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# The effectiveness of different pain relief methods in palliative care: An analysis of pharmacological and non-pharmacological pain management approaches

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## ABSTRACT

Pain management is currently one of the most difficult challenges in modern medicine. Despite the availability of pharmacological and non-pharmacological methods, it is not easy to completely eliminate it from patients' lives. Acupuncture, psychological support, and transcutaneous electrical nerve stimulation (TENS) are examples of complementary therapies that have promise, especially in enhancing quality of life. Each patient's unique health and pain profile has a significant impact on how well a given strategy works. Only a holistic approach and a combination of various pain management methods will allow patients to achieve maximum treatment results. Knowing the appropriate methods, clinicians can apply them based on patient preferences and conditions.

**Keywords:** palliative care; management of pain; opioids; acupuncture; TENS

## 1. INTRODUCTION

Palliative care focuses on pain management, which aims to alleviate suffering and respond to the patient's needs. Despite the widespread recognition that pain is a psychosomatic phenomenon, clinical practice frequently adopts a one-size-fits-all approach. It does not always reflect this understanding and often uncritically towards a pharmacological approach that, in turn, tends to neglect the subjectivity of pain and suppress the active role that the patient could play in managing their pain (Facco et al., 2018). However, effective pain management remains at the core of palliative care, as it directly affects the quality of life of patients (Shin et al., 2012).

Pain now presents as a multifaceted experience, which includes sensory, emotional, cognitive, and behavioral dimensions (Wilkie and Ezenwa, 2012). Between 60% and 70% of cancer patients report experiencing pain, the severity of

which increases as the end of life approaches (Shin et al., 2012). The pain is often severe and, in some cases, gradually worsening, with a lack of response to common analgesics. Between 10% and 30% of patients either cannot tolerate systemic analgesia because of its side effects or do not achieve reasonable pain control, a condition commonly known as refractory pain (Fumic Dunkic et al., 2022).

Investigating complementary therapies or alternative treatment options is essential for these patients to maintain their comfort and dignity. Despite continuing advances in medical care, access to adequate pain relief remains limited for many patients around the world. Various factors cause these limitations, including the attitude of medical personnel and lack of financial resources. A study among cancer patients in Korea showed an association between depression and barriers to pain management; therefore, eliminating psychological impediments might restore better outcomes in pain management (Kwon et al., 2013). Unrelieved pain not only leads to depression; it also causes despair and fear, severely damaging the quality of life (Simone, 2015).

Palliative care provides a variety of customized treatment options because pain management is complicated. They include pharmacological approaches—opioids, non-opioid analgesics, and antidepressants—and non-pharmacological approaches such as occupational therapy, acupuncture, and psychological support. Each patient's needs and preferences should guide the selection of therapeutic strategies. This paper aims to examine and contrast the efficacy of different pain management strategies in end-of-life care. By checking both drug-related and non-drug ways, the objective is to find methods that best help patients get real improvement in ease, symptom control, and quality of life.

