

# Non-opioid alternatives for acute pain management: A literature review

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**Abstract.** Pain is one of the most common reasons for seeking health care. Mostly, the choice of opioids as a treatment for pain is justified because they are potent analgesic drugs and have therapeutic efficacy for the management of acute and chronic pain. However, the opioid crisis was triggered by the excessive and indiscriminate prescription of these medications. The use of non-opioid alternatives for acute pain management is being tested and approved in several clinical settings, studies suggest that non-opioid analgesics, such as acetaminofen, ketamine, and ibuprofen, may be equally effective for acute pain management in patients in certain conditions. Besides that, peripheral nerve stimulation, a non-drug alternative, has proven effective in treating neuropathic and postoperative pain. Non-opioid alternatives for acute pain management offer clear benefits, including the effective control of pain with fewer risks of complications associated with opioid use.

**Keywords.** pain, opioid, non-opioid, analgesics, prescription, hydrocodone, ibuprofen, acetaminophen.

## 1. Introduction

Pain, considered by some literature as the fifth vital sign, is subjective in nature and causes great suffering for those who experience it, being one of the most common reasons for seeking health care. It can be classified as acute, which has a sudden onset, is associated with an injury and disappears when the stimulus ceases, or chronic, when even after the stimulus has disappeared the pain does not cease and continues for a long period of time. [5]

The World Health Organization proposes a scale of progression for pain treatment, in which the first step is for the treatment of mild pain and consists of the use of non-steroidal anti-inflammatory drugs (NSAIDs) and common analgesics, such as metamizole (dipyrone) and acetaminophen. In the second step, corresponding to mild to moderate pain, a weak opioid is added to the NSAIDs, and in the third step, corresponding to severe pain, the weak opioid is replaced by a strong one. The choice of opioids as a treatment for pain is justified because they are potent analgesic drugs and have therapeutic efficacy for the management of acute and chronic pain. [5,2]

Opioids emerged as derivatives of opium, a substance extracted from the poppy (*Papaver somniferum*) that had been cultivated since 3400 BC in Mesopotamia and was later recognized by

Hippocrates as a treatment option. This extract was initially used to treat diarrhea, but its analgesic properties were soon observed. Later, in 1843, morphine was discovered, the first molecule to be synthesized and made commercially available. [1,3]

The classification of opioids is according to the type of molecule and can be divided into natural, semi-synthetic, and synthetic. Natural opioids are derived directly from opium extracted from poppies, semi-synthetic opioids are the result of a partial modification of natural molecules, and synthetic opioids are completely developed in the laboratory. [1]

These substances act on specific pre- and postsynaptic opioid receptors, generally found in the central nervous system (brain and spinal cord) and the peripheral system, causing analgesia, hypnosis, and euphoria. These receptors are highly distributed in areas that are part of the reward networks, causing a feeling of well-being, and the rapid development of tolerance to the substance leading patients to need increasingly higher doses to have the same effect, thus increasing the risk of dependence. [2]

In addition, other dose-dependent side effects caused by opioids have been observed, such as respiratory depression, nausea, vomiting, urinary retention, constipation and increased pressure in the bile ducts, causing serious complications. [3,4,13]

The opioid crisis was triggered by the excessive and indiscriminate prescription of these medications for the treatment of pain, leading to several measures that encouraged greater caution in their prescription. This is why the pharmacological treatment of acute and chronic painful stimuli continues to be a major challenge for medicine, where the lack of fundamental knowledge about its management, combined with the widespread misuse of analgesic medications, contributed to the opioid epidemic, bringing the need to seek therapeutic alternatives in other classes of medications. [2]

## 2. Methodology

After defining the subject of the article, the objective was to evaluate which alternative drugs to opioids are currently available for the treatment of acute pain. The research process took place between August and September 2024 and The Literature Search Strategy consisted of a search on the database platform PubMed using the keywords “pain management”, “opioid”, “non-opioid”, “non-opiate” and “acute pain”. The logical operators “AND” and “OR” were used combined with the keywords for more precise results. 149 results were found and 11 articles were selected.

The articles were read, evaluated and selected according to their eligibility and quality, respecting the inclusion and exclusion criteria that were rigorously applied to the titles and abstracts of the articles found. The inclusion criteria adopted for this review were: recent publication (2019-2023), published in English, presence of the key words in the title and abstract. Regarding the exclusion criteria were not considered articles non-relatable with the subject.

