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Research Article

ADVANCEMENTS IN CHRONIC BACK PAIN MANAGEMENT AND PHYSIOTHERAPY

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Abstract:

Background: The term LBP, which stands for low back pain, describes a well-known and intricate condition. It has multiple diagnoses, causes, and treatments. Accurate assessment and treatment selection are vital for each patient. This issue discusses key topics such as differentiating chronic from acute LBP, therapy connections, psychological factors, and the impact of body weight on LBP, especially in youth. Managing chronic pain in physical therapy and rehabilitation requires specialized expertise.

Objective overview of the types, pathogenesis, diagnosis, and management of **Back Pain**.

Methods: a comprehensive review of Back Pain and therapy. The PUBMED and Google Scholar search engines were the main databases used for the search process, with articles collected from 1999 to 2024.

Conclusion: the multifaceted management of chronic low back pain (CLBP) has evolved into a sophisticated, patient-centered approach that combines traditional treatments, advanced surgical techniques, minimally invasive procedures, physiotherapy, and personalized care. This comprehensive framework addresses not only the physical aspects of pain but also the significant psychological and social dimensions that exacerbate CLBP. Conventional methods like NSAIDs, physical therapy, and cognitive-behavioral therapy remain foundational, while innovations such as Spinal Cord Stimulation, regenerative therapies, and the Intercept Procedure provide targeted relief for those unresponsive to standard treatments. Physiotherapy interventions, including supervised exercises, hydrotherapy, and manual therapies, enhance mobility and self-management, empowering patients to take an active role in their recovery. The rise of personalized care further enables customized treatment plans tailored to individual needs, supported by digital tools and patient-specific devices that foster effective, long-term management. Together, these integrative approaches underscore the importance of adapting treatment to the complex nature of CLBP, ultimately enhancing the quality of life for those affected and pointing toward a more accessible, effective, and patient-centered future in chronic pain management.

Keywords: low back pain, Classification, Clinical Presentation, Management, Physiotherapy.

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INTRODUCTION:

Back pain is an exceedingly common health concern that is distinctly characterized by a sensation of discomfort that is typically localized in the region situated just below the costal margin and extending up to the area above the inferior gluteal folds, and this condition may manifest with or without the presence of accompanying pain in the legs. The categorization of pain includes two primary types, namely acute and chronic. Acute pain is often defined by its quick resolution, while chronic pain can last a long time, potentially resulting in severe levels of disability and a considerable effect on someone's life quality. Also, The term under review covers an array of conditions, featuring both identifiable low back pain, marked by clear medical issues found in examinations and imaging, and non-specific low back pain, which is more ambiguous as it does not present a definitive medical source that can be diagnosed through traditional approaches (1). Moreover, The occurrence of back pain, which has reached a remarkably concerning level, is evidenced by various studies that reveal a staggering statistic: around 80% of people will, at some stage during their lifetime, encounter the discomfort and challenges associated with back pain. Besides, In the vast expanse of the United States, a staggering total of approximately 75.8 million adults, which constitutes an alarming 29.9% of the population aged 18 years and older, disclosed in the year 2018 that they were grappling with the persistent and often debilitating issue of lower back pain, thereby underscoring the extensive nature of this health concern that affects a significant portion of the adult demographic. In addition, Long-term back pain represents a crucial problem, impacting around 50% to 80% of the adult community at assorted moments in their lives, and it frequently happens that several people suffer from repeated pain episodes shortly after they have bounced back from a prior occurrence. Furthermore, it has been observed that around twenty-five to thirty-three percent of people who experience

persistent back pain endure clinically significant symptoms, which ultimately suggests a considerable and often profound effect on their overall quality of life and daily functioning (2). Additionally, The patterns and rates of back pain can differ significantly as a person ages, with a particularly prominent trend found in older adults, especially those within the 75 and up age group, who frequently indicate suffering from the most severe low back pain when assessed against younger age segments (3). Yet, The clear inequalities apparent in this scenario could be profoundly affected by a wide array of diverse influences, which involve many biological, psychological, and social components that connect in complicated patterns (1). Nevertheless, Ongoing low back pain, commonly identified as CLBP, has a deeply harmful effect on the overall quality of life for those who are impacted by this problem, primarily by restricting their ability to perform daily tasks and negatively affecting their emotional wellness. Findings have demonstrated that ongoing low back pain substantially limits patients' involvement in everyday tasks, which is essential for their overall health and life satisfaction, which in turn contributes to an even greater decline in their overall quality of life. Besides, CLBP imposes a significant emotional strain that is profoundly felt, as it correlates with diverse manifestations of emotional suffering that ultimately enhance and worsen the existing negative impacts on the overall quality of life and wellness of the patients who are dealing with this predicament. Also, A thorough multivariate investigation undertaken in this setting has highlighted the essential and impactful nature of various determinants, such as the span of pain suffered and the degree of emotional anguish endured by individuals, acting as major indicators in evaluating the overall quality of life; remarkably, those afflicted with (CLBP) tend to present considerably diminished functioning compared to individuals contending with critical health conditions (4). Furthermore, comprehensive

