

New approaches to managing chronic pain: The role of opioids and alternatives

Pallavi V. Bhosle

Department of Pharmacy, School of Pharmacy, Swami Ramanand Teerth Marathwada University, Nanded, Maharashtra, India

Correspondence:

Pallavi V. Bhosle, Department of Pharmacy, School of Pharmacy, Swami Ramanand Teerth Marathwada University, Nanded, Maharashtra, India.
E-mail: pallavi.1230@gmail.com

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ABSTRACT

Chronic pain, affecting millions globally, is a complex public health issue that significantly impairs physical, emotional, and social well-being. Historically, opioids have been a cornerstone of chronic pain management due to their potent analgesic effects. However, their prolonged use carries significant risks, including addiction, tolerance, and overdose. The opioid crisis has led to a critical reevaluation of their role in long-term pain management. Recent guidelines emphasize a multimodal approach that combines pharmacological and non-pharmacological strategies to mitigate opioid dependence. This review explores the evolution of pain management, the current role of opioids, and emerging alternatives. While opioids remain crucial for some patients, alternative treatments, such as non-opioid medications, physical therapy, cognitive-behavioral therapy, acupuncture, and transcutaneous electrical nerve stimulation, have gained recognition for their effectiveness in managing chronic pain. In addition, medical cannabis and novel pharmacological interventions are becoming increasingly prominent. The shift toward interdisciplinary and personalized approaches in pain management acknowledges the multifactorial nature of chronic pain. Integrating physical, psychological, and pharmacological therapies can improve patient outcomes while reducing opioid reliance. The future of pain management lies in ongoing research into neuroplasticity, gene therapy, and biomarkers to develop safer and more effective treatment strategies.

Keywords: Chronic pain, opioids, cognitive-behavioral therapy, medical cannabis, multimodal approach, non-opioid medications, opioid crisis, pain management, personalized medicine, physical therapy

Introduction

Chronic pain is a significant public health issue affecting millions globally. Defined as pain persisting for 3 months or longer, it impacts not only physical health but also emotional well-being, social interactions, and overall quality of life. Recent estimates indicate that approximately 51.6 million adults in the U.S. experience chronic pain, with 17.1 million suffering from high-impact chronic pain, which severely restricts daily activities. This review discusses the evolution of pain management, the rise of opioid use, and the current role of opioids alongside emerging alternatives in managing chronic pain.^[1]

Background: Chronic Pain as a Public Health Issue

The prevalence of chronic pain has been a growing concern, with studies highlighting its debilitating effects. A survey conducted by the U.S. Pain Foundation revealed that over half of respondents rated their average pain level at 7 or more on a scale of 1-10, and 99% reported restrictions in daily activities due to pain.^[2] The emotional toll is equally alarming, with 60% experiencing anxiety-like symptoms and 59% reporting depression-like symptoms. Furthermore, chronic pain is associated with significant healthcare costs and lost productivity, underscoring its impact on both individuals and society.^[3]

Evolution of Pain Management and the Rise of Opioid Use

Historically, the management of chronic pain has evolved from a focus on acute pain relief to a more comprehensive approach that includes

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pharmacological and non-pharmacological strategies. Opioids emerged as a primary treatment option in the late 20th century, driven by the belief that they could effectively manage chronic pain. However, this led to a dramatic increase in opioid prescriptions and subsequent addiction crises, prompting a reevaluation of their role in pain management.^[4]

In 2022, the CDC released updated guidelines recommending a multimodal approach to pain management, emphasizing the need for diverse treatment options and cautioning against the over-prescription of opioids. The guidelines aim to mitigate the risks associated with opioid use while ensuring that patients have access to necessary pain relief.^[5]

Current Role of Opioids in Chronic Pain Management

Despite the risks, opioids remain a critical component of pain management for many patients. According to the U.S. Pain Foundation survey, nearly half of the respondents reported using opioid medications, although many faced barriers in accessing these drugs due to stigma and regulatory challenges. The complexity of chronic pain necessitates individualized treatment plans that may include opioids alongside other therapies.

