

## Determinants of variation in analgesic and opioid prescribing practice in an emergency department

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### ABSTRACT

**Objective:** Adequate treatment of patients' pain is a top priority for the World Health Organization (WHO), American Medical Association (AMA), and American College of Emergency Physicians (ACEP), but "adequate" is not clearly defined. Most previous studies of emergency department (ED) pain treatments have centered on musculoskeletal pain in terms of rates of analgesia and disparities in treatment based on race and age. This study will examine complaints of pain other than musculoskeletal and will focus on treatment disparities that may result from differences in patient and physician characteristics.

**Methods:** This retrospective study is of ED patients 18 years and older with nonmusculoskeletal pain who were seen by ED faculty over a period of eight weeks. Logistic regression and  $\chi^2$  tests were performed to quantify effects of doctor, patient, and clinical characteristics on rates of ED analgesia, ED opioids, and analgesic prescriptions at discharge.

**Results:** A total of 1,360 patients were included. There was wide variation in the type and frequency of ED analgesia depending on the attending doctor. For example, patients seen by one specific ED doctor were less than half as likely to receive any analgesia and seven times less likely to receive an opioid than those seen by another doctor. Age, race, doctor's training and experience, and whether the patient had chronic pain were important predictors of ED analgesia. There were similar findings for ED opioids and discharge analgesics.

**Conclusion:** Pain practices in EDs are highly variable and seem inadequate when measured against the goals of WHO, AMA, and ACEP. Patient age, race, and type of pain and the physician's identity, training, and experience all contribute to practice variation. Further research is needed to identify the causes of these variations, and

*there is a need to develop interventions to standardize and improve pain assessment and treatment.*

*Key words:* emergency department, pain, pain management, analgesics, opioids

### INTRODUCTION

Pain is the most common complaint in general medical practice and is especially common in emergency departments (EDs). Pain management is an increasingly important issue. The World Health Organization (WHO) co-sponsored the first Global Day Against Pain to increase recognition of the fact that pain relief is an integral factor in attaining the highest level of physical and mental health.<sup>1</sup> The American Medical Association (AMA) recently distributed a comprehensive policy statement on pain management involving opioid analgesics. The AMA linked its findings to the Federation of State Medical Boards' *Model Guidelines for the Use of Controlled Substances for the Treatment of Pain* and to a joint statement from 21 health organizations and the Drug Enforcement Administration titled *Promoting Pain Relief and Preventing Abuse of Pain Medications: A Critical Balancing Act*.<sup>2</sup> The American College of Emergency Physicians' (ACEP) board of directors approved a strongly worded policy statement in March 2004 advocating safe, rapid, and adequate pain treatment for ED patients and further research into ED pain management.<sup>3</sup> Unfortunately, none of these organizations defined adequate pain treatment or established standards for ED pain care.

A number of studies of ED management of specific pain complaints, primarily musculoskeletal, have been published. All report on the quantity of pain treatment but not on quality as judged against an objective standard.<sup>4-14</sup> Most assume that pain should be treated and that low rates of ED analgesia represent inadequate care, but

they offer no guidance on what is adequate. Several studies have explored the effects of patient characteristics such as age, race, and gender on ED analgesia practice, with equivocal results.<sup>5-14</sup> Selbst and Clark<sup>5</sup> studied pain from burns, sickle cell disease, and lower-extremity fractures. Brown et al.<sup>6</sup> studied pain from fractures using the National Hospital Ambulatory Medical Care Survey (NHAMCS), a national weighted sample of ED encounters. Both found that children were less likely to receive ED analgesia and discharge analgesic prescriptions than adults.

Rafty et al.<sup>7</sup> found that patient perception of pain was the greatest predictor of the number and strength of analgesics given in the ED and that patient gender was not a predictor of ED analgesic use for patients with headache or back and neck pain. Several studies have attempted to find race-based disparities, with some finding blacks and Hispanics receiving less ED analgesia and others finding no difference, primarily for patients with long-bone fracture.<sup>8-10</sup> Singer and Thode<sup>12</sup> studied burn patients using NHAMCS and found low rates of analgesia but no disparities based on gender, age, race, ethnicity, or financial status. Tamayo-Sarver et al.<sup>11</sup> also studied NHAMCS looking for racial and ethnic disparities in care provided for migraines, back pain, and long-bone fractures. They found no disparities in ED analgesic use except that blacks were less likely than whites to be prescribed opioids for back pain and migraines.

