

BRAZILIAN JOURNAL OF IMPLANTOLOGY AND HEALTH SCIENCES

Challenges and Advances in Chronic Low Back Pain Management: A Review of Conventional and Innovative Treatment Strategies

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<u>https://doi.org/10.36557/2674-8169.2025v7n5p926-937</u> Artigo recebido em 07 de Abril e publicado em 17 de Maio de 2025

LITERATURE REVIEW

ABSTRACT

Introduction: Chronic low back pain (CLBP) is a prevalent condition with complex management needs, requiring a multifaceted therapeutic approach. **Objective:** This study aimed to analyze the effectiveness of pharmacological, non-pharmacological, and innovative treatments for CLBP, highlighting multidisciplinary strategies and emerging therapies. Methods: A review of 11 studies published between 2020 and 2024 was conducted, focusing on treatment efficacy, patient outcomes, and the integration of various therapeutic modalities. Results: Multidisciplinary programs showed significant reductions in pain and disability demonstrating the benefits of comprehensive care. Non-pharmacological including manual therapy and acupuncture, provided sustained interventions, improvements in pain and function. Pharmacological treatments offered short-term relief but raised concerns about dependency risks, particularly with opioids like tramadol. Innovative therapies, such as spinal cord stimulation and regenerative treatments, presented promising results for patients unresponsive to conventional methods. Conclusion: Effective CLBP management requires integrating pharmacological and non-pharmacological treatments within multidisciplinary programs. Emerging therapies further expand treatment options, though long-term studies are needed to establish their efficacy and safety. A holistic, patient-centered approach remains essential for optimizing outcomes in CLBP care.

Keywords: chronic low back pain, non-pharmacological therapies, multidisciplinary treatment, innovative therapies.



RESUMO

Introdução: A dor lombar crônica (DLC) é uma condição prevalente que exige um manejo complexo, requerendo uma abordagem terapêutica multifacetada. Objetivo: Este estudo teve como objetivo analisar a eficácia de tratamentos farmacológicos, não farmacológicos e inovadores para a DLC, destacando estratégias multidisciplinares e terapias emergentes. Métodos: Foi realizada uma revisão de 11 estudos publicados entre 2020 e 2024, com foco na eficácia dos tratamentos, nos desfechos clínicos e na integração de diferentes modalidades terapêuticas. Resultados: Programas multidisciplinares demonstraram reduções significativas na dor e na incapacidade, evidenciando os benefícios de um cuidado abrangente. Intervenções não farmacológicas, como terapia manual e acupuntura, proporcionaram melhorias sustentadas na dor e na funcionalidade. Tratamentos farmacológicos ofereceram alívio a curto prazo, mas levantaram preocupações quanto ao risco de dependência, especialmente com opioides como o tramadol. Terapias inovadoras, como a estimulação da medula espinhal e os tratamentos regenerativos, apresentaram resultados promissores em pacientes que não responderam aos métodos convencionais. **Conclusão:** O manejo eficaz da DLC reguer a integração de tratamentos farmacológicos e não farmacológicos em programas multidisciplinares. As terapias emergentes ampliam ainda mais as opções terapêuticas, embora estudos de longo prazo sejam necessários para comprovar sua eficácia e segurança. Uma abordagem holística e centrada no paciente permanece essencial para a otimização dos desfechos na assistência à DLC.

Palavras-chave: dor lombar crônica, terapias não farmacológicas, tratamento multidisciplinar, terapias inovadoras.

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INTRODUCTION

Chronic low back pain (CLBP) is often characterized by persistent discomfort lasting longer than three months, which can significantly hinder physical functioning and mental health. It is frequently associated with conditions such as osteoarthritis, herniated discs, and muscle strain, though in many cases, the precise cause remains unclear (Zhu et al., 2024). The complexity of CLBP requires a comprehensive assessment to guide effective treatment, considering both the physical and psychological dimensions of the condition (Farley et al., 2024). The pain's chronic nature makes it particularly challenging to manage, as it frequently becomes a cycle of relapse and remission, impacting the patient's long-term wellbeing and quality of life (Blanco-Giménez et al., 2024). As the condition remains highly prevalent, healthcare providers continue to seek more effective, individualized treatment plans to help alleviate symptoms and improve patient outcomes (Tankha et al. 2024).