evaluations conducted with the WHOQOL-Bref assessment tool have distinctly highlighted the fact that the presence of low back pain has a detrimental impact on numerous facets of life, encompassing not only mental well-being but also the quality of social interactions and relationships with others (5). In addition, Research findings suggest that individuals enduring (CLBP) often face a significant drop in their daily functioning abilities, as reflected in their average score of about .567 on the Quality of Well-Being Scale (QWB), a number that greatly differs from those battling severe illnesses (6). Nevertheless, The intricate interplay of these multifaceted factors significantly underscores the absolute necessity for the development and implementation of comprehensive treatment approaches that meticulously address and consider both the physical ailments and the psychological dimensions associated with chronic low back pain. To enhance and improve the overall quality of life for those individuals who are profoundly affected by this condition, it is essential to establish effective management strategies, which in turn highlights the critical importance of continuous research efforts and thoughtful health policy considerations within this particular area of study and practice (4).

Traditional Approaches to Back Pain Management

Established strategies for handling back pain include various tactics that are tailored to both lessen the pain that individuals endure and boost their general functional performance, particularly for those facing the ongoing difficulties brought on by chronic low back discomfort. Numerous methods typically bring together the use of medication, the execution of physical rehabilitation, and the incorporation of cognitive-behavioral interventions, all of which are thoughtfully blended into a holistic and extensive treatment plan that addresses the intricate nature of back discomfort. Medications play a vital role in standard care approaches, encompassing a variety of treatments like NSAIDs, antidepressants, and muscle relaxants, which are important for relieving pain and decreasing the muscle strain often tied to the sensation of low back pain. Moreover, Antidepressants, especially those specifically designed for this purpose, have been widely recognized and acknowledged for their significant contribution to enhancing the overall outcomes experienced by patients, as they effectively tackle not only the alleviation of physical pain but also the intricate psychological dimensions associated with the persistent and often debilitating nature of chronic

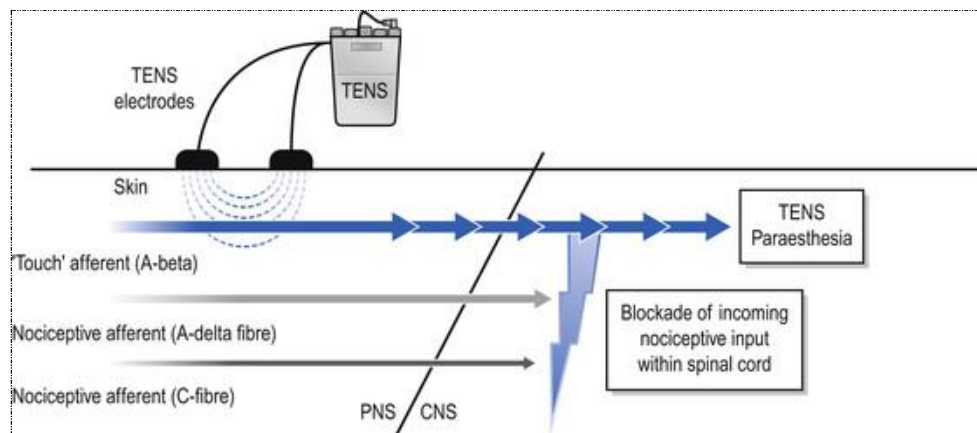
pain. Also, Physical therapy serves as an essential and indispensable element within the broader scope of rehabilitation, concentrating on a range of exercises and targeted interventions meticulously designed to significantly enhance overall mobility while simultaneously alleviating discomfort and pain experienced by individuals. This comprehensive approach encompasses a variety of therapeutic exercises that not only aim to bolster muscular strength and improve flexibility but also include the crucial process of correcting movement faults, which entails the careful identification and subsequent rectification of improper movement patterns that could potentially exacerbate pain and hinder functional performance (7). Furthermore, there is a strong emphasis placed on the thorough assessment and subsequent engagement of the deeper trunk muscles, as this practice is vital for enhancing the overall support and stability of the spine, which is crucial for the proficient management and alleviation of low back pain (8). In addition, Commonly known as CBT, cognitive-behavioral therapy is broadly accepted as a standard and reliable technique that directly aims to address the diverse psychological factors tied to the experience of chronic pain, offering a detailed structure for grasping this complicated issue. The use of CBT helps patients to create numerous effective coping techniques while also addressing and changing their understanding of pain, leading to a meaningful and substantial boost in their ability to manage discomfort and elevate their quality of life (9). However, In this particular medical context, it is clear that opioids emerge as a major and commonly utilized category of medication, celebrated for their significant contribution to pain relief by intricately interacting with the central nervous system to lessen and ultimately alleviate the discomfort that individuals may face, Although opioids are commonly seen as effective in alleviating pain, it is incredibly vital that their administration is closely supervised and governed due to the considerable dangers linked to dependency and the numerous side effects that could ensue from their use. Complementing the opioid class, tramadol hydrochloride arises as another remedy that is distinctly utilized at the spinal level for the objective of pain alleviation, thus providing an alternative solution for patients who might encounter challenges with the stronger effects typically linked to more powerful opioid medications (10) (7). Moreover, The class of drugs termed neuroleptics is commonly prescribed for different psychiatric issues, and neurostimulants, famous for improving focus and mental abilities, may also be utilized effectively to tackle and lessen pain in the brain's cortical region, hence expanding the therapeutic choices available for