We found very little research examining the effect of provider characteristics on ED pain practice. Tamayo-Sarver et al.<sup>13</sup> examined pain practice by emergency physicians (EPs) using written case vignettes. They found wide variation in analgesic practice but could not identify any provider characteristics that explained the variations. Todd et al.<sup>9</sup> studied racial disparities in the care of long-bone fractures and statistically controlled for provider differences in their analysis.

Our research group<sup>14</sup> completed a companion study to the one presented here in which we investigated variations in treatment of musculoskeletal pain in the ED. We found that different physician characteristics and wide variation in practice were the only sources of disparities in the prescription of analgesics in the ED. However, the study found patient characteristics including race, age, chronic pain, and trauma influenced prescription for the subgroups receiving opioids in the ED and discharge analgesic prescriptions. No gender or financial status disparities were found. Fewer opioids and discharge analgesics were prescribed for black patients than for whites. Younger patients and those with trauma or chronic pain received more opioids and discharge analgesics than others. Doctors who completed emergency medicine (EM) residencies and those with less than three years of experience prescribed more analgesics in the ED than non-EM-trained physicians and those with more experience.

In summary, current knowledge about ED pain treatment is limited, and there are no valid standards for evaluating the adequacy of treatment. Some patient and doctor characteristics have been identified that predict ED analgesic use, primarily for musculoskeletal pain, but not all relevant contributors to ED pain treatment have been identified.

We sought to describe ED analgesic prescribing practice for painful conditions other than musculoskeletal pain and to investigate whether patient or doctor characteristics would predict variations in ED pain management.

## METHODS

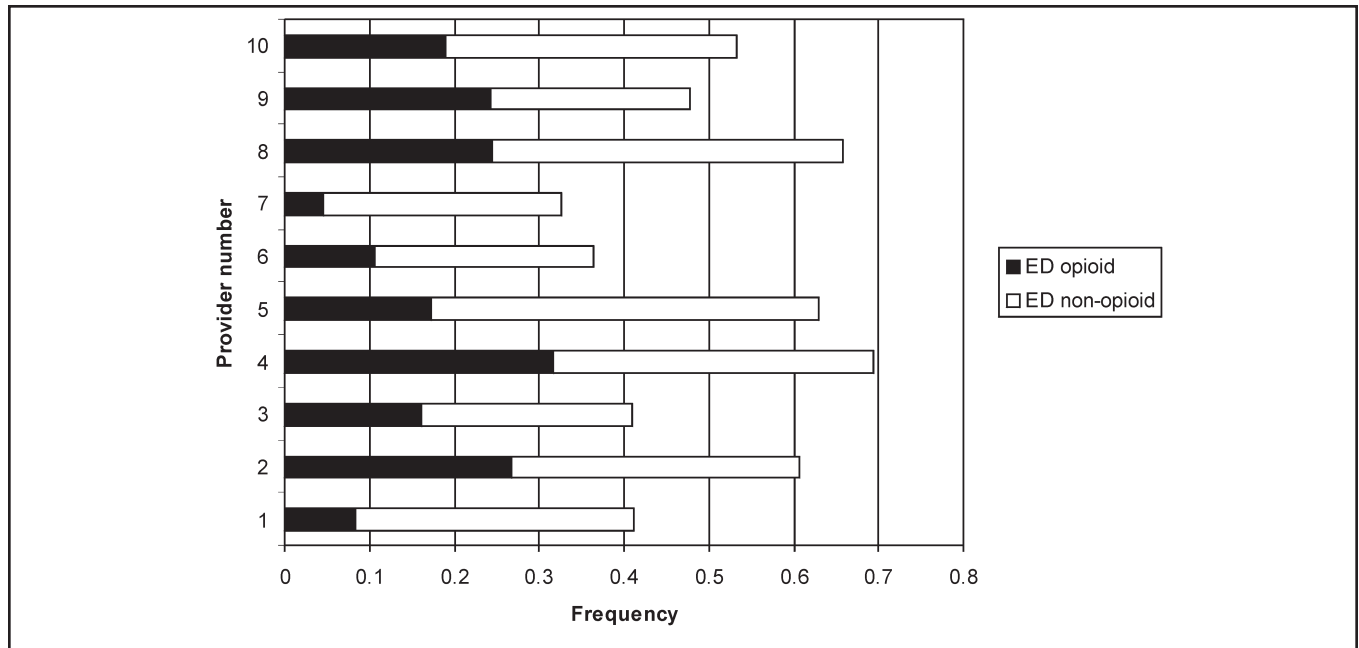
### Study design and participant selection

