Emergency Department Pain Management in Pediatric Patients With Fracture or Dislocation in a Bi-Ethnic Population

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Study objective: We determine whether ethnicity in a bi-ethnic population of northern Israel is associated with disparities in pediatric emergency department (ED) opioid analgesia in patients with fracture or dislocation.

Methods: A retrospective cohort study was conducted. All records of patients aged 3 to 15 years and receiving a diagnosis of a limb fracture or dislocation were extracted. Data on demographics, including ethnicity, nurse ethnicity, pain level, and pain medication, were collected. Medications were administered according to a nurse-driven pain protocol.

Results: During the nearly 4-year study period, 3,782 children with fractures visited the ED, 1,245 Arabs and 2,537 Jews. Of these, 315 Arabic patients and 543 Jewish patients had a pain score of 7 to 10. The proportion of Arabic and Jewish children who received opioid therapy was 312 of 315 (99.05%) and 538 of 543 (99.08%), respectively (difference 0.03%; 95% confidence interval –0.13% to 0.19%). Of the 315 Arabic children, 99 were approached by Arabic nurses (31.4%), and 98 of those received opioids (98.9%); 216 were approached by Jewish nurses (68.6%), and 214 of those received opioids (99%). Of the 543 Jewish children, 351 were approached by Jewish nurses (64.6%), and 348 of those received opioids (98.9%); 192 were approached by Arab nurses (35.4%), and 190 of those received opioids (98.9%). During the 2014 11-week Israeli-Palestinian armed conflict, 232 children with fractures visited the ED, 87 Arabs and 145 Jews, of whom 16 and 27 had pain scores of 7 to 10. The proportion of Arabic and Jewish children who received opioid medication was 16 of 16 (100%) and 26 of 27 (96%), respectively (difference 4%; 95% confidence interval –16% to 18%).

Conclusion: Findings suggest that ethnic differences, including during periods of conflicts, have no effect on opioid analgesia in this ED. [Ann Emerg Med. 2016;67:9-14.]

Please see page 10 for the Editor’s Capsule Summary of this article.
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Editor's Capsule Summary

What is already known on this topic
Ethnic disparities in analgesic therapy have been demonstrated in the United States, predominantly between white and black patients.

What question this study addressed
The authors reviewed analgesic opioid therapy for 315 Arabic and 543 Jewish children in Israel with severe pain from orthopedic injuries who were treated with a nurse-driven protocol.

What this study adds to our knowledge
There were no ethnic disparities in the proportion of Arabic (99%) versus Jewish (99%) children receiving opioid therapy, regardless of patient-nurse ethnicity congruence or care during active Israeli-Palestinian armed conflict.

How this is relevant to clinical practice
These data suggest that providers in this emergency department do not discriminate across ethnicities, that protocol-driven analgesia ameliorates ethnic disparities in analgesic therapy, or both.

management exist, educational programs should be initiated to mitigate these disparities.

Goals of This Investigation
We sought to examine whether ethnicity has an influence on receipt of opioid analgesia for Arabic and Jewish children with a limb fracture or dislocation treated in a pediatric ED of a tertiary care center in northern Israel.

MATERIALS AND METHODS
Setting, Study Design, and Selection of Participants
Rambam Health Care Campus, the only tertiary care hospital in the north of the country, serves a population of more than 2 million. Two major ethnic groups are admitted to the pediatric ED of Rambam Health Care Campus, Jews and Arabs.

A retrospective cohort study was conducted during nearly 4 years. We extracted the electronic medical records of all ED patients aged 3 to 15 years who received a diagnosis of an upper limb fracture or dislocation, or a lower limb fracture or dislocation. Joint subluxations, limb contusions, lacerations, open wounds, and abrasions were not included. Two cohorts of patients who received opioids were compared according to their ethnicity, Arabic and Jewish children. The study was approved by the institutional review board.

The triage nurse is responsible for pain assessment and treatment of any child admitted to the department, according to the ED protocol (Appendix E1, available online at http://www.annemergmed.com). The medication option is selected independently by the nurse according to the pain score, without a physician’s input. Patients assessed to have a pain score of 7 to 10 received either oral oxycodone or intravenous morphine according to protocol, at the nurse’s discretion.18

Oxycodone is the drug of choice, but the child’s and caregiver’s preference and compliance are taken into consideration (a child who has an intravenous catheter placed before ED admission and a child who refuses oral oxycodone are treated with intravenous morphine).

