Evolution of treatment for unspecific back pain: From past to future

Évolution du traitement des rachialgies non spécifiques : Du passé au futur

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Abstract

Unspecific back pain (UBP) has long puzzled medical professionals. Historically, back pain (BP) was often attributed to mystical causes, treated with incantations or herbal concoctions. The Middle Ages shifted towards empirical practices, though still intertwined with superstition, using methods like leeches and bloodletting. The Renaissance introduced systematic healthcare approaches, laying the foundation for modern medicine. The 20th century saw significant advancements with diagnostic imaging, pharmacotherapy, physical therapy, and surgical interventions, though UBP remained elusive. Recent decades have seen a paradigm shift towards multidisciplinary approaches, addressing BP's multifactorial nature through holistic methods considering biomechanical, psychosocial, and lifestyle factors. This shift integrates quantitative research with hermeneutic interpretation, emphasizing evidence-based guidelines. Non-pharmacological interventions such as exercise therapy, electrotherapy, cognitive behavioral therapy, and mindfulness-based stress reduction have gained prominence, empowering individuals in their recovery. Technological innovations like virtual reality and artificial intelligence offer personalized treatment plans, optimizing outcomes. The future of BP treatment holds promise with advancements in regenerative medicine, neuromodulation, telemedicine, and remote monitoring platforms, enhancing accessibility and continuity of care, especially in underserved communities. However, challenges such as the opioid epidemic and healthcare disparities remain, necessitating judicious prescribing practices and equitable resource distribution. The evolving treatment landscape for UBP reflects the dynamic interplay between scientific progress, clinical innovation, and societal needs, aiming to alleviate the burden of back pain and improve quality of life.

Key words: Cognitive Behavioral Therapy; Diagnostic Imaging; Mindfulness-Based Stress Reduction; Multidisciplinary Care; Regenerative Medicine

Résumé

Les rachialgies non spécifiques (RNS) ont longtemps intrigué les professionnels de la santé. Historiquement, les rachialgies étaient souvent attribuées à des causes mystiques, traitées avec des incantations ou des concoctions à base de plantes. Le Moyen Âge a marqué un passage vers des pratiques empiriques, bien que toujours mêlées de superstition, utilisant des méthodes comme les sangsues et les saignées. La Renaissance a introduit des approches de soins systématiques, jetant les bases de la médecine moderne. Le 20ème siècle a connu des avancées significatives avec l'imagerie diagnostique, la pharmacothérapie, la physiothérapie et les interventions chirurgicales, bien que les RNS soient restées insaisissables. Ces dernières décennies ont vu un changement de paradigme vers des approches multidisciplinaires, abordant la nature multifactorielle des rachialgies par des méthodes holistiques prenant en compte les facteurs biomécaniques, psychosociaux et liés au mode de vie. Ce changement intègre la recherche quantitative avec l'interprétation herméneutique, mettant l'accent sur les lignes directrices fondées sur des preuves. Les interventions non pharmacologiques telles que la thérapie par l'exercice, l'électrothérapie, la thérapie cognitivo-comportementale et la réduction du stress basée sur la pleine conscience ont gagné en importance, permettant aux individus de se rétablir. Les innovations technologiques telles que la réalité virtuelle et l'intelligence artificielle offrent des plans de traitement personnalisés, optimisant les résultats. L'avenir du traitement des rachialgies est prometteur avec les progrès de la médecine régénérative, de la neuromodulation, de la télémédecine et des plateformes de surveillance à distance, améliorant l'accessibilité et la continuité des soins, notamment dans les communautés mal desservies. Cependant, des défis tels que l'épidémie d'opioïdes et les disparités en matière de santé subsistent, nécessitant des pratiques de prescription judicieuse et une répartition équitable des ressources. Le paysage évolutif du traitement des RNS reflète l'interaction dynamique entre le progrès scientifique, l'innovation clinique et les besoins sociétaux, visant à alléger le fardeau des douleurs dorsales et à améliorer la qualité de vie.