After institutional review board approval and waiver of the Informed Consent requirement, we collected chart review data from complete records on all patients 18 years and older with documented pain other than musculoskeletal pain who were seen by our 10 core faculty members and discharged from our ED over an eight-week period in 2004. Our ED is part of an urban, academic medical center with Level 1 trauma designation and an annual census of about 30,000. A pain complaint was defined as any pain or discomfort described with words like ache, sore, tight, hurt, etc. at triage or during physical evaluation or a nonzero pain score on a verbal 0 to 10 scale.

### Methods of measurement

Data were collected following the guidelines of Gilbert et al.<sup>15</sup> Chart abstractors were trained on the structure of charts, definitions of study variables, inclusion and exclusion criteria, the printed abstraction tool, and data entry procedures. Frequent discussion among investigators and abstractors via e-mail and in person helped resolve all uncertainties. In addition, random reabstraction of 10 percent of the charts was performed to assess inter-rater reliability by the  $\kappa$  statistic. Abstractors could not be blinded to all study hypotheses.

Patient variables abstracted included age (divided into "under 50" and "50 or older"), sex, race, insurance status (divided into self-pay or insured), location of pain, traumatic mechanism, presence of chronic pain, analgesic given in ED, opioid given in ED, and both analgesic and opioid prescribed at discharge. Because review of ED census data before the study revealed only a small population of patients 65 and older, patients 50 and older were assigned to the "older" group to provide adequate comparative samples based on age. The name of the attending was obtained from the chart. Data on physician gender, type of training, and time in practice were collected by interview.



**Figure 1.**

Pains were described as headache, chest pain, abdominal pain, neuropathic pain, and other. The “other” category included primarily skin and skin structure pain from infection or superficial injury and dental, throat, and ear pain. (As noted earlier, patients with musculoskeletal pain were excluded from this study.)

For patients with multiple painful complaints, the patient’s most important single site was recorded. Traumatic mechanism was coded if injury occurred within one week of presentation and no other healthcare had been sought previously for the injury.

No validated definition of chronic pain in EM was found through our literature search. Therefore, we allowed consensus of the investigators to define chronic pain as pain occurring for more than one month and treated with an analgesic on a regular basis before the ED visit.

Definitions of analgesics were broad and specific to pain location. We evaluated only pharmaceutical agents and did not code for analgesia if the only interventions were nonpharmacologic, e.g., ice, elevation, and splinting. Medications treating underlying conditions that might cause pain were not considered analgesics (e.g., antibiotics for a urinary tract infection causing suprapubic pain or for pneumonia causing chest pain, hypoglycemics given to a patient with diabetic neuropathic pain).

Acetaminophen, NSAIDs, and opioids were considered analgesics for all pain sites. For headaches, oxygen was considered an analgesic for cluster headache. Migraine-specific drugs such as prochlorperazine, droperidol, and sumatriptan were coded as analgesics. Tricyclic antidepressants, topical and injected anesthetics, and anticonvulsants such as gabapentin were considered analgesics for neuropathic pain. Nitroglycerin was counted

as an analgesic for chest pain. Aspirin was not considered analgesic for chest pain as it was for all other pain because its use in chest pain is to treat suspected platelet aggregation, an underlying condition causing pain. Antacids, acid suppressors, and antispasmodics were analgesics for abdominal pain. Local anesthesia and procedural sedation for injuries and painful treatments were considered analgesics.

### Outcome measures

Primary outcome was analgesic treatment in the ED. Secondary outcomes included ED opioid treatment and discharge opioid and nonopioid analgesic prescriptions.