Two self-assessment instruments are used by the ED nursing staff to assess pain in triage: the Wong-Baker FACES Pain Rating Scale and the visual analog scale.19 The Wong-Baker FACES Pain Rating Scale is a self-report scoring scale, translated into Hebrew and Arabic, mainly designed for use by children aged 3 to 7 years. The visual analog scale is a self-report scoring scale, translated into Hebrew and Arabic, mainly designed for use by children aged 8 to 15 years.19

Data Collection and Processing
Data were extracted from the electronic medical records of the hospital (Prometheus, Rambam Health Care Campus, Haifa, Israel). This computerized system is a mandatory working tool for all physicians, nursing staff, social workers, and any ED health care personnel. Patients’ demographic data, including identification number and ethnicity, are obtained from the parents by the ED clerk and recorded in the system. The computerized information system also includes vital signs, triage information, and pain level when relevant. It also contains any data collected in real time by the nurses during triage and reevaluation rounds and identifies the medication administration.

Using a structured form, 2 abstractors (E.B. and D.S.) reviewed the charts independently. Chart review was conducted in accordance with published methods for retrospective studies, with the sole exception that abstraction of data was not done blindly in regard to study hypothesis and group assignment.20 The following variables were abstracted: time of ED admission, demographics (age, weight, and sex), ethnicity category (Arab or Jew), type of fracture or dislocation, triage category, pain level and treatment, dosages of oxycodone and morphine, and time from ED registration to treatment. Triage category level is based on the Paediatric
Canadian Triage and Acuity Scale: level 1, patient requires immediate evaluation and care; level 2, patient requires evaluation and care within 15 minutes; level 3, patient requires evaluation and care within 30 minutes; level 4, patient requires evaluation and care within 60 minutes; and level 5, patient requires evaluation and care within 120 minutes. Ethnicity (Arabic or Jewish) was verified by place of residence, in addition to given name and surname.

Outcome Measures
The primary outcome measure for the study was the proportion of Arabic children versus Jewish children receiving an opioid pain medication. Secondary outcome measures included oxycodone dosage, and period of time from ED admission to oxycodone treatment.

Primary Data Analysis
The $\chi^2$ test was used to assess differences between categorical variables. The Student $t$ test was used to analyze differences in the means of continuous variables. All statistics were calculated with StatsDirect (version 2.6.6; StatsDirect Limited, Cheshire, UK).

RESULTS
Characteristics of Study Subjects
Twelve thousand five hundred twenty-eight patients aged 3 to 15 years and with orthopedic injuries were triaged by the ED nursing staff between January 1, 2011, and October 31, 2014. Of this cohort, 3,838 patients had a limb fracture or dislocation. Of the 3,782 patients with identified ethnicity, 1,245 were Arabs and 2,537 were Jews (Figure 1). Of these, 315 Arabic patients and 543 Jewish

Figure 1. Study flow chart. PED, Pediatric emergency department; RHCC, Rambam Health Care Campus.
patients had a pain score of 7 to 10. Demographic characteristics, injury type distribution, pain scores, and opioid management are presented in Table 1.

The distribution of the 2 ethnic groups remained unchanged throughout the nearly 4-year study period, including during the 11 weeks of the 2014 Israeli-Palestinian armed conflict in Gaza and southern Israel. To compare pain treatment with and without armed conflict occurring, the 2014 weekly distribution of patients is presented in Figure 2.

The proportion of Arabic and Jewish children with pain score of 7 to 10 who received opioid therapy was 312 of 315 (99.05%) and 538 of 543 (99.08%), respectively (difference 0.03%; 95% confidence interval [CI] −0.13% to 0.19%).

Patients who received opioids were managed by 17 triage nurses, 12 Jewish and 5 Arabic. Of the 315 Arabic children with pain scores of 7 to 10, 99 were approached by Arabic nurses (31.4%), and 98 of those received opioids (98.9%); 216 were approached by Jewish nurses (68.6%), and 214 of those received opioids (99%). Of the 543 Jewish children with pain scores of 7 to 10, 351 were approached by Jewish nurses (64.6%), and 348 of those received opioids (98.9%); 192 were approached by Arab nurses (35.4%), and 190 of those received opioids (98.9%).

Twenty-four Arabic children and 36 Jewish children were treated with morphine. Two hundred eighty-eight Arabic children and 502 Jewish children were treated with oxycodone. Demographic characteristics, triage category, and pain scores of the 2 groups are presented in Table 2.