Mots clés: Imagerie diagnostique; Médecine régénérative; Réduction du stress basée sur la pleine conscience; Soins multidisciplinaires; Thérapie cognitivo-comportementale

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Introduction

The prevalence of back pain (BP) presents a significant challenge in the fields of epidemiology, medicine and health economics (1-3). BP is a widespread medical condition that affects approximately 540 million individuals' worldwide (data of 2016) (4). It is a leading cause of disability globally and can hinder individuals from engaging in occupational and daily activities (4). The first differentiations between BP subgroups were probably not made until the late 19th century at the earliest (see later) (5-8). Nowadays (ie; in 2024), we distinguish between two main types of BP, unspecific BP (UBP, or degenerative BP, no clear cause) and specific/ symptomatic BP with clear cause/diagnose such as a fracture, tumor, infection, structural deformity, or underlying disease (eg; osteoporosis, inflammatory disorder, radicular syndrome, cauda equina syndrome) (9-12). UBP, which occurs more frequently, is usually caused by musculoskeletal problems, is a ubiquitous disease and continues to puzzle doctors (11).
BP/UBP treatment journey traverses' centuries, witnessing a progression from ancient remedies to modern therapeutic approaches (13). As we stand at the precipice of medical innovation, it is imperative to reflect on the evolution of treatments and envision the future landscape of managing this pervasive condition (14,15).
The aim of this history note was to relate the evolution of treatment for UBP. Box 1 provides a chronological overview of how the treatment for UBP has evolved over time, reflecting changes in medical knowledge, technology, and cultural attitudes towards health and wellness.

Past

In antiquity, BP was often attributed to mystical causes, invoking divine intervention or supernatural forces (16). Treatments ranged from incantations and rituals to herbal concoctions, reflecting humanity's struggle to comprehend and alleviate this enigmatic discomfort (16). Treatment was linked to the art of observation and often to a spiritual interpretation, likely in the sense of a hermeneutic approach (17). Derived from Hermes, the messenger of the gods who mediated between gods and the human race, the Strasbourg philosopher Dannhauer probably first used this term in 1670 (17). He was concerned with a general science of interpretation, with an instrument for interpreting statements and observations (17).
As medical knowledge evolved, so did the understanding of BP (13,16). The Middle Ages heralded a shift towards more empirical practices, albeit intertwined with remnants of superstition (13,16). Leeches, bloodletting, and crude orthopedic devices were employed to alleviate pain, often with limited success (13,16,18). It was not until the Renaissance that more systematic approaches to healthcare emerged, laying the foundation for modern medicine (13,17-19). The 19th and 20th centuries saw significant advances in the treatment landscape for BP (13,20). The advent of diagnostic imaging, such as X-rays and magnetic resonance imaging scans, revolutionized the understanding of spinal pathology (10,20,21). Pharmacotherapy, physical therapy, surgical interventions and microscopic anatomy became standard modalities, offering relief to countless sufferers (13,20,21).
German neuroanatomist Otto Deiters first described the structure of nerve cells, dividing them into dendrites, cell bodies, and axons (5-8). Santiago Ramón y Cajal defined nerve cell function, discovering that axons had small heads enabling stimulus transmission (5-8). Charles Scott Sherrington named these heads synapses (5-8). Around 1900, Sigmund Freud realized that both the conscious and unconscious mind influence the body (5,7). Freud connected feelings, thoughts, and physical symptoms, leading to today's understanding of psychosomatics, where body and soul are seen as a unit, aligned with the bio-psycho-social model (5,7).
However, amidst these strides, UBP remained a formidable challenge (22,23). The term itself embodies the enigma surrounding the condition—an ailment lacking a definitive anatomical or pathological explanation (22,23). Traditional treatments often provided symptomatic relief but failed to address the underlying causes, leading to recurrent episodes and chronic disability (22,23).

Present

The last few decades have seen a paradigm shift toward more multidisciplinary approaches to the treatment of BP (24,25). Health professionals became aware of the multifactorial nature of BP and placed greater emphasis on a holistic approach that simultaneously addresses biomechanical, psychosocial, and lifestyle factors (24-26). These approaches reflect the complex interplay between physical, psychological, and social determinants of health, illness, or pain (24-26).
As part of this development, the research-logical dualism between the hermeneutic approach influenced by the Middle Ages and the empiricism dominated by modern times was overcome (27-29). In recent epistemology, it has become clear that experimentally collected empirical data ("quantitative research") are no longer pure facts but rather parameters that must be interpreted in a hermeneutic context, "qualitative research" (28,29).
When establishing new medical care options, so-called "evidence-based guidelines" are required worldwide (30), meaning that there must be a proven connection or demonstrable effectiveness. Accordingly, all concepts for the treatment of UBP are currently subject to an ongoing selection process regarding their empirically proven effectiveness (30-32). Simultaneously with the paradigm shift described above, we are also observing an increasing development of the welfare state worldwide, with the possibility of treatment costs being covered by public providers or health insurance companies (33). This development means that therapeutic approaches are used, in particular, those that correspond to the requirements of the public authorities (33).
Especially in the last few decades, non-pharmacological

interventions such as exercise therapy (10,34), electrotherapy (35-37), electromagnetic induction (34), cognitive behavioral therapy (37,38), and mindfulness-based stress reduction (37,38) have become increasingly important in the treatment of UBP (25). These treatments not only relieve pain but also empower individuals to actively participate in their own recovery, thereby promoting resilience and self-efficacy (25).