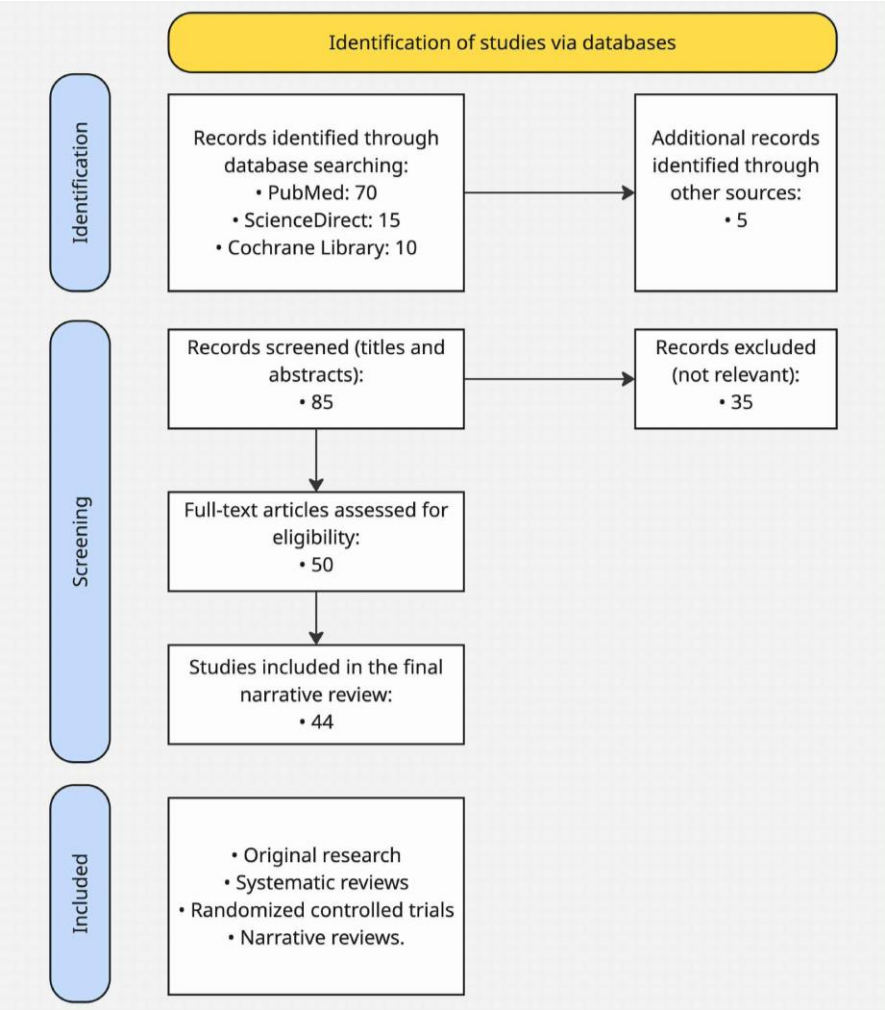


**Figure 1**. PRISMA flow diagram illustrating the study selection process

## 2. REVIEW METHODS

The authors of this narrative review based their review on relevant scientific literature from PubMed, ScienceDirect, and the Cochrane Library. They searched for publications from February to April 2025, focusing on clinically relevant studies from the last 10–15 years.

The authors used keywords and MeSH terms such as palliative care, pain management, opioid therapy, neuropathic pain, non-pharmacological interventions, cancer pain, and alternative pain control. The authors based their study selection on relevance, methodological quality, and applicability to current palliative care. They selected original research, systematic reviews, randomized trials, and narrative reviews on both pharmacological and complementary methods such as hypnosis, virtual reality, and music therapy (Figure 1). The references list a total of 44 key sources.

## 3. RESULTS AND DISCUSSION

**Pharmacological management of palliative pain**

One of the most critical aspects of patient support in palliative care is efficient pain management. The World Health Organization (WHO) created the well-known three-step analgesic ladder, which healthcare professionals frequently use to guide pharmacological treatment of pain associated with cancer (Edwards and Bennett, 2019). Table 1 presents this three-step analgesic ladder.

The first step is to use non-steroidal anti-inflammatory drugs (NSAIDs), which are usually prescribed for mild pain (1–4 on the Numerical Rating Scale [NRS] according to the Polish Pain Therapy Guidelines) and are particularly beneficial when bone pain is present. When pain reaches a moderate level (4–6 on the NRS), clinicians start weak opioids. When NSAIDs no longer relieve the pain, clinicians prescribe drugs such as codeine, tramadol, and dihydrocodeine.

The third stage is reached if pain persists despite these efforts. Fentanyl, morphine, tapentadol, oxycodone, hydromorphone, buprenorphine, and methadone are the best treatment option in this case. When milder therapies fail to control severe pain, these potent medications are necessary (Pysz-Waberski et al., 2019). Clinicians ensure patient safety and treatment by carefully adjusting doses and monitoring patients.

