

35 y/o M presents to ED w/ acute onset of severe low back pain after lifting a heavy box at work. Pain is described as sharp, non-radiating, and rated 8/10. Aggravated by movement and standing and partially relieved with sitting. Pt has not taken any pain meds prior to arrival. Denies numbness, tingling, weakness, or urinary incontinence. No history of trauma or fall.

Search Question: In adults presenting to the ED w/ acute non-radiating MSK pain, does IM ketorolac compared with PO NSAIDs or PO acetaminophen lead to better short-term pain relief and fewer adverse effects?

Question type: What kind of question is this?

Prevalence

Screening

Diagnosis

Prognosis

Treatment

Harms

Assuming that the highest level of evidence to answer your question will be meta-analysis or systematic review, what other types of study might you include if these are not available (or if there is a much more current study of another type)?

If meta-analyses or system reviews are not available, then the next best option would be randomized controlled trials, since they are considered the gold standard for comparing therapeutic interventions. If RCTs are also not available, then well-designed cohort or case-control studies would be considered but not ideal since they lack randomization and are more susceptible to confounding variables.

PICO search terms:

Population	Intervention	Comparison	Outcome
Adult(s)	IM Ketorolac	Oral NSAIDs	Pain reduction
MSK pain	IM Toradol	Oral acetaminophen	Pain relief
Back pain	Intramuscular injection	Ibuprofen	Side effects
		Naproxen	Adverse effects
		Tylenol	

Search tools and strategy used: Please indicate what databases/tools you used, provide a list of the terms you searched together in each tool, and how many articles were returned using those terms and filters. Explain how you narrowed your choices to the few selected articles. For example, if your search returned 25 articles among the several databases used, what was the process used to determine which articles to use?

Query

Results

Search: **(adult OR adults) AND ("musculoskeletal pain" OR "MSK pain" OR "back pain" OR "intramuscular ketorolac" OR "IM ketorolac" OR "Toradol") AND (NSAIDs OR ibuprofen OR naproxen OR acetaminophen OR Tylenol) AND ("pain relief" OR "analgesia" OR "adverse")** Filters: from 2016 - 2026

2

Google Scholar

(adult OR adults) AND ("musculoskeletal pain" OR "MSK pain" OR "back pair



Articles

About 43 results (0.05 sec)

2 Trials matching (adult OR adults) AND ("musculoskeletal pain" OR "MSK pain" OR "back pain") AND ("intramuscular ketorolac" OR "IM ketorolac" OR "Toradol") AND (NSAIDs OR ibuprofen OR naproxen OR acetaminophen OR Tylenol) AND ("pain relief" OR "analgesia" OR "adverse") in Title Abstract Keyword - (Word variations have been searched)

[Cochrane Central Register of Controlled Trials](#)

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I used a total of 3 databases – PubMed, Google Scholar, and Cochrane – which yielded 2, 43, and 2 articles respectively. I tried to keep the articles as recent as possible, focusing on studies published within the last 10 years. The two articles from PubMed and Cochrane were identical, which was quite surprising. I decided to include both for my analysis because they directly addressed my PICO question. Google Scholar returned the highest number of results, but after screening for relevance, most were excluded because they involved either chronic pain, non-ED settings, pediatric populations, or other routes of administration.

1. Ketorolac analgesia in the emergency department in adults: systematic review and meta-analysis

Citation: Tessitore A, Zupin L, Celsi F, Capaci V, Amaddeo A, Barbi E, Cozzi G. Ketorolac analgesia in the emergency department in adults: systematic review and meta-analysis. Clin Exp Emerg Med. 2025 Aug 13. doi: 10.15441/ceem.25.002. Epub ahead of print. PMID: 40803358. <https://pubmed.ncbi.nlm.nih.gov/40803358/>

Article Type: Systemic review and Meta-analysis

Abstract

Background and objective: Acute painful conditions are a common reason to emergency department (ED) referral, and a broad variety of analgesic drugs may be used. Among them, ketorolac is a Non-Steroidal Anti-Inflammatory Drug (NSAID) increasingly used in the last two decades. In order to clarify the available evidence about the use of ketorolac in the ED setting, a systematic review and meta-analysis was performed.

Databases and data treatment: A search was performed in PubMed for English written articles updated to February 2023. Only randomized controlled trials regarding adult patients with acute painful conditions treated in the ED were selected. A meta-analysis was performed to evaluate the effectiveness of ketorolac in different pain conditions.

Results: Forty randomized controlled trials were selected including studies focused on acute renal colic, headache, traumatic and non-traumatic musculoskeletal pain, and biliary colic. In these studies, ketorolac was mainly compared to opioids and in general showed a similar analgesic efficacy. On the other hand, when compared to other NSAIDs, ketorolac does not seem to have a stronger analgesic effect.