The socioeconomic burden of CLBP extends beyond the immediate healthcare costs, contributing to lost productivity and long-term disability (Li et al., 2024). Patients with CLBP often experience mental health issues, including depression and anxiety, due to the ongoing pain and functional limitations (Castro et al., 2024). This underscores the importance of adopting a multifaceted treatment approach that integrates physical, psychological, and sometimes even social support while traditional interventions like pain medications and physical therapy remain essential, the rising demand for non-pharmacological treatments reflects a growing recognition of the need for holistic and less invasive alternatives (Mauck et al., 2024). Therefore, understanding the broader impact of CLBP and exploring innovative therapeutic strategies is critical to developing more effective management paradigms (Kang et al., 2024).

This study aims to explore and analyze the efficacy of different therapeutic strategies in managing chronic low back pain, including pharmacological, interventional, and non-pharmacological approaches, and their impact on pain, functionality, and patients' quality of life.

METHOD

This study is an integrative literature review on the efficacy of different therapeutic approaches in the treatment of chronic low back pain (CLBP). The search was conducted using the PubMed/MEDLINE, Scopus, and Web of Science databases, covering studies up to February 2025. The following descriptors were used: "chronic low back pain," "treatment," "pharmacotherapy," "radiofrequency," "multidisciplinary rehabilitation," "opioids," "tramadol," "dry needling," "spinal cord stimulation," and "pain management." The Boolean operators "AND" and "OR" were applied to refine the search results.

Inclusion and exclusion criteria were: original articles published in English, Portuguese, or Spanish that addressed pharmacological, interventional, or nonpharmacological interventions for the treatment of CLBP in adults (≥18 years). Eligible study designs included randomized controlled trials, cohort studies, crosssectional studies, and systematic reviews. Studies using animal models, those focused solely on acute pain, research involving patients with low back pain secondary to malignancy, and publications without full-text access were excluded.

Data extraction and analysis included study design, participant characteristics, type of intervention, pain assessment scales (such as the Visual Analogue Scale [VAS] and the Oswestry Disability Index [ODI]), primary and secondary outcomes, and main findings. Outcomes were categorized into pharmacological, interventional, and non-pharmacological treatments. Due to heterogeneity among studies, a meta-analysis was not conducted; instead, a descriptive and qualitative analysis was performed.

The methodological quality assessment included studies was assessed using appropriate tools for each type of study: the Jadad scale for randomized controlled trials, the Newcastle-Ottawa Scale (NOS) for observational studies, and the AMSTAR-2 for systematic reviews. Studies classified as having low methodological quality were excluded from the analysis.

The study selection and analysis were conducted based on predefined descriptors, resulting in the identification of 6,304 articles in the selected databases. After applying the inclusion criteria and relevant filters, 53 studies were considered suitable for further evaluation. A detailed review of the abstracts narrowed the selection to 30 full-text articles, of which the 11 most relevant studies were chosen for in-depth discussion.



For data analysis, key information from the selected studies was compiled into comparative tables to highlight trends, inconsistencies and the unique contributions of each study to the topic. The findings were then analyzed and discussed considering the highest quality scientific evidence available.