Furthermore, technological innovations have catalyzed novel treatment modalities for back pain (14). Virtual reality, augmented reality, and wearable devices offer promising avenues for pain management and rehabilitation (14). Advanced imaging techniques, coupled with artificial intelligence, enable personalized treatment plans tailored to individual patient profiles, optimizing outcomes and minimizing adverse effects (14). Moreover, the integration of telemedicine and remote monitoring platforms enhances accessibility and continuity of care, particularly in underserved communities (14).

Future

Looking ahead, the future of BP treatment holds immense promise (14,39). Emerging fields such as regenerative medicine and neuromodulation offer novel approaches to tissue repair and pain modulation, potentially revolutionizing the management of chronic BP (14,39). A holistic biomechanical approach to UBP management is promising (12,40,41). Advances in biomechanics and exercise science now favor dynamic, individualized methods over static posture correction (40,42). Additionally, integrating a bio-psycho-social assessment in UBP management is crucial, considering the interplay between biological, psychological, and social factors (43-45). This approach can enhance patient engagement and satisfaction, prevent the transition from acute to chronic pain, and improve overall outcomes (45). However, amidst this optimism, challenges persist. The opioid epidemic underscores the pitfalls of overreliance on pharmacotherapy for pain management, highlighting the need for judicious prescribing practices and alternative analgesic modalities (14,46). Furthermore, disparities in healthcare access and outcomes underscore the imperative of equitable distribution of resources and interventions (15,46).

In conclusion, the treatment of UBP has evolved significantly, influenced by scientific progress, clinical innovation, and societal needs (15,25,39). Each era, from ancient remedies to futuristic technologies, has contributed to our understanding and management of this condition (20). As we move forward, we should leverage past knowledge and embrace new therapies to alleviate back pain and improve quality of life.

DECLARATION:
ChatGPT 3.5 was used to correct and improve the medical writing (47).

Box 1. Summary of the history of the evolution of treatment for nonspecific back pain (BP).

Era	Key developments
Antiquity	. BP attributed to mystical causes . Treatments included incantations, rituals, and herbal concoctions
Middle ages	. Shift towards empirical practices . Treatments included leeches, bloodletting, and crude orthopedic devices
Renaissance	. Emergence of systematic healthcare approaches, laying the foundation for modern medicine
19th-20th century	. Advances in diagnostic imaging (***eg***; X-rays, magnetic resonance imaging), pharmacotherapy, physical therapy, surgical interventions
Modern neuroscience	. Discoveries by *Otto Deiters*, *Santiago Ramon y Cajal*, and *Charles Scott Sherrington* on nerve cells and synapses
Early 20th century	. *Sigmund Freud*'s insights into psychosomatics and the mind-body connection
Present	. Multidisciplinary approaches considering biomechanical, psychosocial, and lifestyle factors; non-pharmacological interventions (***eg***; exercise therapy, cognitive behavioral therapy) . Technological innovations (***eg***; virtual reality, AI, telemedicine) for personalized treatment and enhanced care accessibility
Future	. Promising fields like regenerative medicine, neuromodulation, and holistic biomechanical approaches