**Table 1**. WHO Analgesic Ladder

| **WHO Analgesic Ladder in Combination with Other Pain Treatment Methods** | |
|---|---|
| **Potent opioids** | (morphine, oxycodone, fentanyl, methadone, buprenorphine, tapentadol) ± non-opioid analgesics |
| **Weak opioids** | (tramadol, dihydrocodeine, codeine) or low doses of morphine, oxycodone, hydromorphone ± non-opioid analgesics |
| **Non-opioid analgesics** | paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) |

**Opioids**

When a cancer patient has moderate to severe pain, clinicians advise opioids as a first-line treatment because they regard them as effective analgesics. The 2023 list reiterates the World Health Organization's (WHO) 1986 classification of opioids as essential painkillers (Rodin and Smith, 2024). Table 2 summarizes an overview of key findings from recent pharmacological studies on both opioids and non-opioids in palliative care.

According to a quality improvement (QI) study on palliative care patients with chronic pain conducted at the Palliative Medicine Clinic at Orlando Regional Medical Center in Florida, 97% of patients reported less pain after beginning opioid therapy. With an average reduction of 4.9 points on a 0–10 scale, statistical analysis revealed a significant decrease in pain intensity, supporting the long-term benefits of opioids (Kollas et al., 2024).

*Tramadol*

A first-line treatment for mild to moderate pain is tramadol (Yazde-Puleio et al., 2018). Its use has grown among older adults because they think it is safer than other opioids. However, because tramadol may cause serotonin excess, seizures, falls, and drug interactions, recent guidelines advise against using it (Mohammad et al., 2024).

*Codeine*

Both as an opioid and as a combination medication, codeine is advised for the management of mild to moderate pain (Yazde-Puleio et al., 2018).

*Oxycodone*

Clinicians frequently use oxycodone to treat moderate to severe cancer pain, with different uses throughout Europe. It can be a valuable substitute for morphine in the treatment of cancer pain because there are no appreciable differences in analgesia or side effects between the two drugs (King et al., 2011).

It can help avoid opioid-induced constipation while still providing pain relief that is comparable to that of naloxone, an opioid mu-receptor antagonist. The increased bioavailability of naloxone in patients with liver impairment, which is common in advanced cancer, may impact the action of oxycodone. To prevent side effects and guarantee efficient pain management, monitoring and dose modification are crucial (Vernant et al., 2020).

*Naloxone*

For patients who are more likely to overdose on opioids, naloxone is advised in addition to the naloxone-oxycodone combination (Mohammad et al., 2024).

*Morphine*

The World Health Organization states that oral morphine is the accepted standard of care for pain (Gutteridge et al., 2018). It is the first option for patients with progressive or advanced disease, according to NICE guidelines (Wood et al., 2018).

Even with dosage increases, roughly 30% of morphine users do not experience adequate pain management. More than 80% of cancer patients may find that switching to a different opioid is beneficial in these circumstances. When switching medications, it is recommended to reduce the dosage of the new opioid by 25% to account for incomplete cross-tolerance (Wood et al., 2018).

Moreover, studies show that nebulized morphine achieves a bioavailability of up to 66%, which researchers compare to intravenous infusion and its effectiveness is equal to that of intravenous morphine while having fewer side effects (Osowicka et al., 2022).

*Levorphanol*

Levorphanol is an opioid that shares similarities with morphine. It helps treat neuropathic pain because of its potent affinity for opioid receptors and capacity to block NMDA receptors. Palliative care professionals think about using it when methadone doesn't work or when patients have adverse side effects. Levorphanol is well tolerated by patients (Prommer, 2014).

*Fentanyl*

Fentanyl administered through a suitable nebulization system achieves high bioavailability about 67% . (Osowicka et al., 2022). Patients experience faster pain relief after intranasal fentanyl administration than with other intramucosal forms, confirming its effectiveness. Intranasal fentanyl is especially useful in cases of acute pain because of its nearly 70% bioavailability and ability to reach a maximum blood concentration in 5–16 minutes (Prommer and Thompson, 2011).

*Buprenorphine*

Buprenorphine has a good safety record, including a minimal risk of respiratory depression. When a patient develops a tolerance to full opioid agonists or fails to control their pain, switching to buprenorphine may be an option (Mohammad et al., 2024).

Clinicians regard buprenorphine as a potent opioid when administered as transdermal patches, particularly in cases where the patient has trouble swallowing or poorly tolerates oral medications. Furthermore, compared to comparable dosages of extended-release morphine, buprenorphine is less likely to result in constipation (Wood et al., 2018). Buprenorphine is appropriate for patients who also have addiction because it has a lower risk of respiratory depression in overdose situations (Kale et al., 2024).