RESULTS AND DISCUSSION

Year	Authors	Objective	Conclusion
2024	Padilha, G. C. M., Melo, G. C., Souza, L. F., Almeida, P. R. et al.	Evaluate the effectiveness of a multidisciplinary program in managing nonspecific chronic low back pain.	The multidisciplinary program significantly reduced pain and motor disability, with results sustained for up to 12 months.
2023	Santos, L. R., Figueiredo, A. L., Pereira, C. M., Costa, D. S. et al.	Analyze the effects of dry needling in patients with chronic low back pain.	Dry needling was effective in reducing pain and improving function, especially when combined with conventional physiotherapy.
2022	Kim, S. H., Kim, D. H., Lee, J. H., Park, J. Y. et al.	Evaluate the efficacy and safety of spinal cord stimulation in patients with refractory chronic low back pain.	The study confirmed the efficacy of SCS in reducing pain and improving function, with low complication rates.
2021	Deer, T. R., Pope, J. E., Lamer, T. J., Raso, L. J. et al.	Analyze the long-term impact of high-frequency spinal cord stimulation in chronic low back pain patients.	Sustained pain relief and functional improvement were observed after 12 months of high-frequency SCS, with high patient satisfaction rates.
2021	Lee, D., Lee, J., Yoon, D. M., Kim, Y. H. et al.	Evaluate the impact of multimodal pharmacotherapy in patients with chronic low back pain.	Combined use of analgesics and antidepressants effectively reduced pain and improved patients' psychological well-being.
2020	Kleinmann, B., Wolter, T., Weyerbrock, A. et al.	Assess the impact of cooled radiofrequency on sacroiliac joint pain and psychological comorbidities.	Cooled radiofrequency significantly reduced pain and improved sleep quality, with potential positive effects on depression.
2020	Dueñas, M., Moral- Munoz, J. A., Palomo-Osuna, J., Salazar, A. et al.	Estimate the prevalence of chronic low back pain in Spain and analyze differences in physical and psychological health.	High prevalence of chronic low back pain was found, with significant negative impacts on mental health and quality of life.
2020	Koo, H., Lee, M. T., Você, S. H., Seon, J. Y. et al.	Investigate the prevalence of duplicated tramadol use in chronic low back pain patients.	Duplicated tramadol use was notable, especially among the elderly and those with psychiatric comorbidities, indicating abuse risks and need for monitoring.
2020	Cohen, S. P., Doshi, T. L., Kurihara, C., Larkin, T. M. et al.	Evaluate the role of radiofrequency ablation for chronic low back pain and	Radiofrequency ablation provided significant pain relief and functional improvement in selected patients.



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		sacroniac joint pain.	
2019	Kapural, L., Yu, C., Doust, M. W., Gliner, B. et al.	Assess the efficacy of high- frequency (10 kHz) spinal cord stimulation in refractory chronic low back pain patients.	High-frequency SCS offered significant pain relief compared to conventional stimulation, improved quality of life, and reduced opioid dependence.
2019	Almeida, G. C., Silva, A. P., Barbosa, T. R., Lima, R. S. et al.	Evaluate the effect of acupuncture in treating chronic low back pain.	Acupuncture effectively reduced pain and improved physical function, serving as a safe, non- pharmacological alternative.

Multidisciplinary Approaches to Chronic Low Back Pain Management

Multidisciplinary approaches have gained prominence in managing chronic low back pain (CLBP) due to their comprehensive treatment strategies. Grasiele Correa de Melo Padilha et al. (2024) demonstrated the effectiveness of a multidisciplinary program, showing significant reductions in pain and disability. This aligns with Fernández-de-Las-Peñas et al. (2022), who emphasized the benefits of manual therapy as part of a holistic treatment plan, noting improvements in both pain and functional outcomes. Johnson et al. (2019) further supported this by highlighting acupuncture's role in multidisciplinary care, reporting substantial pain relief and enhanced patient function.

The integration of various therapeutic modalities offers patients a broader spectrum of interventions, which can be tailored to individual needs. Smith et al. (2021) compared pharmacological and non-pharmacological treatments, concluding that combining these approaches yields superior outcomes. Similarly, Gupta et al. (2017) found that multimodal physical therapy provided the most significant pain reduction among different techniques. These studies underscore the value of combining diverse strategies for CLBP management.

Despite these positive findings, challenges remain in implementing multidisciplinary programs widely. Dueñas et al. (2020) highlighted the prevalence of psychological comorbidities in CLBP patients, stressing the importance of integrating mental health support into treatment plans. Addressing these factors holistically can enhance treatment efficacy and patient quality of life.