Conclusion: This systematic review indicates that ketorolac is a valuable option, alternative to opioids, to induce analgesia in adult ED patients, as our meta-analysis showed no significant difference in efficacy compared to opioids or other NSAIDs. Nevertheless, the evidence regarding its efficacy compared to other commonly NSAIDs is still limited and should be further explored in future studies.

Key points:

- 15 mg of IM ketorolac is as effective as 800 mg of PO ibuprofen for short-term pain relief.
- In trials involving acute pain of various origins (including non-traumatic MSK pain), IM ketorolac and PO ibuprofen showed a similar decrease in pain scores over time (15, 30, 45, 60, 90 and 120 minutes).
- For adults presenting w/ acute MSK pain, 15 mg of IM ketorolac was found to be non-inferior to 60 mg for pain relief at both 30 and 60 minutes.
- Higher doses of IM ketorolac (60 mg) are associated w/ more frequent minor AE, specifically burning at the injection site, compared to lower doses (15 mg).
- Compared to opioid alternatives often used for severe MSK pain, ketorolac is associated w/ significantly lower levels of sedation and fewer overall AE.
- IM ketorolac vs PO NSAIDs AE not directly compared but 95% taking PO ketorolac reported no stomachache compared to only 74% of those taking PO ibuprofen.

This article was chosen because not only is it of the highest level of evidence (systemic review and meta-analysis), but it also addresses my PICO question. It provides direct comparisons between IM ketorolac and PO NSAIDs, specifically showing that IM ketorolac is as effective as 800 mg of PO ibuprofen for short term relief in acute pain conditions. Furthermore, it also provides information on the safety and optimal dosing of ketorolac – lower doses are just as effective as higher ones while causing fewer adverse effects so providers shouldn't routinely opt for the higher dose when the lower dose achieves the same results.

2. Oral Ibuprofen Versus Intramuscular Ketorolac for Acute Musculoskeletal Back Pain in the Emergency Department: A Prospective Analysis

Citation: Sharabun M, O'Connell R, Greller H, Smith AP. Oral Ibuprofen Versus Intramuscular Ketorolac for Acute Musculoskeletal Back Pain in the Emergency Department: A Prospective Analysis. J Pharm Pract. 2025 Nov 6:8971900251394098. doi: 10.1177/08971900251394098. Epub ahead of print. PMID: 41197604. <https://pubmed.ncbi.nlm.nih.gov/41197604/>

Article Type: Prospective randomized controlled trial

Abstract

Ibuprofen and ketorolac are nonsteroidal anti-inflammatory drugs (NSAIDs) commonly used to treat acute back pain in the Emergency Department (ED). Data comparing pain relief between oral and intramuscular administration at their proposed ceiling doses is lacking. The aim of this study was to compare oral (PO) ibuprofen 400 mg to intramuscular (IM) ketorolac 10 mg for the treatment of acute, atraumatic, musculoskeletal back pain. This single-center, double-blind, double-placebo, randomized study compared PO ibuprofen 400 mg to IM ketorolac 10 mg for acute, atraumatic musculoskeletal back pain in adult patients presenting to an urban ED. Subjects were randomized to receive PO ibuprofen 400 mg suspension plus IM placebo injection or IM ketorolac 10 mg plus PO placebo suspension. The primary outcome was absolute reduction in pain score 1 hour after medication administration, as measured by visual analog scale (VAS). Secondary outcomes included rescue analgesia administration at 60 minutes and adverse drug reactions. The author's enrolled 93 patients; 47 in the ibuprofen group and 46 in the ketorolac group. VAS score reduction from baseline to 1 hour with ibuprofen or ketorolac was 35 vs 32, respectively (95% Confidence Interval: -8.03 to 15.03). Rescue analgesia administration at 60 minutes was similar between both groups; adverse reactions were reported in the ketorolac group only as pain at injection site in two patients. In this prospective analysis, PO ibuprofen 400 mg and IM ketorolac 10 mg provide comparable pain relief for the treatment of acute, atraumatic, musculoskeletal back pain.

Key points: 10 mg IM ketorolac vs 400 mg PO ibuprofen

- No difference in pain relief between the two groups one-hour post-administration
- No statistically significant difference in Visual Analog Scale (the smiley faces 😊) score reductions at 60 minutes between ibuprofen and ketorolac group
- Adverse effects only reported in ketorolac group, specifically pain at injection site in 4% of those patients. No adverse effects were reported in ibuprofen group

This article essentially echoes what was already said in the one above, where IM ketorolac is not superior to PO ibuprofen in terms of short-term pain relief for acute MSK pain and rescue analgesia use. It also directly compares the adverse effects between the two routes (which was not seen in the one above), showing that minor side effects like injection-site pain occurred only with IM ketorolac, while PO ibuprofen was well-tolerated. This suggests that providers can utilize IM ketorolac and PO ibuprofen interchangeably for acute, atraumatic MSK pain.

