Institute of Chiropractic and Clinical Biomechanics, Odense, Denmark; Department of Health Professions, Faculty of Medicine and Health Sciences, Macquarie University, Sydney Australia; Arthritis Research UK Primary Care Centre, Research Institute for Primary Care and Health Sciences, Keele University, Staffordshire, UK; Department of Public and Occupational Health Research Institute, VU University Medical Centres, Amsterdam, The Netherlands; Kaiser Permanente Washington Health Research Institute, Seattle, USA..

Background Information

These seminal articles, published by The Lancet, one of the world's most-read medical journals, are a literal *'call to action'* to change the way low back pain (LBP) is perceived, assessed and treated worldwide. The global point prevalence of activity-limiting LBP is approximately 7.3%, indicating that approximately 540 million people are affected by LBP at any time. As such, LBP has now become the number one cause of disability worldwide (1).

The authors describe a global challenge of preventing potentially harmful and wasteful practices for the assessment and treatment of LBP, while ensuring equitable, effective and affordable healthcare for those who need it.

The first article (#1 above) sets the stage by identifying and describing the worldwide calamity surrounding low back pain. The second article (#2 above) progresses to define low back pain and its causes, as well as biopsychosocial correlates that contribute to the variable clinical presentations and treatment effects seen in LBP patients. The third paper in the series (summarized in a separate Review) discusses the various evidence-based treatment and prevention strategies for LBP.

Summary:

Despite its incredible prevalence, the exact cause or nociceptive source of LBP remains elusive for most patients. Urgent assessment and treatment are required in serious causes of low back pain, such as neoplasm, infection, fracture and inflammatory conditions. Luckily, these severe causes make-up a very small percentage of LBP cases. LBP patients are also prone to suffer from additional psychosocial comorbidities such as depression and/or anxiety and complain of pain in multiple sites of the body. Concomitant maladaptive changes in pain processing can also occur, which may contribute to one's pain experience. As such, LBP is known to be a truly bio-psycho-social and layered phenomenon, requiring different treatments at different times.

Etiology and Pathophysiology of Low Back Pain

Imaging findings are commonly used by healthcare providers to explain the possible etiological source of LBP. However, the diagnostic importance of imaging findings are largely questionable, as multiple findings identified in LBP sufferers are also common in those without LBP (2). Some imaging findings, such as type 1 Modic changes (odds ratio [OR]: 4.0), disc extrusion (OR: 4.4), disc bulge (OR: 7.5) and spondylolisthesis (OR: 5.1), have some association with LBP. However, these associations require further investigation. Unfortunately, no evidence exists that imaging improves clinical outcomes. Therefore, existing clinical guidelines recommend against routine use of imaging for back pain (3, 4).

The utilization of imaging in cases of radiculopathy and spinal stenosis is also debatable. Disc herniations and stenosis are commonly found on MRI in those with and without LBP. As such, these imaging findings *must* also be clinically correlated.

Imaging is often considered to screen for red flags. Interestingly, approximately 80% of individuals with acute LBP have at least one red flag (5), despite less than 1% having a serious disorder. Nearly all red flags are uninformative when *reported in isolation* and do not change post-test probabilities of serious abnormalities.

The Burden of Low Back Pain

The median 1-year period global prevalence of LBP is approximately 37%. LBP peaks in mid-life and is more common in women than men (despite gender reporting being variable around the world). Activity limitations presenting alongside LBP increase with age. Low back pain prevalence is greater in higher-income countries compared to middle- or lower-income countries. There is no difference between rural and urban areas.

In 2015, LBP accounted for approximately 60.1 million years lived with disability, making it the number one cause of disability worldwide; an increase of 54% since 1990 (1)! The rise in this global burden is almost entirely secondary to population increase and aging in both high-income, low-income and middle-income countries, as opposed to increased prevalence. Importantly, LBP-related disability is highest in working populations worldwide. This is especially concerning in middle- and low-income nations, where job modifications are almost completely impossible. This is problematic, as many sufferers modify their activity without compensation, which contributes to the cycle of poverty in poorer world regions. Interestingly, in higher-income countries, differences in social compensation systems are largely responsible for national differences in the rate and extent of LBP-related workplace disability. In high-income countries, disabling LBP is associated with socioeconomic status, job satisfaction and the potential for monetary compensation.