### Primary analysis

We described the range of practice in our group by using frequencies and percentages. We also used SAS 9.1 to perform  $\chi^2$  and binary logistic regression analysis to determine the significance of variations in analgesic treatment due to patient demographic and clinical characteristics and doctor identity, training, and experience in pain treatment, while controlling for other variables.

### RESULTS

A total of 1,360 patients met inclusion criteria and were included in the analysis. Female patients made up 52.6 percent of the study group, blacks 69.8 percent, and uninsured patients 63.5 percent. The majority of patients (82.1 percent) were < 50 years of age. Other pain and abdominal pain were the most common complaints at

**Table 1. Logistic regression results for each outcome**

	Odds ratio interval	95 percent confidence interval
<b>ED analgesia</b>		
> 50 vs. < 50 years	0.49	0.37-0.66
White vs. black	1.42	1.12-1.81
Chronic vs. not	2.36	1.50-3.71
EM-trained vs. not	1.28	1.02-1.61
> three years' experience vs. less	0.66	0.52-0.84
<b>ED opioid</b>		
White vs. black	2.27	1.64-3.16
Chronic vs. not	1.79	1.07-3.01
EM-trained vs. not	1.46	1.08-2.04
<b>Discharge prescription</b>		
> 50 vs. < 50 years	0.54	0.40-0.73
White vs. black	1.47	1.16-1.86
Chronic vs. not	2.12	1.38-3.23
<b>Discharge opioid</b>		
White vs. black	2.10	1.46-3.02
Trauma vs. not	1.66	1.05-2.62

39.7 percent and 31.3 percent, respectively. Chest pain accounted for 15.6 percent and headache 12.1 percent of patient pain complaints. In testing for inter-rater reliability of data abstraction, all variables had moderate to near-perfect correlation, with all  $\kappa$  values greater than 0.6.

The faculty included five EM-residency-trained physicians and five trained in other specialties but practicing EM full time. Five EPs had less than three years of attending experience, and five had more than three years. In both groups, the number included one female and four male doctors.

Just over half of the patients with pain (51.5 percent) received analgesia in the ED. Of the 700 patients who received ED analgesia, 36.0 percent received opioids. Of the 585 patients who received a discharge prescription, 57.6 percent were prescribed opioids.

Rates of ED analgesia by prescribing doctor are shown in Figure 1 and are primarily remarkable for the wide variation in practice. One specific doctor was less than half as likely to prescribe any ED analgesic and seven times less likely to give ED opioids than the doctor with the highest treatment rates.

An in-depth review of four individual cases of lower molar pain without signs of abscess was performed to illustrate the inconsistency of pain treatment in our ED. All patients reported severe pain (10 out of 10 on a verbal scale). Each was seen by a different doctor. Three patients were black and one white. Two were female, and one was over 50 years old. All were referred to a dentist upon discharge. Patient 1 received nothing in the ED and was given no discharge analgesic recommendation or prescription. Patient 2 received nothing in the ED and was told to take over-the-counter acetaminophen or ibuprofen for pain at discharge. Patient 3 received oral ibuprofen 800 mg in the ED and received a discharge prescription for hydrocodone/acetaminophen 5 mg/500 mg, 10 tablets, with instructions to take one by mouth every six hours as needed for pain. Patient 4 received hydrocodone/acetaminophen 5 mg/500 mg two tablets by mouth in the ED, and the emergency physician performed an inferior alveolar block with bupivacaine 0.5 percent with epinephrine. This last patient also received a prescription for hydrocodone/acetaminophen 7.5 mg/500 mg, 15 tablets, with instructions to take one tablet every four to six hours as needed for pain. No discharge

pain assessments were made, so no inference about adequacy of treatment was available.

The rate of analgesic use varied greatly according to pain location. ED patients with headache received analgesics 63.5 percent of the time, compared to 51.6 percent for abdominal pain, 51.9 percent for chest pain, and 48.0 percent for other pain. Headache and chest pain patients were less likely to receive opioids. Only 18.3 percent of headache and 20.0 percent of chest pain patients received opioids, compared to 49.1 percent of abdominal pain and 38.6 percent of other pain patients.