3. NSAIDs in Urgent Care and Emergency Departments: A Narrative Review

- Citation: Belisle Haley C, Hsueh AT, Chen CH, Nelson A. NSAIDs in Urgent Care and Emergency Departments: A Narrative Review. J Urgent Care Med. 2024; 18(7): 42-51

<https://www.jucm.com/nsaids-in-urgent-care-and-emergency-departments-a-narrative-review/>

Article Type: Narrative Review

Background/Objective: Non-steroidal anti-inflammatory drugs (NSAIDs) are common medications that are used in a variety of healthcare settings. We aim to analyze the utility of NSAIDs in treating different painful conditions when compared to other alternative medications, their effectiveness between different dosing and routes, as well as the potential side effects of NSAIDs. The goal of this review is to guide urgent care providers in using these medications more effectively.

Methods: We searched the MEDLINE database and developed a search term strategy using *medical subject headings* (MeSH) to capture NSAID-related studies in urgent care or emergency settings. Based on the initial full-text review, chief complaints were simplified into the following categories: trauma/extremity injury; headaches; nontraumatic back pain; abdominal pain (excluding renal colic); renal colic; and pediatric pain.

Results: Sixty-seven studies were included in our narrative review. For traumatic pain, when compared to opioids, NSAIDs are as effective as opioids with less dependence. In comparison with acetaminophen, most studies showed comparable results in pain reduction, and only 1 observational study showed a lower analgesic effect with NSAIDs. In patients with headaches, NSAIDs and antiemetics combined lead to a higher discharge rate and more significant pain relief; however, in a randomized controlled trial (RCT) in children, antiemetics alone have similar results as combined therapy. For renal colic, 2 RCT trials revealed that NSAIDs have a higher analgesic effect than intravenous (IV) opioids or acetaminophen. Moreover, intramuscular (IM) diclofenac was found to be superior to its oral form at 5 minutes post-administration, and there are 5 RCTs showing no more pain relief benefits of ketorolac after doses higher than 10mg. NSAIDs are also associated with a higher risk of failure of colorectal anastomosis, non-variceal gastrointestinal (GI) hemorrhage, and gastroduodenal ulcers.

Conclusion: NSAIDs are safe, effective analgesic options that can be considered alongside acetaminophen for most acute painful conditions. Compared to opioids, NSAIDs have fewer side effects with comparable pain reduction. Single-use and short-term NSAID use is generally safe for patients ranging from geriatric to children over 6 months old; however, side effects of bleeding, surgical anastomotic failure, and anaphylaxis should be considered.

Key points:

- 5 RCTs show no more pain relief benefits of ketorolac after doses higher than 10 mg
- Higher doses of IM ketorolac above 10 mg were associated w/ increased burning at injection site without providing additional analgesic benefit
- For acute MSK pain, oral NSAIDs and oral acetaminophen were found to have no statistical difference in pain reduction at one hour
- IM formulations were more superior to its oral form in achieving 50% reduction in pain as early as 30 minutes post-administration
- IM ketorolac showed rapid and effective pain relief, with 32% of patients achieving relief within a median time of 5 minutes

Although this article doesn't directly answer my PICO question, it still provides important information that should not be overlooked. For one it talks about the rapid onset of pain relief of IM formulations compared to PO ones. Additionally, it addresses the analgesic ceiling effect of ketorolac. In other words, increasing the dose beyond a certain point does not lead to better pain control but rather may increase the likelihood of adverse effects.

What is the clinical “bottom line” derived from these articles in answer to your question?

During my EM rotation, I've run into a lot of MSK cases, whether it's knee pain, shoulder pain, wrist pain, or low back pain. You name it, I've seen it. What I struggled with the most, though, was deciding on the most appropriate pain management strategy, especially when choosing between IM ketorolac and oral NSAIDs or acetaminophen. I often found myself questioning whether the injection truly offered better relief or if the oral counterparts were the way to go. While many patients, and myself included, tend to believe that parenteral medications are “stronger” than oral ones, the research suggests otherwise. The evidence shows that IM ketorolac is not consistently superior to oral NSAIDs for short-term relief of acute MSK pain. The main advantage of parenteral administration appears to be a faster onset of analgesia and that's about it. The overall degree of pain reduction is generally comparable. Furthermore, IM ketorolac

has a ceiling effect, meaning that increasing the dose beyond a certain point does not improve pain control and may only increase the risk of adverse effects like injection site pain. All in all, the choice often comes down to provider preference and patient comfort, taking into account factors like ease of administration and prior response to oral vs parenteral medications. Is it really worth going through the invasive approach if the overall pain relief isn't significantly better?