References

1. Casser HR. Conservative treatment methods. Definition, epidemiology and socio-economic importance of non-specific low back pain. Orthopade. 2012;41(4):311-2.
2. Karoui S, Mouhli N, Yahyaoui A, Maaoui R, Rahali H, Ksibi I. Assessment of muscle strength in chronic low back pain patients: Comparison between isocinetic rehabilitation and conventional rehabilitation. Tunis Med. 2024;102(5):296-302.
3. Miladi S, Makhlouf Y, Boussaa H, Ben Abdelghani K, Fazaa A, Laatar A. Prevalence and associated factors for persistent low back pain in the postpartum period. Tunis Med. 2023;101(8-9):688-92.
4. GBD 2016 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet. 2017;390(10100):1211-59.
5. Wachmann EM, Thesis Master of Science, Der Zusammenhang zwischen innerer Anspannung (Stress, Psyche) und äußerer Verspannung (Schmerz), 2022. Link: https://unipub.uni-graz.at/obvugrhs/content/titleinfo/8085864/full.pdf (Last visit: July 15, 2024)
6. Roth G, Strüber N. Wie das Gehirn die Seele macht. Stuttgart : Klett-Cotta, 2021.
7. Kugelstadt A. Dann ist das wohl psychosomatisch! München: Mosaik, Verlag, 2022.
8. Sherriff B, Clark C, Killingback C, Newell D. Impact of contextual factors on patient outcomes following conservative low back pain treatment: systematic review. Chiropr Man Therap. 2022;30(1):20.
9. Deyo RA, Mirza SK, Martin BI. Back pain prevalence and visit rates: estimates from U.S. national surveys, 2002. Spine (Phila Pa 1976). 2006;31(23):2724-7.
10. Chou R, Deyo R, Friedly J, Skelly A, Weimer M, Fu R, et al. Systemic pharmacologic therapies for low back pain: A systematic review for an American college of physicians clinical practice guideline. Ann

Intern Med. 2017;166(7):480-92.