Logistic regression analysis of the primary and three secondary outcomes demonstrated significant predictors for each outcome (Table 1). For ED analgesia, age, race, chronic pain, and physician characteristics predicted use. Older people were half as likely to receive analgesia as younger patients. The undertreatment of older people continued with regard to discharge analgesics. Whites were 42.0 percent more likely to receive an ED analgesic.

Patients with chronic pain received analgesics, opioids, and discharge prescriptions twice as often as patients without chronic pain. EM-trained physicians were more likely to give analgesics and opioids in the ED than non-EM-trained providers. Physicians with less than three years of experience were more likely to prescribe analgesics in the ED. Blacks were only half as likely to receive ED opioids as whites.

## DISCUSSION

Our study is consistent with other studies that have shown low rates of pain treatment in EDs and treatment disparities based on age and race.<sup>4,6,8,9,11-14</sup> Nearly half of our patients, with their varied pain complaints, received no analgesia in the ED. Patients 50 or older were less likely to receive analgesia both in the ED and at discharge. Blacks received less pain treatment than whites for all tested outcomes. These findings are statistically, and maybe clinically, significant, but we found that the most important factor determining rates of pain treatment was the identity of the doctor.

The reasons for the wide variation in pain practice by doctors in our ED are not clear and were not within the scope of this study. However, some possibilities could be suggested from our results and from anecdotal evidence from discussions with faculty after the study was completed. For instance, bias related to patient age and race likely plays some role. Fear, on the parts of patients and physicians, of opioid side effects, drug diversion, and addiction promotion also likely contribute to practice variation.

Understanding the factors associated with prescribing behavior and patient analgesic use is a key to providing better pain management in the ED. Our group is currently investigating which knowledge and attitudes of health-care providers may determine pain management practice.

Studies of patient factors that influence analgesic-taking behavior and desire for pain relief are also needed. Finally, development of systematic interventions to standardize pain practice may reduce inconsistencies in practice and improve satisfaction with care.

Tamayo-Sarver et al.<sup>11,13</sup> identified wide variation in pain practice by EPs based on written case vignettes but could not find any predictors of that variation, despite their investigation of many doctor characteristics. We found that type of residency training and length of experience significantly influenced rates of ED analgesia but did not influence discharge prescriptions. That EM-trained physicians and recent graduates give more analgesia in the ED makes some intuitive sense, considering the recent emphasis on pain management in the EM literature and by the largest EM professional organization.<sup>3,4</sup> In addition, our findings are consistent with a recent systematic review of the effect of years of experience on quality-of-care outcomes which demonstrated that increasing experience resulted in worse quality of care.<sup>16</sup>

If the finding of lower prescription rates of analgesia by more experienced practitioners is validated in a much larger sample of EPs, peer feedback, continuing education, or other intervention will be needed to overcome this deficiency.

## Limitations

Due to the retrospective design, we are limited in our ability to draw firm conclusions about the causes of our findings, despite conscientious efforts to use rigorous chart-review methods to maximize the validity of our results. At best, we can generate useful hypotheses for future study.

Obviously, our EP group and patient list represent a tiny part of EM in the United States, so our findings must be generalized very cautiously. Since we are affiliated with a separate children's hospital, our patients are almost all adults, so we limited the study to those 18 years and older. Therefore, this study can not infer any conclusions about pain management in children. Also, this study includes no data on follow-up pain assessments or patient satisfaction with treatment, so we can not assess adequacy of treatment. Finally, our definitions of chronic pain and traumatic mechanism were arbitrary, so findings of influence on rates of analgesia require validation in other settings.

## CONCLUSION

This study demonstrates that ED pain practices are highly variable and seem inadequate when measured against the goals of the WHO, AMA, and ACEP.<sup>1-3</sup> Patient age, race, and type of pain and physician identity, characteristics of training, and experience influence pain

treatment. Further research to identify causes of this variation is needed, and there is a need to develop interventions to standardize and improve pain assessment and treatment.

## DISCLOSURE STATEMENT

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The results described in this paper and other work from our group were presented in abstract form at the 2005 Society for Academic Emergency Medicine Annual Meeting on May 25, 2005, in New York, NY. The abstract was published in the May 2005 issue of *Academic Emergency Medicine*.

Results of a companion study to the one presented here were recently published.<sup>14</sup> Study cohorts were mutually exclusive, so no data from any patient were duplicated.

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