patients suffering from complex pain conditions that often do not react well to standard pain management approaches. Other supportive measures, crucial in strategies for managing pain, consist of different approaches like epidural injections and spinal blocks; these techniques are created to deliver medication directly to the discomfort zone, thus encouraging precise pain relief that can significantly elevate the living standards of those facing chronic pain challenges. Nevertheless, Commonly called TENS

devices [figure 1], transcutaneous electrical nerve stimulators are regularly employed in the spinal cord, where they apply a method of controlled electrical stimulation to effectively halt pain signal transmission to the brain, thereby offering substantial pain relief for those suffering from discomfort (10).

Figure (1): The physiological intention of conventional TENS.

Arrows indicate the direction of TENS-induced nerve impulses; PNS = peripheral nervous system; CNS = central nervous system (11).



Moreover, Surgical techniques designed for the management of back pain encompass a diverse range of strategies that are specifically tailored to address various structural issues that may arise within the intricate framework of the spine. These particular surgical methods become increasingly significant and relevant, especially for those patients who have unfortunately not experienced any form of relief or improvement through more conservative treatment options, such as physical therapy sessions or the administration of medication. In the vast array of surgical procedures commonly undertaken, several of the most frequently executed encompasses spinal fusion operations, discectomy, and the approach to the posterior spine, each boasting its distinct indications and advantages. Spinal fusion operations consist of the elaborate task of uniting multiple vertebrae to ensure greater spine stability, immobilizing the painful sections and ultimately contributing to a notable

decrease in the disc-related pain that sufferers often report (12), This particular surgical procedure is frequently favored by medical professionals for individuals suffering from persistent and debilitating chronic back pain that has shown no improvement or positive response to various non-surgical treatment options and therapies. It is essential to keep in mind that this surgical approach may lead to the formation of neighboring level ailments, a scenario that results from the disruption of standard spinal dynamics, which should be factored in significantly when involved in extensive surgical preparation and choices (13). Also, In a discectomy, which serves to relieve discomfort from a herniated disc, a targeted section of the disc that is exerting pressure on spinal nerves is meticulously removed, and this technique is regularly applied to tackle various health conditions, most notably the harsh pain associated with sciatica. Lately, the percutaneous lumbar discectomy technique has