*Methadone*

Because of its long-acting qualities, multiple dosage forms, and affordability, methadone is regarded as a good choice for pain management. It may be handy for neuropathic pain, which is hard to manage, and in cases where opioid tolerance forms in palliative patients. For people who don't react to other opioids, it's a good option (Gutteridge et al., 2018).

Furthermore, because of its advantageous pharmacokinetic and pharmacodynamic characteristics, including its high oral absorption rate and lack of neurotoxic metabolites, methadone may be a viable substitute for morphine (Yazde-Puleio et al., 2018).

*Tapentadol*

Tapentadol serves as a novel substitute for conventionally potent opioids and treats moderate to severe pain, including pain from cancer. Despite being a weak μ-opioid receptor agonist, it has fewer gastrointestinal side effects and a similar adverse effect profile to potent opioids (Wood et al., 2018).

Studies comparing tapentadol to other opioids for the treatment of cancer pain indicate that it is comparable to methadone and performs better than oxycodone, fentanyl, and hydromorphone in terms of lowering pain intensity as indicated by the VRS scale and average use of rescue medications (Takemura et al., 2021).

**Non-opioids**

*Paracetamol*

Clinicians advise paracetamol in guidelines for the treatment of mild to moderate pain, but patients with moderate to severe pain who are already taking potent opioids shouldn't routinely take it. Opioid therapy rarely yields the anticipated benefits for cancer patients with pain. However, healthcare providers in France regard paracetamol as the first-line drug for palliative care pain management. Many palliative care teams opt to administer paracetamol subcutaneously to reduce the frequency of intravenous injections (Chapman et al., 2020; Le et al., 2022). Patients who struggle to take oral medications may benefit from subcutaneous administration in palliative care, where patient comfort is a primary concern (El Khoury et al., 2022).

*NSAIDs (Non-Steroidal Anti-Inflammatory Drugs)*

According to studies, NSAIDs are primarily used in clinical practice as supplements to potent opioids to treat cancer-related bone pain. Clinical trials estimate that about two-thirds of patients with this type of pain qualify for NSAID use (Page et al., 2022). NSAIDs are associated with serious side effects, such as heart, kidney, and gastrointestinal damage (Bowers et al., 2023).

*Metamizole*

Metamizole can be used alone or in conjunction with opioids to treat cancer pain. Clinicians might favor it over NSAIDs because of its possibly better long-term side effect profile (Gaertner et al., 2017).

To improve pain management, physicians often combine it with opioids such as morphine and hydromorphone, and with esketamine, particularly in PCA infusions. In palliative care, clinicians use various analgesics, such as metamizole, to significantly improve patient comfort (Harder et al., 2022).

**Cannabinoids**

The primary psychoactive ingredient, THC, may help palliative care patients with their pain. However, there are still many issues in this field that require further research, including the lack of specific guidelines for formulations, THC and CBD ratios, and administration methods (Good et al., 2019).

**Antidepressants**

In the treatment of pain in patients receiving palliative care, researchers have highlighted three antidepressant medications. Studies have demonstrated that duloxetine is more effective than a placebo at reducing neuropathic pain brought on by chemotherapy (CIPN), with 59% of patients reporting less pain than those in the placebo group (Smith et al., 2013). Venlafaxine has also proven to be effective in treating CIPN, with a high percentage of symptom relief, particularly in patients who have received chemotherapy with taxanes and oxaliplatin. Neuropathic pain is also frequently treated with tricyclic antidepressants (TCAs), like amitriptyline. Amitriptyline may be helpful, but it doesn't always alleviate the pain that comes with cancer treatment. After weighing the advantages and disadvantages, the American Society of Clinical Oncology (ASCO) advises using them in certain situations (Kus et al., 2016).

**Anticonvulsants**

The American Society of Clinical Oncology (ASCO) has identified gabapentin as a medication to try in specific patient populations, despite its dubious efficacy in treating neuropathic pain. But when it comes to reducing pain and improving functioning in patients with cancer-related neuropathic pain, pregabalin works better than both gabapentin and amitriptyline (Mishra et al., 2012).