## 3. Results

Despite the widespread belief that non-opioid medications are less effective than opioids for acute pain, the use of non-opioid alternatives for acute pain management is being tested and approved in several clinical settings, as shown in the reviewed literature. [6,8]

In pediatric procedures such as laparoscopic appendectomy, the use of non-opioid analgesics like the combination of ibuprofen and acetaminophen is effective in controlling pain without the need to use opioids. In this context, a double-blind study demonstrated that parents reported adequate pain control with the use of over-the-counter analgesics without prescription opioids in 100% of the cases, showing the potential for opioid substitution in the recovery of some surgical procedures. [7]

Studies also suggest that non-opioid analgesics may be equally effective for acute pain management in patients with long bone fractures, renal colic, and other minor traumas, compared with opioids. However, medications such as ibuprofen and ketorolac are associated with risks of gastric bleeding, renal dysfunction, and platelet disorders, in

addition to acetaminophen, which may contribute to liver toxicity or, despite serious occurrences, should be chosen when choosing treatment. [8]

The efficacy of opioids is still evident in situations of more intense pain, such as in severe burns and trauma. On the other hand, the combination of ketamine and propofol has been widely used, as opposed to fentanyl, achieving a therapeutic pressure effect in pediatric patients with burns for sedation and pain relief. At the same time, lidocaine and gabapentinoids have shown little benefit in these cases. Adverse effects of the combination of ketamine and propofol, such as delirium and excessive salivation, should be considered. [10]

Another study comparing the combination of non-opioid analgesics, such as ibuprofen and acetaminophen, with hydrocodone in wisdom teeth extraction surgeries showed that patients who received non-opioids reported greater satisfaction with pain relief, better sleep quality, and greater ability to perform daily activities. In addition, there were fewer leftover opioid pills, which reduced the risk of diversion and abuse of these substances. [9,11]

Furthermore, a meta-analysis demonstrated that the use of non-opioid intravenous analgesics, such as diclofenac and propacetamol, in orthopedic surgeries was effective in reducing 24-hour opioid use, decreasing hospital stay, and reducing adverse effects, such as nausea and vomiting. [12]

An advantage demonstrated in our studies is that patients who receive appropriate management of non-opioid analgesics have a shorter wait for opioid prescriptions in the emergency department than those who initially receive a prescription for opioids, even if their diagnosis was not indicative of such treatment. [8]

### 3.1 Peripheral nerve stimulator

As a non-drug alternative, peripheral nerve stimulation, for example, has proven effective in treating neuropathic and postoperative pain, with the advantage of reducing the need for opioids. Studies indicate that peripheral nerve stimulation can control acute postoperative pain, being beneficial even with the low possibility of adverse effects, such as infections, bruising, intolerance to stimulation, and allergic dermatitis. The technique also requires the use of specific equipment and materials, such as ultrasound and special sterile needles, which can make access to patients difficult, and is contraindicated in patients with coagulopathies or signs of infection at the procedure site. [6]

## 4. Discussion

The findings of this study, back the increasing shift towards minimizing or substituting opioids in treating pain cases like traumatic pain situations. Opting for opioid options like nonsteroidal anti-

inflammatory drugs (NSAIDs), acetaminophen (paracetamol), ketamine, and peripheral nerve stimulation provides a comprehensive method that can lower the dangers linked to opioid usage such, as dependency and associated negative impacts.

While opioids are still considered crucial for treating pain, like burns and major trauma according to the review presented in the text; it suggests that their usage should be restricted to cases and administered cautiously due to concerns regarding leftover drugs and misuse risks. In general, non-opioid approaches have proven effective, in addressing acute pain issues which in turn can help reduce dependency on opioids thus enhancing patients' quality of life and lowering the chances of complications.

The results further highlight the importance of considering the dangers linked to NSAIDs and ketamine. Like gastrointestinal issues and mild confusion. When it comes to ensuring pain relief for patients in need of such treatment methods. It is crucial to adopt a customized strategy that considers each patient's traits such as coagulation disorders or vulnerability, to dependency in order to maximize the effectiveness of treatment interventions.

## 5. Conclusion

The evidence about the effectiveness of non-opioid alternatives is growing and suggests that healthcare professionals have to continue adopting the use of these options. Non-opioid alternatives for acute pain management offer clear benefits, including the effective control of pain with fewer risks of complications associated with opioid use. However, it's necessary to consider which case with an individual approach, evaluating the severity of the pain and the risk profile of the patient to avoid unnecessary use and ensure effective pain control.

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