been acknowledged significantly as a notably effective and less invasive surgical possibility, which aids in the essential process of relieving nerve root stress while at the same time substantially lowering the degree of tissue damage usually seen with more aggressive surgical methods. This innovative approach proves to be particularly advantageous, as it effectively minimizes the surgical trauma experienced by patients, which is an important factor that can greatly influence and reduce the severity of postoperative pain that they may otherwise endure following traditional surgical procedures (14). Similarly, The posterior spinal surgical approach represents a highly significant and essential technique in the field of spinal surgery, especially in instances where there is considerable vertebral body destruction and instability that needs to be addressed. This particular method encompasses procedures such as intrapleural or retroperitoneal corpectomy, which are specifically designed to facilitate comprehensive circumferential decompression of the spinal cord while also ensuring effective stabilization of the affected area. It entails the careful placement of interbody spacers combined with posterior instrumentation, all of which work together to restore the overall stability of the spine and rectify deformities that may have arisen, such as kyphosis, which is characterized by an abnormal curvature of the spine. This surgical approach proves to be exceptionally beneficial in managing complex cases, particularly those that involve the presence of infectious agents or neoplastic lesions that complicate the clinical picture and require a more intricate surgical intervention (15).

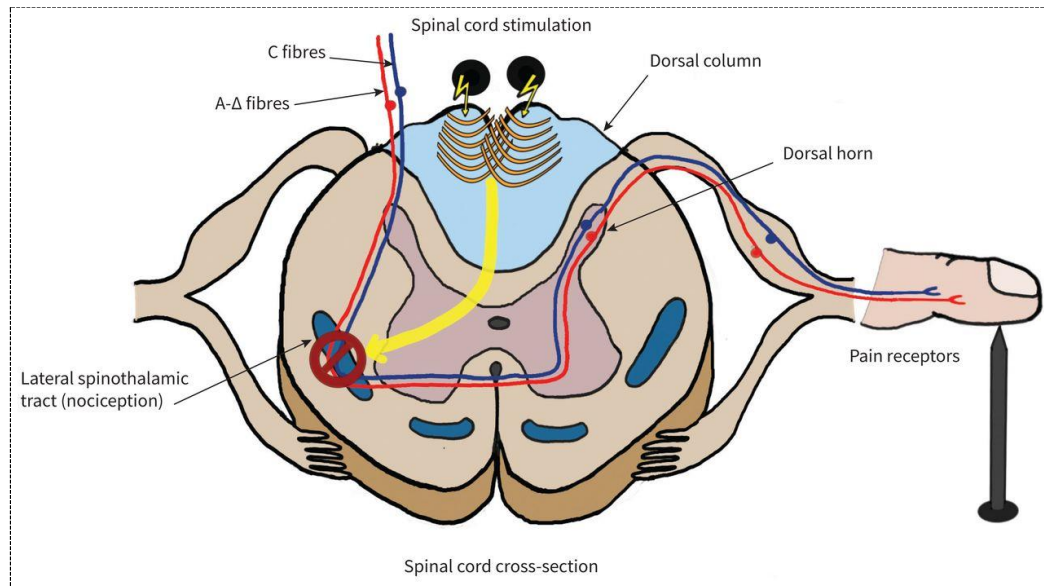
In recent years, there has undeniably been a significant and noticeable shift towards the adoption of less invasive techniques, as well as an increasing reliance on the utilization of electrical stimulation devices and implanted infusion devices specifically designed for the management of chronic pain conditions. These advanced medical devices facilitate the precise and targeted delivery of analgesic medications directly to the affected areas, thereby largely superseding the more traditional ablative procedures that were once commonplace in pain management practices. This remarkable evolution in treatment modalities reflects a much broader trend that is observable within the field of neurosurgery, as it progressively moves away from

destructive methods that cause significant tissue damage towards more conservative and effective strategies aimed at relieving pain without unnecessary harm. The decision on which surgical technique to use for back pain management is heavily determined by various aspects, including the precise medical diagnosis involved, the patient's health profile, and a detailed evaluation of the risks and benefits tied to every specific procedure. As surgical techniques and technologies continue to advance and evolve, the primary focus remains steadfastly on minimizing trauma to the patient while simultaneously addressing and effectively treating the underlying causes that contribute to the experience of back pain (16).

Advancements in Back Pain Management

Innovations and improvements in the handling and management of persistent low back pain have been brought to light through the integration of groundbreaking therapies alongside a holistic and all-encompassing approach to treatment that takes into account various aspects of patient care. In recent times, the emergence of novel therapeutic options, which encompass a range of new medications as well as advanced techniques, has demonstrated encouraging outcomes in various clinical trials, significantly contributing to the enhancement of the overall management strategies for this widely recognized and prevalent medical condition (7). Also, Emerging technologies play a significant and transformative role in the continuous advancements and improvements associated with pain management strategies and methodologies. Spinal Cord Stimulation, often called SCS [figure 2], has served as a valuable method for over forty years, employing precisely tuned electrical impulses to effectively disrupt and obstruct pain messages as they strive to reach the brain, demonstrating notable advantages and efficacy for those enduring neuropathic pain disorders (17). Comparably, Dorsal Root Stimulation (DRG) emerges as a more contemporary and innovative technique that specifically focuses on targeting particular nerve cells, and it has been demonstrated to exhibit significantly elevated success rates when juxtaposed with conventional Spinal Cord Stimulation (SCS) practices (18).