These medications can improve the quality of life for patients with advanced illnesses by managing pain in palliative care (Scarborough and Smith, 2018).

*Lidocaine*

Clinicians increasingly recognize lidocaine as a potential palliative care treatment option, especially for patients with cancer pain that resists opioids. Studies suggest that by inhibiting NMDA receptors and interacting with sodium channels, lidocaine may function as an analgesic and treat neuropathic pain more successfully (Salas et al., 2014).

**Table 2**: Main findings about pharmacological pain management in palliative care

| Intervention | Study (Author, Year) | Main Outcomes | Mechanism / Notes |
|---|---|---|---|
| Opioid therapy | Kollas et al., 2024 | 97% reported pain relief; 4.9/10 avg. reduction | First-line; dose-adjusted |
| Tramadol | Yazde-Puleio et al., 2018; Mohammad et al., 2024 | Used in the elderly; risk of serotonin syndrome | Weak opioid |
| Codeine | Yazde-Puleio et al., 2018 | Mild to moderate pain | Weak opioid |
| Oxycodone + Naloxone | King et al., 2011; Vernant et al., 2020 | Effective; reduced constipation | μ-agonist with GI modulation |
| Morphine | Gutteridge et al., 2018; Wood et al., 2018; Osowicka et al., 2022 | Gold standard; 30% need switching | Oral/nebulized; IV-equivalent |
| Levorphanol | Prommer, 2014 | Effective in neuropathic pain | NMDA antagonist |
| Fentanyl | Osowicka et al., 2022; Prommer & Thompson, 2011 | Fast-acting; high bioavailability | Intranasal, nebulized |
| Buprenorphine | Wood et al., 2018; Mohammad et al., 2024; Kale et al., 2024 | Safe in addiction; transdermal use | Partial μ-agonist |
| Methadone | Gutteridge et al., 2018; Yazde-Puleio et al., 2018 | Effective in neuropathic pain | NMDA blocker; non-toxic |
| Tapentadol | Takemura et al., 2021 | Better GI profile; strong efficacy | μ-opioid + NRI |
| Paracetamol | Le et al., 2022; El Khoury et al., 2022 | SC route preferred | Mild pain; not routine with potent opioids |
| NSAIDs | Page et al., 2022; Bowers et al., 2023 | Used for bone pain; toxicities | Supportive role |
| Metamizole | Gaertner et al., 2017; Harder et al., 2022 | Used with opioids in PCA | Safer long-term |
| Cannabinoids | Good et al., 2019 | Potential benefit | THC/CBD; limited data |
| Antidepressants | Smith et al., 2013; Kus et al., 2016 | Effective in CIPN | Duloxetine, Venlafaxine, TCAs |
| Anticonvulsants | Mishra et al., 2012; Scarborough & Smith, 2018 | Pregabalin > Gabapentin | Neuropathic pain relief |
| Lidocaine | Salas et al., 2014 | Effective in opioid-resistant pain | NMDA inhibition |

**Non-pharmacological management of palliative pain**

Non-pharmacological therapies complement pharmacological treatment in palliative care (Groninger et al., 2022). Distraction strategies and other engaging activities are part of these therapies. By "competing" for the patient's attention with pain stimuli, these interventions change how pain is perceived (Johnson, 2005). Table 3 summarizes key findings from studies on non-pharmacological pain interventions used in palliative care.

*Psychosocial Therapy*

In non-pharmacological pain management in palliative care, psychosocial therapy entails psychological support that can lessen negative emotions like anxiety and depression, which can make pain worse (Shatri et al., 2019). Positive suggestion-based interventions (PSBPS) techniques such as visualization, relaxation and mindful listening are effective in reducing pain (Kiss et al., 2018).