Emerging Alternatives to Opioids

In light of the opioid crisis, there has been a surge in interest in alternative pain management strategies. These include:

Non-opioid medications

Drugs, such as non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and certain antidepressants or anticonvulsants can provide effective pain relief without the risks associated with opioids.

Physical therapy

Structured exercise programs and physical therapy can help improve function and reduce pain.

Cognitive-behavioral therapy

Psychological interventions can assist patients in managing pain through coping strategies and behavioral changes.

Complementary therapies

Acupuncture, chiropractic care, and mindfulness practices have gained traction as adjuncts to traditional pain management strategies.^[3,4]

The Role of Opioids in Chronic Pain Management

History of opioid use

Opioids have been utilized for pain relief for centuries, with their use dating back to the 1800s. Initially, opioids were employed to

manage acute pain, particularly in the context of warfare injuries. The understanding of pain physiology and the discovery of endogenous opioids and receptors in the late 20th century further facilitated the adoption of opioids for chronic pain management. However, this increased reliance on opioids also led to significant public health challenges, including the opioid epidemic, which has prompted a reevaluation of their role in pain management.^[6]

Mechanism of action

Opioids alleviate pain primarily through their action on the central nervous system. They bind to specific opioid receptors (μ , δ , and κ) located in the brain, spinal cord, and other tissues. This binding inhibits the transmission of pain signals and alters the perception of pain, producing analgesia. In addition, opioids can induce feelings of euphoria, which may contribute to their potential for misuse and addiction. The complexity of pain pathways and the multifactorial nature of chronic pain necessitate a nuanced understanding of how opioids interact with these systems.^[7]

Effectiveness in chronic pain

Research on the efficacy of opioids for long-term chronic pain management presents mixed findings. While opioids can provide significant short-term pain relief, evidence supporting their long-term effectiveness is limited. A systematic review indicated that most studies assessing opioid efficacy in chronic pain lasted less than 16 weeks, leaving a gap in understanding their long-term benefits and risks. The CDC guidelines highlight that while opioids can reduce pain, the evidence for sustained pain relief and improved quality of life with long-term use is insufficient. Consequently, clinicians are encouraged to consider alternative therapies and a multimodal approach to pain management.^[7]

Risks and complications

The use of opioids is associated with several risks and complications, including:

Addiction

Opioids have a high potential for misuse and addiction, with estimates indicating that approximately 8%–12% of patients may develop opioid use disorder (OUD).

Tolerance

Over time, patients may require higher doses to achieve the same level of pain relief, leading to an increased risk of adverse effects.

Overdose

The risk of overdose is significant, particularly when opioids are combined with other central nervous system depressants, such as benzodiazepines. The CDC reported that over 165,000 deaths in the U.S. were attributed to opioid-related overdoses from 1999 to 2019.

Other adverse effects

Chronic opioid use can lead to various side effects, including constipation, hormonal imbalances, and increased sensitivity to pain (hyperalgesia).

Current guidelines

Current medical guidelines for opioid prescription in chronic pain emphasize a cautious and judicious approach. The CDC's 2022 guidelines recommend that clinicians:

Use opioids only when necessary and in conjunction with other pain management strategies.

Assess the benefits and risks of opioid therapy regularly.

Consider non-opioid alternatives and non-pharmacological treatments as first-line options.

Implement a comprehensive treatment plan that includes monitoring for signs of misuse and addressing any potential complications associated with opioid therapy.

Challenges in opioid-based pain management

Opioid crisis

The opioid crisis represents one of the most significant public health challenges in recent history, characterized by widespread opioid over-prescription and misuse. Over the past two decades, nearly 600,000 people have died from opioid overdoses in the U.S. and Canada, with projections estimating that an additional 1.2 million could die from opioid overdoses by 2029 if current trends continue. The crisis has been exacerbated by the increasing availability of synthetic opioids, such as fentanyl, which are far more potent than traditional prescription opioids. Public health implications include a rise in healthcare costs, increased rates of addiction, and a strain on social services and law enforcement systems. Addressing this crisis requires a comprehensive public health approach that integrates prevention, treatment, and harm reduction strategies across various sectors, including healthcare, education, and social services.^[8]