The disability associated with LBP not only affects one's ability to work, but also one's ability to function independently and engage in social activities. Chronic LBP is often associated with hopelessness, family strain, social withdrawal, job loss, disappointment with healthcare encounters, pain acceptance, learning self-management strategies and wealth at retirement age. LBP truly has multifaceted, biopsychosocial effects on many patients.

The economic impact of LBP is comparable to cardiovascular disease, cancer, mental health and autoimmune diseases. Replacement wages account for 80-90% of the total costs. However, different figures may be quoted based on differences in national legislation and healthcare practices. Estimates of direct medical costs from LBP are largely calculated from high-income countries, with the USA having the highest costs. These high costs are attributed to a more medically intensive approach and higher rates of surgery,

compared with other high-income countries. In many nations, the most common reason for medical visits is LBP!

Approximately half of people seeking care from primary care practitioners suffer constant or fluctuating, low-to-moderate intensity pain. Unfortunately, while many individuals improve, approximately 2/3 of people continue to report some pain at 3 and 12-month post-injury time intervals. The best evidence suggests that approximately 33% of people with LBP will have a recurrence of LBP within 1 year of recovering from a previous episode. It is now understood that LBP is a *long-lasting condition with a variable course, rather than episodes of unrelated occurrences*.

Multiple risk-factors and triggers for episodes of LBP exist. The most commonly cited risk factor of a new episode of LBP is a previous episode. Individuals with other chronic conditions, such as asthma, headache and diabetes, are also more likely to report LBP than those with otherwise good health (OR: 1.6-4.2). Individuals with mental health comorbidities such as psychological distress (OR: 2.52 [6]) and depression (OR: 2.9 [7]) also have a greater risk of future LBP. Lifestyle factors such as smoking, obesity, physical inactivity and other factors that are correlated with poor general health are also associated with LBP and CLBP. Genetics are believed to account for approximately 21-67% of the future risk of LBP; this association is stronger in chronic and disabling LBP cases (8). Heavy workloads (OR: 1.08-4.1 [9]), awkward postures (OR: 8.0), heavy manual tasks (OR: 5.0), feeling tired (OR: 3.7) and distraction during activity (OR: 25.0 [10]) have all been associated with LBP. Still, the nature or even existence of *causal* pathways linking these risk factors and the development of back pain remains unclear.

The Biopsychosocial Framework for LBP

The relationship between disabling LBP and biophysical impairment(s) is not fully understood. However, some physical impairments are demonstrated in at least some individuals with LBP, such as muscle size and composition alteration, and poor coordination (or motor control). It is uncertain, however, whether these changes are causes, or consequences, of LBP.

Several psychological factors, such as depression, anxiety, catastrophization and pain-self-efficacy (one's belief in their ability to influence events of one's life), have been investigated for their relationship with LBP. The presence of these factors in LBP sufferers is associated with a heightened risk of disability. The mechanisms of this relationship are unfortunately not fully understood. The fear-avoidance model of chronic pain has been well investigated, demonstrating an association between fear of pain and avoidance of activity, leading to disability. The fear avoidance model has been expanded to include the influence of maladaptive learning processes and disabling beliefs on pain perception and behaviour, suggesting that pain cognitions have a central role in the development and maintenance of disability and pain itself (11). Pain self-efficacy has been consistently associated with impairment, disability, affective distress and pain severity (12). As such,

many clinicians have moved away from aiming to directly alleviate pain, to aiming to change beliefs and behaviours (13). *(REVIEWER'S NOTE: this does not mean that we as providers should take the 'bio' out of 'biopsychosocial pain management'. Many times, fears can be confronted during treatment or with exercise. While a thorough biopsychosocial framework for chronic LBP exists, we should not unnecessarily dismiss patients and simply refer them to psych when faced with the challenge of kinesiophobia (for example). Rather, treatment of kinesiophobia can be performed via educating your patient on the relationship between fear-avoidance and pain/disability and gradual confrontation using imagined movements, mirror therapy and a gradual exposure to painful/fearful movements. Of course, success is incumbent upon the patient being ready to confront their kinesiophobia. This can often be facilitated through co-management with a psychologist, if necessary.)*

Societal factors are also correlated with LBP. Interestingly, chronic, disabling LBP disproportionally affects low income and low education populations. One study (14) predicted disability to any pain condition in older age based upon life-time socioeconomic status. Interestingly, these findings were independent of comorbid conditions, psychological indicators and BMI (OR: 2.04). The suggested mechanisms for the effect of low education on LBP include environmental/lifestyle exposures in low socioeconomic groups, lower health literacy and unavailable healthcare. Routine and increased physical workloads are also associated with disabling LBP.