Figure (2): Gate theory of pain. This theory postulates that pain signal transmission via the spinothalamic tract from pain-transmitting fibers (unmyelinated C fibers and lightly myelinated A- Δ fibers) is blocked by stimulating the dorsal column of large myelinated fibers and the polysynaptic interneurons (PSINs). The PSINs then fire back up on the dorsal horn, blocking pain receptors from synapsing. Illustration by Jean Chan (19).



Additionally, Another innovative and groundbreaking approach that has emerged in the realm of pain management is the Intercept Procedure, a sophisticated technique that employs the advanced technology of radio-frequency ablation specifically designed to effectively block and interrupt the transmission of pain signals originating from the basivertebral nerve, ultimately providing a highly effective and minimally invasive treatment option for patients who are seeking relief from chronic pain without the need for more invasive surgical interventions (20). Furthermore, the exploration of regenerative treatments, which encompass innovative approaches that harness the body's intrinsic healing mechanisms, including the utilization of plasma and stem cells, is currently underway to repair nerve cells that have sustained damage and provide relief from persistent back pain. These remarkable strides in healthcare illustrate a clear transition towards more individualized and potent management tactics specifically tailored for those grappling with chronic lumbar pain, while also emphasizing the essential role of blending various treatment methods to enhance the overall patient experience and improve results (21).

Role of Physiotherapy in Back Pain Management

Physiotherapy serves an essential and pivotal function in the comprehensive management and alleviation of back pain, especially in cases of chronic back pain, which unfortunately impacts a considerable segment of the population at large. The approach taken in treatment is frequently characterized by a multidisciplinary framework, which seamlessly integrates an array of diverse methods and strategies specifically designed to effectively address the intricate and multifaceted factors that contribute to the experience of pain. One of the most essential and widely utilized techniques in the realm of rehabilitation and physical recovery is known as physiokinetotherapy, a comprehensive approach that artfully integrates the principles of physical therapy with targeted exercise regimens designed specifically to restore optimal mobility and significantly alleviate pain for individuals suffering from various ailments. This specific approach has shown remarkable success in addressing a range of ailments, notably sciatica, a common issue often linked to lumbar disc herniation, which can significantly worsen the ongoing and chronic back discomfort faced by numerous individuals (22). In tandem with the distinct method of physiokinetotherapy, centered on merging physical motion with rehabilitation, physiotherapists make use of multiple neuromuscular facilitation strategies specifically crafted to boost not just movement but

also the general functional potential, essential in the holistic treatment of back pain, as indicated by numerous research findings and clinical experiences. These creative strategies function together to support patients in reclaiming their lost power, while concurrently advancing their total mobility and flexibility, making a notable difference in the decrease of pain they might face regularly (23). Moreover, it's essential to point out that manual interventions, involving a range of tactile methodologies aimed at easing discomfort and boosting physical performance, are commonly used in therapeutic contexts to successfully diminish pain and enhance functional abilities, making it a key element of physiotherapy strategies particularly oriented towards resolving the issues related to back pain. Furthermore, for those afflicted with chronic back pain, supervised exercise therapy is generally recommended as a core intervention, typically alongside behavioral therapies that specifically aim to confront and manage the concerns and doubts that patients might hold about their situation and its repercussions on their daily existence, also, Exercise strategies form a fundamental and indispensable element of physiotherapy, aiding not just in the increase of physical strength and enhancement of mobility but also having a profound effect on the overall pain relief for individuals in rehabilitation (24). Nevertheless, Hydrotherapy is also employed as a highly effective method for alleviating pain and aiding in the rehabilitation process, skillfully utilizing the various properties of water to promote movement and diminish discomfort experienced by individuals. This particular approach can prove to be especially advantageous for patients who find themselves facing challenges when it comes to engaging in traditional exercise routines due to the limitations imposed by pain or restrictions in their mobility (23). Besides, the discipline of physiotherapy underscores the significance of employing self-management strategies that are tailored to empower patients, facilitating their active involvement in managing their back pain efficiently while also adopting preventive actions to thwart any potential return of their ailment, as indicated in the referenced material. This empowerment is not simply advantageous, but rather vital, as it develops a deep awareness of control over one's health and wellness, which consequently greatly inspires individuals to follow the treatment regimens prescribed for their recovery. Additionally, the various interventions employed in physiotherapy are frequently integrated with evidence-based guidelines and advice, all to significantly enhance the overall treatment outcomes for individuals who are suffering from low back disorders.