Patient barriers

Patients face numerous barriers when it comes to opioid-based pain management. Dependence on opioids can lead to withdrawal symptoms when the medication is reduced or discontinued, making it challenging for patients to achieve long-term sustainability in pain management. Many individuals report a fear of addiction, which can deter them from using opioids even when they are medically necessary. In addition, the stigma surrounding opioid use can prevent patients from seeking help or discussing their pain management needs with healthcare providers. These barriers complicate the effective management of chronic pain and can lead to inadequate pain control, further diminishing patients' quality of life.^[9,10]

Economic impact

The economic impact of opioid misuse and chronic pain treatment is substantial. Direct costs include healthcare expenses related to treating OUD, emergency services for overdose cases, and long-term rehabilitation programs. Indirect costs encompass lost productivity

due to absenteeism, disability, and pre-mature death. A 2022 study estimated that the total economic burden of the opioid crisis in the U.S. exceeds \$1 trillion annually, factoring in both healthcare costs and lost economic output. This financial strain highlights the urgent need for effective pain management strategies that minimize reliance on opioids while addressing the multifaceted nature of chronic pain.^[8-10]

Alternatives to Opioids for Chronic Pain Management

Non-pharmacological approaches

Physical therapy

Physical therapy plays a crucial role in managing chronic pain through exercise, movement, and rehabilitation. Evidence suggests that structured exercise programs can improve physical function, reduce pain, and enhance overall quality of life. Regular physical activity helps strengthen muscles, improve flexibility, and promote better posture, all of which can alleviate pain. A systematic review indicated that physical therapy interventions, particularly those involving aerobic and strengthening exercises, yield significant benefits for patients with various chronic pain conditions, including low back pain and osteoarthritis.^[11]

Psychological interventions

Psychological interventions, such as cognitive-behavioral therapy (CBT) and mindfulness practices are effective in managing chronic pain. CBT helps patients develop coping strategies, modify negative thought patterns, and improve emotional regulation, which can reduce the perception of pain. Mindfulness techniques, including mindfulness-based stress reduction, promote relaxation, and enhance self-awareness, further aiding pain management. Research has shown that these psychological approaches can lead to significant reductions in pain intensity and disability, making them valuable components of a comprehensive pain management strategy.^[12]

Acupuncture and massage therapy

Acupuncture and massage therapy are traditional and complementary therapies that have gained recognition for their effectiveness in chronic pain management. Acupuncture involves inserting thin needles into specific points on the body to stimulate the nervous system and promote natural pain relief. Studies indicate that acupuncture can provide significant pain relief for conditions such as chronic back pain and migraines. Similarly, massage therapy has been shown to reduce muscle tension, improve circulation, and enhance relaxation, contributing to pain relief and improved well-being.

Transcutaneous electrical nerve stimulation

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-invasive technique that uses electrical stimulation to relieve pain. TENS devices deliver low-voltage electrical currents through electrodes placed on the skin, which can disrupt pain signals sent to the brain and promote the release of endorphins. Research supports the efficacy of TENS in managing various types of chronic pain, including neuropathic

pain and osteoarthritis, making it a valuable adjunct to other pain management strategies.

Pharmacological alternatives

Non-opioid medications

Non-opioid medications, including NSAIDs, anticonvulsants, and antidepressants, are commonly used in chronic pain management. NSAIDs can effectively reduce inflammation and alleviate pain, while anticonvulsants, such as gabapentin and pregabalin, are particularly useful for neuropathic pain. Antidepressants, especially tricyclic antidepressants and serotonin-norepinephrine reuptake inhibitors, have also shown efficacy in managing chronic pain by modulating pain pathways in the brain.^[12]

Medical cannabis

The role of medical cannabis in pain management has gained increasing attention. Cannabinoids, the active compounds in cannabis, interact with the endocannabinoid system, which plays a role in pain modulation. Research indicates that medical cannabis can provide relief for various chronic pain conditions, including neuropathic pain and cancer-related pain. Patients often report improved pain control and reduced reliance on opioids when using medical cannabis as part of their treatment plan.^[13]

Novel drugs and emerging therapies

Recent developments in pain medication include novel drugs and emerging therapies that target specific pain pathways. Research is ongoing into medications that enhance the body's natural pain relief mechanisms without the risks associated with opioids. These include drugs that target specific receptors in the nervous system or modulate neurotransmitter activity to provide pain relief. The exploration of gene therapy and biomarker identification also holds promise for developing more personalized and effective pain management strategies.