11. Kunow A, Freyer Martins Pereira J, Chenot JF. Extravertebral low back pain: a scoping review. BMC Musculoskelet Disord. 2024;25(1):363.
12. Airaksinen O, Brox JI, Cedraschi C, Hildebrandt J, Klaber-Moffett J, Kovacs F, et al; COST B13 working group on guidelines for chronic low back pain. Chapter 4. European guidelines for the management of chronic nonspecific low back pain. Eur Spine J. 2006 Mar;15 Suppl 2(Suppl 2):S192-300.
13. Allan DB, Waddell G. An historical perspective on low back pain and disability. Acta Orthop Scand Suppl. 1989;234:1-23.
14. Rohaj A, Bulaj G. Digital therapeutics (DTx) expand multimodal treatment options for chronic low back pain: The nexus of precision medicine, patient education, and public health. Healthcare (Basel). 2023;11(10).
15. Sayed D, Grider J, Strand N, Hagedorn JM, Falowski S, Lam CM, et al. The American society of pain and neuroscience (ASPN) evidence-based clinical guideline of interventional treatments for low back pain. J Pain Res. 2022;15:3729-832.
16. Truumees E. A history of lumbar disc herniation from Hippocrates to the 1990s. Clin Orthop Relat Res. 2015;473(6):1885-95.
17. Dannhauer JC. Idea boni interpretis et malitiosi calumniatoris quae obscuritate dispulsa, verum sensum a falso discernere in omnibus auctorum scriptis ac orationibus docet, & plene respondet ad quaestionem unde scis hunc esse sensum, non alium? Omnium Facultatum Studiosis perquam utilis: Staedel; 1674. 445 p.
18. Silvette H. The doctor on the stage (Part I): Medicine and medical men in seventeenth century english drama. Ann Med Hist. 1936;8(6):520-40.
19. Silvette H. The doctor on the stage (Part II): Medicine and medical men in seventeenth century english drama. Ann Med Hist. 1937;9(1):62-87.
20. Malone J, McMahon B. Medical physics and physics in medicine in Ireland (part 1: 1600-~2000). Phys Med. 2020;70:85-95.
21. Schneck P. The history of medical physics and biophysics at the Humboldt University in Berlin. NTM. 2001;9(3):177-90.
22. Dutmer AL, Soer R, Wolff AP, Reneman MF, Coppes MH, Schiphorst Preuper HR. What can we learn from long-term studies on chronic low back pain? A scoping review. Eur Spine J. 2022;31(4):901-16.
23. Sikdar S, Srbely J, Shah J, Assefa Y, Stecco A, DeStefano S, et al. A model for personalized diagnostics for non-specific low back pain: the role of the myofascial unit. Front Pain Res (Lausanne). 2023;4:1237802.
24. Flynn DM. Chronic musculoskeletal pain: Nonpharmacologic, noninvasive treatments. Am Fam Physician. 2020;102(8):465-77.
25. Skelly AC, Brodt ED, Kantner S, Diulio-Nakamura A, Mauer K, Shetty KD. Systematic review on noninvasive nonpharmacological treatment for chronic pain: Surveillance report 3: Literature update period: January 2021 through March 2022. Noninvasive nonpharmacological treatment for chronic pain: Surveillance reports. Rockville (MD)2019.
26. Mescouto K, Olson RE, Hodges PW, Setchell J. A critical review of the biopsychosocial model of low back pain care: time for a new approach? Disabil Rehabil. 2022;44(13):3270-84.
27. Pyo J, Lee W, Choi EY, Jang SG, Ock M. Qualitative research in healthcare: Necessity and characteristics. J Prev Med Public Health. 2023;56(1):12-20.
28. Ismā'īl 'a-R. Folk medicine in modern Egypt; being the relevant parts of the Ṭibb al-rukka, or Old wives' medicine, of 'Abd al-Raḥmān Ismā'il. In: Walker J, editor. London: Luzac; 1934.
29. De Micheli-Serra A. By way of a synthesis of its conceptual evolution towards scientific medicine. Gac Med Mex. 1999;135(1):67-72.
30. Van Middelkoop M, Rubinstein SM, Kuijpers T, Verhagen AP, Ostelo R, Koes BW, et al. A systematic review on the effectiveness of physical and rehabilitation interventions for chronic non-specific low back pain. Eur Spine J. 2011;20(1):19-39.
31. Sheridan DJ, Julian DG. Achievements and limitations of evidence-based medicine. J Am Coll Cardiol. 2016;68(2):204-13.
32. Burns PB, Rohrich RJ, Chung KC. The levels of evidence and their role in evidence-based medicine. Plast Reconstr Surg. 2011;128(1):305-10.
33. Ranabhat CL, Acharya SP, Adhikari C, Kim CB. Universal health coverage evolution, ongoing trend, and future challenge: A conceptual and historical policy review. Front Public Health. 2023;11:1041459.
34. Hartard M, Bäuerle V, Jeschke D, Nowak D. Health training as a form of primordial disease prevention in a future working environment. Arbeitsmedizin Sozialmedizin Umweltmedizin. 2001;36(11):521-31.
35. Paley CA, Wittkopf PG, Jones G, Johnson MI. Does TENS reduce the intensity of acute and chronic pain? A comprehensive appraisal of the characteristics and outcomes of 169 reviews and 49 meta-analyses. Medicina (Kaunas). 2021;57(10).
36. Traeger AC, Gilbert SE, Harris IA, Maher CG. Spinal cord stimulation for low back pain. Cochrane Database Syst Rev. 2023;3(3):CD014789.
37. Zhang Q, Xu H, Wang Y, Jiang J, Xue Q, Qiu Z. Efficacy of cognitive behavioral therapy for reducing pain susceptibility and increasing social engagement in patients with chronic low back pain: A systematic review and meta-analysis. Medicine (Baltimore). 2023;102(45):e35269.
38. Mackey S, Gilam G, Darnall B, Goldin P, Kong JT, Law C, et al. Mindfulness-based stress reduction, cognitive behavioral therapy, and acupuncture in chronic low back pain: Protocol for two linked randomized controlled trials. JMIR Res Protoc. 2022;11(9):e37823.
39. Gu X, Carroll Turpin MA, Romero-Ortega MI. Biomaterials and regenerative medicine in pain management. Curr Pain Headache Rep. 2022;26(7):533-41.
40. Roggio F, Ravalli S, Maugeri G, Bianco A, Palma A, Di Rosa M, et al. Technological advancements in the analysis of human motion and posture management through digital devices. World J Orthop. 2021;12(7):467-484.
41. Sairyo K, Fujitani J, Kasamasu T. A basic exercise strategy for low back pain-Mini review. EC Orthopaedics 2021, 12(8):90-3.
42. Almasoodi IC, Mahdavinejad R, Ghasmi G. The effect of 8 weeks national academy of sports medicine exercises training on posture, shoulder pain, and functional disability in males with upper cross syndrome. Syst Rev Pharm. 2020;11(11):1826-33.
43. Gatchel RJ, Peng YB, Peters ML, Fuchs PN, Turk DC. The biopsychosocial approach to chronic pain: scientific advances and future directions. Psychol Bull. 2007;133(4):581-624.
44. Linton SJ, Shaw WS. Impact of psychological factors in the experience of pain. Phys Ther. 2011;91(5):700-11.
45. Waddell G, Burton AK. Occupational health guidelines for the management of low back pain at work: evidence review. Occup Med (Lond). 2001;51(2):124-35.
46. Dowell D, Ragan KR, Jones CM, Baldwin GT, Chou R. CDC clinical practice guideline for prescribing opioids for pain - United states, 2022. MMWR Recomm Rep. 2022;71(3):1-95.
47. Dergaa I, Ben Saad H. Artificial intelligence and promoting open access in academic publishing. Tunis Med. 2023;101(6):533-6.