Personalized Treatment Approaches

The rise in popularity of personalized treatment methods specifically for back pain has been noteworthy in recent times, emphasizing the essential role of crafting and executing individualized plans that meet the unique demands and particular conditions of each patient. The essence of this pioneering framework is rooted in the basic notion of individualized therapy, which demands a meticulous and exhaustive analysis of the patient's health profile, paired with their functional tendencies, acknowledging several factors like the core pain dynamics and the various causal elements that could impact their condition, This distinctive strategy gives clinicians the chance to precisely develop a detailed and complex treatment blueprint that is uniquely adapted to fulfill the particular demands and scenarios of every individual patient, ultimately elevating the overall performance and effectiveness of pain control techniques. One particularly innovative and noteworthy aspect of the personalized treatment process is the implementation and utilization of customized therapy routines that are intricately designed to cater to the individual requirements of each patient. These unique routines are meticulously developed based on detailed user input and feedback, thereby empowering individuals to actively participate in a self-directed process that is in perfect alignment with their distinct pain profiles and personal experiences (25). Also, By employing a sophisticated and interactive questionnaire designed specifically to collect patient data, healthcare providers can amass a wealth of pertinent information from individuals seeking treatment, which can subsequently be utilized to formulate a highly personalized and tailored treatment regimen that can be effectively implemented without the necessity for ongoing and constant professional supervision or oversight. This innovative approach not only serves to empower patients by involving them more actively in their health journey but also significantly aids in facilitating a return to optimal body alignment, which in turn promotes a state of natural muscular equilibrium as well as internal balance within the body's systems. Furthermore, in addition to these customized routines that are specifically designed for individual needs, the incorporation of advanced digital therapeutic techniques has fundamentally transformed how back pain is effectively managed and treated. These groundbreaking approaches have the potential to reproduce the positive effects of standard in-clinic therapies by integrating automated systems, which makes the treatment journey not just easier for a wider selection of patients but also significantly more

efficient in providing relief and addressing symptoms (26). Furthermore, the innovative advancement in the creation and design of personalized low back support devices provides exceptional orthopedic support that is specifically customized to cater to the unique needs of the lumbar region, which in turn significantly enhances the overall comfort and proper alignment of the spine during a wide array of daily activities that individuals typically engage in (27). Moreover, Chronic pain recovery initiatives, tailored specifically for the unique challenges faced by those experiencing ongoing pain, also play a remarkably important and necessary role in creating and carrying out personalized care approaches suited to the specific needs and situations of every patient. These comprehensive programs skillfully utilize a strategic combination of both physical and psychological therapies, which work synergistically to effectively address the multifaceted and complex nature of chronic pain, a condition that frequently involves intricate mechanisms such as nervous system sensitization that can complicate the overall treatment process (28). Additionally, By implementing a meticulously organized treatment strategy that encompasses a diverse array of therapeutic approaches, individuals seeking relief can experience significant and enduring enhancements in their levels of pain, emotional well-being, and overall functional abilities in their daily lives. Furthermore, the incorporation of advanced interventional pain management techniques, which may include targeted injections and minimally invasive surgical procedures, presents additional alternatives for patients who might not exhibit favorable responses to traditional therapeutic interventions (29). Besides, These targeted approaches have demonstrated notable effectiveness, especially regarding the treatment of both sudden and long-lasting pain issues, and they integrate effortlessly with an individualized care philosophy that emphasizes the paramount importance of each patient's distinct and personal requirements. In conclusion, the various personalized treatment approaches that are available for addressing back pain encompass an extensive array of strategies, which include tailored therapy regimens, innovative digital interventions, supportive devices designed for comfort and efficacy, as well as comprehensive rehabilitation programs that address multiple aspects of recovery. By placing a strong emphasis on the distinctive characteristics and requirements of each patient, these advanced approaches are purposefully designed to significantly enhance pain management outcomes while simultaneously improving the overall quality of life for those affected (28).

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