Interdisciplinary and Multimodal Approaches to Chronic Pain

Multimodal pain management

Multimodal pain management involves combining various therapies to achieve more effective outcomes. This approach recognizes that chronic pain is complex and often requires a combination of pharmacological and non-pharmacological interventions tailored to the individual patient. Studies have shown that patients receiving multimodal treatment experience greater reductions in pain and improved functionality compared to those receiving single-modality treatments.

Role of pain management clinics

Pain management clinics play a vital role in providing interdisciplinary care models that include physicians, physiotherapists, psychologists, and other healthcare professionals. These clinics facilitate coordinated care, allowing for comprehensive assessments and the development of personalized treatment plans that address the multifaceted nature of

chronic pain. This collaborative approach enhances patient outcomes and fosters a more holistic understanding of pain management.^[12]

Personalized medicine

Personalized medicine in chronic pain management involves tailoring treatment strategies to the individual based on genetic, psychological, and lifestyle factors. By considering these unique characteristics, healthcare providers can optimize pain management approaches, improving efficacy and minimizing adverse effects. Advances in genetic research and biomarker identification are paving the way for more individualized treatment plans that address the specific needs of each patient.^[13]

Recent Advances in Chronic Pain Research

Neuroplasticity and pain

Recent research into neuroplasticity has provided insights into how chronic pain can alter brain function and structure. Understanding these changes is crucial for developing effective treatment strategies, as it highlights the potential for reversing or modifying pain pathways through targeted interventions. This knowledge can inform the development of therapies aimed at restoring normal pain processing and reducing the impact of chronic pain on patients' lives.

Gene therapy

Gene therapy is an emerging area of research with the potential to alter pain pathways at the molecular level. By targeting specific genes involved in pain perception and modulation, researchers aim to develop innovative treatments that can provide long-lasting pain relief without the risks associated with traditional pharmacological approaches. While still in the experimental stages, gene therapy holds promise for revolutionizing chronic pain management in the future.^[14]

Biomarkers for pain

Identifying biomarkers for pain is a critical area of research that aims to provide objective measures for assessing pain and tailoring treatments. Biomarkers can help predict individual responses to various pain management strategies, allowing for more personalized and effective interventions. Ongoing research in this field seeks to establish reliable biomarkers that can guide clinical decision-making and improve patient outcomes.^[12]

Ethical Considerations in Chronic Pain Treatment

Opioid use in vulnerable populations

The use of opioids in vulnerable populations, such as the elderly, youth, and individuals with a history of substance use disorder, raises significant ethical concerns. Healthcare providers must carefully weigh the benefits and risks of opioid therapy in these groups, considering the potential for addiction and adverse effects. Developing alternative pain

management strategies that minimize reliance on opioids is essential to protect these populations.^[14]

Informed consent and patient autonomy

Informed consent and patient autonomy are critical components of chronic pain treatment. Healthcare providers must engage patients in discussions about the risks and benefits of various treatment options, including opioids and non-opioid alternatives. Ensuring that patients have a clear understanding of their treatment options empowers them to make informed decisions about their care.

Equity in access to pain management

Addressing disparities in access to pain management is an ethical imperative in chronic pain treatment. Underserved populations often face barriers to receiving appropriate care, including limited access to healthcare resources and stigma surrounding pain management. Efforts to improve access to comprehensive pain management services are essential to ensure that all patients receive the care they need.

Conclusion

Chronic pain remains a significant public health issue, requiring a multifaceted approach. While opioids still play a role, the focus is shifting toward comprehensive strategies that include alternative therapies. As healthcare systems adapt, patient-centered care and ongoing research are crucial to improving outcomes.

The evolving understanding of chronic pain highlights the need for personalized treatment plans that combine various modalities. Though opioids are effective for some, their risks must be carefully considered, with alternatives, such as physical therapy, psychological interventions, and non-opioid medications gaining traction.

Future efforts should prioritize safe, multimodal approaches to reduce opioid reliance and improve pain management outcomes.

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