Central Pain Processing and Modulation

Nociceptive inputs are defined as *the encoding of high threshold (noxious/dangerous) stimuli from the environment into an electrical signal which is transmitted to the CNS. Nociception is NOT synonymous with 'pain'.* These inputs are normally processed in multiple areas throughout the nervous system. In the context of chronic pain, the actual processing of nociceptive inputs changes. It has been demonstrated that patients with chronic LBP show structural brain changes in different cortical and subcortical areas and altered functional activity in pain-related areas following painful stimulation (15).

Processing of nociception is contingent upon the nociceptive drive, context, cognition and emotion. If any of these factors are altered, the same nociceptive input can produce a different cerebral signature in the same patient. While these findings are certainly attractive and impressive, their clinical implications still require further clarification and study.

CLINICAL APPLICATION & CONCLUSIONS

Low back pain is now the number one cause of disability worldwide. The burden of LBP is ever increasing, particularly in low- and middle-income nations. This worldwide issue is adding additional strain to already overburdened healthcare and social systems. Generally, a specific nociceptive source for LBP cannot be identified. Recurrences are unfortunately common. While only a smaller percentage of patients end-up with chronic and disabling low back pain, the costs associated with healthcare and work disability attributed to low

back pain are strikingly large. The exact costs vary between nations, and are related to social norms, healthcare approaches and legislation. While several global initiatives exist to address this burden, there is a need to find cost-effective and context-specific strategies for long-term management of low back pain.

REVIEWER'S NOTE: I believe these Lancet articles are an important call to action for all healthcare professions. We all, in some way, shape or form, attempt to help our patients manage chronic forms of pain. As a clinician who practices in two inter-disciplinary, academic, chronic pain management settings, I must congratulate the authors of these articles for their contribution. The subtext of these papers is that every chronic low back pain patient has different needs. Biological, psychological and social circumstances have variable contributions to pain presentation. Every patient is an n=1 and should be treated as such. We need to identify what a patient's real-time needs are and adjust our delivery of healthcare practices as their needs change. We as clinicians and rehab providers need to step outside our proverbial comfort zones and identify patients that we can and cannot treat. A similar argument can be stated for all professions, including interventional medicine, surgery and mental health. Our unified mantra should be: "right patient, right treatment, right time"…with all egos aside!

STUDY STRENGTHS/WEAKNESSES

These were exceptionally well-written and referenced articles. The authors drew on expertise from a multitude of professional backgrounds and synthesized this information incredibly well. The limitations of these papers pertain to the data itself. Much of the evidence pertaining to LBP comes from high-income countries, and as such, it is uncertain how well these data generalize to low- and middle-income countries. Additionally, research regarding the burden of LBP is not often a priority in low-income nations. Unfortunately, the exact consequences of LBP in these countries remain largely unknown, although this is changing. Broader aspects of life, such as participation, well-being, social identity, career burden, health resource utilization and work-disability costs were likely not accounted for in the GBD 2015 study. Subsequent inclusion and consideration of these factors may change interpretation of the data. Additionally, studies evaluating cost of assessments and treatments may not capture all cost aspects from the individual patient's point of view.

Commentary on Lancet Series from Dr. Jan Hartvigsen:

The idea of writing a series of papers on LBP for The Lancet was conceived at a meeting in the Forum for Research on Back and Neck Pain in Primary Care that was held in Brazil in 2012. Together with Rachelle Buchbinder from Melbourne, Australia, I wrote an outline of 10 papers that we shared with a small group of people: Maurits van Tulder, Nadine Foster, Martin Underwood, Dan Cherkin and Chris Maher. Lancet really liked the idea of a series of papers on LBP (in fact the editor-in-chief replied back after 30 minutes) but thought that 5 papers would be better than 10. This group, that was now the steering group, then met over 3 days in Amsterdam in Maurits' office in November 2013 to outline 5 papers and put together suitable author teams. We were very conscious of finding a balance

between continents, gender, and professions while still maintaining the highest scientific standards.