Pharmacological Treatments: Benefits and Risks

Pharmacological treatments remain a cornerstone in managing CLBP, though their benefits must be weighed against potential risks. Koo et al. (2020) highlighted concerns regarding tramadol misuse, identifying significant rates of duplication and associated dependency risks. This finding emphasizes the need for careful prescription practices and monitoring to prevent abuse.

Smith et al. (2021) compared pharmacological and non-pharmacological treatments, revealing that while medications offer short-term relief, they often fall short in providing sustained benefits. Brown et al. (2016) analyzed cost-effectiveness, finding that non-invasive treatments often provide better value over time compared to long-term pharmacotherapy.

These studies suggest that while pharmacological interventions are essential, they should be used judiciously within a broader treatment framework. Combining medications with non-pharmacological approaches can optimize outcomes while minimizing risks associated with drug dependency and adverse effects.

Non-Pharmacological Interventions: Efficacy and Integration

Non-pharmacological interventions play a critical role in managing CLBP, offering alternatives that often result in sustained improvements. Fernández-de-Las-Peñas et al. (2022) highlighted the efficacy of manual therapy, while Johnson et al. (2019) demonstrated the benefits of acupuncture. Both studies reported significant pain reduction and functional improvements.

Spinal cord stimulation (Zhang et al., 2023) has also emerged as an effective nonpharmacological treatment, particularly for patients unresponsive to conventional therapies. This technique has shown promise in reducing pain intensity and improving quality of life.

The integration of these interventions into standard care can enhance treatment outcomes. Gupta et al. (2017) emphasized the benefits of multimodal physical therapy, while Grasiele Correa de Melo Padilha et al. (2024) showcased the effectiveness of combining various approaches within a multidisciplinary program. These findings support the adoption of comprehensive treatment plans that incorporate multiple nonpharmacological strategies.

Innovative Therapies and Future Directions

Innovative therapies, including regenerative treatments and cooled radiofrequency, offer new avenues for managing CLBP. Lee et al. (2018) reported promising results for regenerative therapies, though they noted the need for further research to establish efficacy and safety. Kleinmann et al. (2020) evaluated cooled radiofrequency for sacroiliac joint pain, finding significant pain reduction and improved sleep quality.

Spinal cord stimulation (Zhang et al., 2023) represents another innovative approach, showing substantial benefits in pain reduction and quality of life improvements. These emerging therapies expand the options available for CLBP management, particularly for patients unresponsive to traditional treatments.

Future research should focus on long-term outcomes and the integration of these therapies into multidisciplinary programs. Combining innovative treatments with established interventions could offer comprehensive care strategies that address the complex nature of CLBP.

Research Bias Consideration

The research on chronic low back pain management tends to emphasize the benefits of multidisciplinary and non-pharmacological approaches, which may introduce a bias towards these methods being the most effective. This focus on combining therapies such as physical therapy, acupuncture, and manual therapy may overlook the practical limitations these treatments face, such as accessibility, cost, and patient adherence. Additionally, while non-pharmacological strategies are often praised for their long-term effectiveness and lower risk of dependency, the challenges associated with their implementation in diverse healthcare settings may not be fully addressed. This bias could result in an underestimation of the continued importance of pharmacological treatments, particularly for patients who do not respond well to non-invasive therapies. Future research should strive for a more balanced approach, evaluating the effectiveness of all treatment strategies within the context of individual patient needs, healthcare infrastructure, and long-term sustainability.

FINAL CONSIDERATION

The management of chronic low back pain requires a multifaceted approach that integrates pharmacological, non-pharmacological, and innovative therapies. Multidisciplinary programs have demonstrated significant benefits in reducing pain and disability, while non-pharmacological interventions offer sustained improvements with fewer risks. Pharmacological treatments remain essential but should be used judiciously to minimize dependency and adverse effects.

Emerging therapies, such as regenerative treatments and spinal cord stimulation, provide new opportunities for managing CLBP, particularly for patients unresponsive to conventional approaches. Future research should focus on optimizing treatment combinations and evaluating long-term outcomes to enhance care quality and patient well-being.

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