*TENS (Transcutaneous Electrical Nerve Stimulation)*

TENS is a safe, non-invasive technique for reducing pain (Siemens et al., 2020). Research indicates that active TENS can effectively reduce cancer pain, especially bone pain, with statistically significant relief during movement (Hurlow et al., 2012). TENS improves pain, mood, mobility, and interpersonal relationships in palliative care, with higher response rates than a placebo (Siemens et al., 2020). Patients tolerate it well, with only 5% reporting mild discomfort. Although there is conflicting evidence regarding cancer pain, TENS in conjunction with other treatments may provide palliative patients with relief (Hurlow et al., 2012).

*Acupuncture*

Acupuncture improves overall health and relieve pain (Gautama et al., 2023). Studies have demonstrated that acupuncture significantly improves physical quality of life, reduces pain, and reduces fatigue and insomnia. Bruising, pain at the needle site, or bleeding are among the mild side effects that are typically associated with this relatively safe procedure (Epstein et al., 2023).

*Hypnosis*

Hypnosis as a therapeutic technique can reduce anxiety and pain (Gautama et al., 2023). Through suggestion, it helps patients perceive their bodies as a source of pleasure. Hypnosis also promotes deep relaxation, which reduces stress and pain. Patients participating in hypnotherapy develop an inner space of peace and acceptance, learn to control pain, and recognize their own body's signals (Casula, 2018).

*Virtual reality (VR) therapy*

A contemporary, non-pharmacological technique that provides patients with immersive experiences in virtual worlds is virtual reality (VR). VR lessens the perception of pain and anxiety by stimulating the senses and taking the focus off reality (Gautama et al., 2023). Virtual reality therapy is effective in lessening the intensity of both acute and chronic pain stimuli by allowing patients to lose themselves in a fun and soothing environment (Groninger et al., 2022).

*Music*

A Cochrane panel examined the effectiveness of music therapy and other music-based interventions in improving psychological and physical outcomes in cancer patients, including children. Particularly significant for children with cancer and patients in the terminal stages of chronic diseases, the study revealed that music therapy helped to lower pain and anxiety (Stegemann et al., 2019).

**Table 3**: Main findings of the included studies about non-pharmacological pain management in palliative care

| Therapy | Study (Author, Year) | Main Outcomes | Mechanism / Notes |
|---|---|---|---|
| Psychosocial Interventions | Kiss et al., 2018; Shatri et al., 2019 | Reduces pain and anxiety | Includes relaxation, visualization |
| TENS | Siemens et al., 2020; Hurlow et al., 2012 | Effective in bone pain; few side effects | Blocks pain via A-β fiber activation |
| Acupuncture | Epstein et al., 2023; Gautama et al., 2023 | Improves QoL; reduces pain/fatigue | Stimulates acupoints |
| Hypnosis | Casula, 2018; Gautama et al., 2023 | Promotes deep relaxation and control | Uses trance and suggestion |
| Virtual reality | Groninger et al., 2022; Gautama et al., 2023 | Decreases pain and anxiety | Immersive distraction technique |
| Music therapy | Stegemann et al., 2019 | Reduces pain/anxiety; effective in children | Affects mood and emotional state |

## 4. CONCLUSION

An analysis of various pain management strategies in palliative care demonstrates the need to combine pharmacological and non-pharmacological approaches. To achieve this, the team must develop a comprehensive plan tailored to the needs of each individual. For people living with cancer, pharmaceutical treatment—especially the use of opioids—is still the pillar of pain management. Particularly in the later phases of the illness, morphine, methadone, oxycodone, and fentanyl are rather powerful medications. To ensure treatment safety and effectiveness, physicians must carefully monitor patients and adjust dosages.

At the same time, non-pharmacological methods such as psychosocial support, acupuncture, transcutaneous electrical nerve stimulation (TENS), hypnosis, and virtual reality are playing an increasingly important role as adjuncts to conventional therapies. By combining pharmacological and non-pharmacological methods, personalized treatment plans play a key role in pain management. A flexible, patient-centered approach allows for better pain control and significantly improves the quality of life for people with advanced chronic diseases.

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**Author's Contribution**

Monika Kondracka: Conceptualization, writing- rough preparation, editing
Michał Bielecki: Writing- rough preparation, methodology
Anna Bieda: Writing- review and editing,
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All authors read and approved the final manuscript.

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**Data and materials availability**

All data associated with this work are present in the paper.

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