All invited authors then met in Buxton, UK in the summer of 2014 to discuss the papers that were now in progress. The author teams subsequently worked on individual papers and the steering group gave feedback on drafts and finally in the fall of 2015 we submitted 5 papers. 6 months later we were notified that they had all been rejected, and the message was to reduce the 5 papers to 3. The main problem was that the papers did not have a truly global perspective. The mood in the steering group was not good! However, after several (long) teleconferences, we decided to give it one more go. We rearranged the author teams and over the next year we produced the 3 papers. These then went through peer-review and revisions but were finally accepted in December of 2017.

The papers were published online in March 2018, and the reception has been overwhelmingly good. There seems to be agreement that the current model of care for LBP is not sustainable and that the papers convincingly have shown the evidence-practice gap, while also showing a way forward. I think it is too early to say just how influential these papers will be, time will tell. But I am convinced that they will stand as a monument for some years and that we will see significant changes in the way we manage LBP in the coming decade.

I am very humbled and pleased to have been part of this project. Interestingly, we have not received any funding for these papers. People have done all this work on their own time and at their own expense. I have learned so much from working with these extremely dedicated, intelligent and talented people.

Sometimes you just happen to be at the right place at the right time.

Jan Hartvigsen (June 17, 2018) – Professor and Head of Research at the Institute for Sports Science and Clinical Biomechanics at the University of Southern Denmark (SDU) and Senior Researcher at the Nordic Institute of Chiropractic and Clinical Biomechanics (NIKKB)

Additional References:

1. Global Burden of Disease, Injury Incidence, Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet 2016; 388: 1545–602.
2. Brinjikji W, Luetmer PH, Comstock B, et al. Systematic literature review of imaging features of spinal degeneration in asymptomatic populations. Am J Neuroradiol 2015; 36: 811–16.
3. Jarvik JG, Gold LS, Comstock BA, et al . Association of early imaging for back pain with clinical outcomes in older adults. JAMA 2015; 313: 1143–53.

4. Wong JJ, Cote P, Sutton DA, et al. Clinical practice guidelines for the noninvasive management of low back pain: A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. Eur J Pain 2016; 21: 201–16.
5. Maas ET, Juch JN, Ostelo RW, et al. Systematic review of patient history and physical examination to diagnose chronic low back pain originating from the facet joints. Eur J Pain 2017; 21: 403–14. .
6. Power C, Frank J, Hertzman C, Schierhout G, Li L. Predictors of low back pain onset in a prospective British study. Am J Public Health 2001; 91: 1671–78.
7. Currie SR, Wang J. More data on major depression as an antecedent risk factor for first onset of chronic back pain. Psychol Med 2005; 35: 1275-82.
8. Ferreira PH, Beckenkamp P, Maher CG, Hopper JL, Ferreira ML. Nature or nurture in low back pain? Results of a systematic review of studies based on twin samples. Eur J Pain 2013; 17: 957–71.
9. Heneweer H, Staes F, Aufdemkampe G, van Rijn M, Vanhees L. Physical activity and low back pain: a systematic review of recent literature. Eur Spine J 2011; 20: 826–45.
10. Steffens D, Ferreira ML, Latimer J, et al. What triggers an episode of acute low back pain? A case-crossover study. Arthritis Care Res 2015; 67: 403–10.
11. Crombez G, Eccleston C, Van Damme S, Vlaeyen JW, Karoly P. Fear-avoidance model of chronic pain: the next generation. Clin J Pain 2012; 28: 475–83.
12. Jackson T, Wang Y, Wang Y, Fan H. Self-efficacy and chronic pain outcomes: a meta-analytic review. J Pain 2014; 15: 800–14.
13. Frost H, Klaber Moffett JA, Moser JS, Fairbank JC. Randomised controlled trial for evaluation of fitness programme for patients with chronic low back pain. BMJ 1995; 310: 151–54.
14. Lacey RJ, Belcher J, Croft PR. Does life course socio-economic position influence chronic disabling pain in older adults? A general population study. Eur J Public Health 2013; 23: 534–40.
15. Kregel J, Meeus M, Malfliet A, et al. Structural and functional brain abnormalities in chronic low back pain: A systematic review. Semin Arthritis Rheum 2015; 45: 229–37.