Southern Illinois University Edwardsville School of Pharmacy

Ketorolac Safety and Efficacy in Hospitalized Patients

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Background:

- Ketorolac tromethamine is a nonsteroidal anti-inflammatory drug (NSAID) that exhibits antipyretic, analgesic, and anti-inflammatory effects
- Side effects including bleeding and increased risk of myocardial infarction and stroke limit ketorolac use to 5 days
- Research suggests that the lowest effective dose of ketorolac may be 10 mg as illustrated by the analgesic ceiling dose effect[1,2]
- The analgesic ceiling dose is defined as the dose at which no further dose increase will yield additional analgesic benefit and potentially adds an unnecessary risk of harm

Purpose:

Primary outcome:
- Examine the frequency of ketorolac dosing above the suggested 10 mg analgesic ceiling dose in patients admitted to the internal medicine unit

Secondary outcomes:
- Indication
- First pain medication administered
- Concurrent analgesics
- Pain scores before and after ketorolac administration
- Duration of use
- Discharge pain medication

Methods:

Study design:
- Single center retrospective review

IRB approval:
- Springfield Committee for Research Involving Human Subjects Institutional Review Board

Data collection/interpretation:
- Information was collected from patients' electronic health records and was analyzed with descriptive statistics

Inclusion criteria:
- 18-89 years old, admitted to the academic medical center between January 1, 2018 and June 30, 2019 and received at least one dose of ketorolac

Exclusion criteria:
- Ketorolac used for postoperative pain or hospital stay less than 23 hours

Results:

Figure 1: Baseline Characteristics (n=109)

Gender *(n, %)*	
Female	67 (61.5)
Age (years) *(mean)*	50
Race *(n, %)*	
Caucasian	81 (74)
African American	26 (24)
Pacific Islander	1 (1)
Declined	1 (1)
Weight (kg) *(mean)*	85.5
Height (in) *(mean)*	66.8
Serum Creatine (mg/dL) *(mean)*	1.1

Figure 2: Enrollment and Primary Outcome

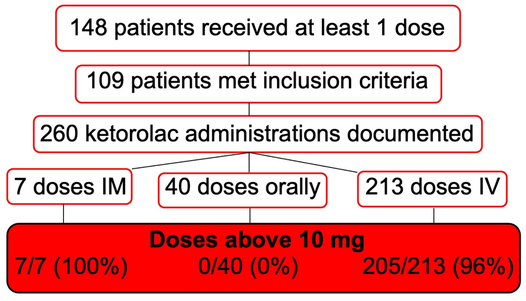
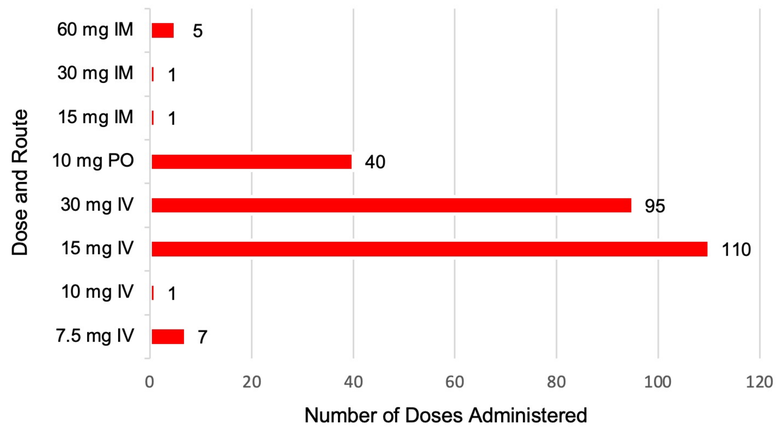


Figure 3: Ketorolac Adminstrations (n=109)



Most common indications:
- Abdominal pain (n=23,21%), chest pain (n=21,19%), headache (n=10,9%)

First analgesic administered (n=109):
- Ketorolac (n=58, 53%)
- Acetaminophen (n=16,15%)
- Morphine (n=10,9%)
- Fentanyl (n=5,5%)
- Miscellaneous other (n=20,18%)

Concurrent analgesics:
- Additional pain medications (within 24 hours of a ketorolac dose) were administered in 99 patients (91%)

Pain scores *(mean)*:

Dose/Route	Number of patients	Pain scores before administration*	Pain scores after administration*
10 mg PO	23	8	5
15 mg IV	55	7.5	5.6
30 mg IV	68	8.1	6

*pain scores based on numeric 0-10 scale with 0 being no pain and 10 being the most severe pain

Duration:
- 2 patients (2%) exceeded the 5-day maximum

Discharge pain medications:
- 51 patients (47%) did not receive any pain prescriptions post-discharge
- Hydrocodone-acetaminophen was the most frequently ordered analgesic upon discharge (n=11,10%)

Discussion:

- Similar reduction in pain scores among the different doses support the analgesic ceiling dose effect of 10 mg
- The results of this study show that 96% of the patients who received IV ketorolac therapy and 100% of patients who received IM ketorolac therapy were prescribed doses above the proposed 10 mg ceiling dose
- Prescriber education and implementation of a dose cap are both viable methods to reduce the number of orders above 10 mg
- Based on the formulations of ketorolac available (15 mg, 30 mg, and 60 mg vials), a 15 mg dose cap rather than 10 mg may be considered due to ease of administration
- Limitations: small sample size, no evaluation of bleed risk or cardiovascular events, pain scale was not used to assess all doses administered

Conclusion:

Although data suggests that ketorolac exhibits an analgesic ceiling dose effect, prescribers continue to order doses above 10 mg. Prescriber education and a motion to implement a dose cap for ketorolac is warranted at the institution.

References:
1.Staquet MJ. A double-blind study with placebo control of intramuscular ketorolac tromethamine in the treatment of cancer pain. J Clin Pharmacol. 1989;29(11):1031-1036. doi:10.1002/j.1552-4604.1989.tb03274.x
2. Motov S, Yasavolian M, Likourezos A, et al. Comparison of Intravenous Ketorolac at Three Single-Dose Regimens for Treating Acute Pain in the Emergency Department: A Randomized Controlled Trial. Ann Emerg Med. 2017;70(2):177-184. doi:10.1016/j.annemergmed.2016.10.014