During the 2014 11-week Israeli-Palestinian armed conflict, 232 children with fractures visited the ED, 87 Arabs and 145 Jews, of whom 16 and 27 had pain scores of 7 to 10, respectively. The proportion of Arabic and Jewish children who received opioid medication was 16 of 16 (100%) and 26 of 27 (96%), respectively (difference 4%; 95% CI −16% to 18%).

Arabic and Jewish children had a mean oxycodone dosage of 0.22 mg/kg (SD 0.09 mg/kg) and 0.23 mg/kg (SD 0.1 mg/kg), respectively (95% CI between means −0.05 to 0.16). Arabic and Jewish children had a mean period from ED admission to oxycodone treatment of 25.9 minutes (SD 17.3 minutes) and 29.2 minutes (SD 21.2 minutes), respectively (95% CI between means −2.2 to 8.7).

LIMITATIONS

Our study has limitations inherent in a retrospective chart review, including dependence on the quality of documentation. Because the information extracted from the medical records was objective, we believe that this factor had minimal effect because it was not subjected to abstracter bias. This was a single-center study; therefore, conclusions of this study may not apply to other EDs in Israel. Ethnic disparities or the lack thereof for Arab and Jewish children in Israel may not be reflective of other ethnicities or regions.

DISCUSSION

This study found that the 2 cohorts, Arabic and Jewish children, had similar levels of pain at triage and that similar proportions of children with pain scores of 7 to 10 were treated with opioids as per our written nurse-driven protocol.
These findings suggest that Arabic and Jewish children had the same likelihood of receiving opioid analgesia. The 2 cohorts were treated with similar doses of oxycodone and had similar waiting times from ED admission to oxycodone treatment. Patient-nurse concordance analysis suggests that having a nurse of the same ethnicity did not influence the rate of analgesia. These findings provide support that there were no differences in nurses’ treatment between the 2 ethnic groups.

Differences in analgesia administration were also not found during the 11 weeks of the 2014 Israeli-Palestinian armed conflict (June 12, 2014, to August 26, 2014). This finding suggests that nearby regional conflicts involving corresponding coethnicities have no influence on pain management in this ED.

Study findings suggest that the similarity in pain management between the 2 ethnic groups is the result of successful adherence to our nurse-driven pain protocol. We believe that this adherence reflects the professionalism of the nursing staff. Triage nurses in this department receive ongoing education on pain assessment and management. This education may contribute to improving and maintaining knowledge. It includes courses that involve human patient simulation, as well as inhouse workshops and refresher courses throughout the year. Strategies of one-on-one coaching and audit with structured feedback, designed to improve protocol implementation, are used regularly by the nursing staff and improve the management of pain in triage. Another important possible explanation for our findings is the organizational culture of the institution (Rambam Health Care Campus). Its vision of “placing people at the heart of every medical endeavor” may encourage nurses to strive for a shared vision of social equality.

The results of our study differ from data in the literature. In Israel, a single-center study on labor pain found that despite the fact that Jewish and Arabic women reported similar levels of pain during delivery and postdelivery, the medical staff that consisted of only Jewish ethnicity interpreted the Arabic women’s pain as less intense. This adult study was conducted in a different clinical setting, and a nurse-driven pain protocol was not used.

A recent study from the United States investigated 27,183 children who were admitted to EDs because of “potentially painful conditions.” This study reported that the variables of black race and being treated in hospitals with a high proportion of black patients were independently associated with lower odds of opioid use.

In summary, during the nearly 4-year study period there were no differences in opioids administration between Arabic and Jewish children who visited the pediatric ED because of a limb fracture or dislocation. Findings suggest that ethnic differences, including during periods of conflicts, have no effect on opioid analgesia in this ED. Further research is needed to generalize findings on a national level.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Oxycodone</th>
<th>Morphine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Arabic Children</td>
<td>Jewish Children</td>
</tr>
<tr>
<td>N</td>
<td>288</td>
<td>502</td>
</tr>
<tr>
<td>Age, mean (SD), y</td>
<td>9.72 (3.5)</td>
<td>9.56 (4.2)</td>
</tr>
<tr>
<td>Male patients (%)</td>
<td>204 (71)</td>
<td>343 (68)</td>
</tr>
<tr>
<td>Triage category, median (IQR)*</td>
<td>3 (1-5)</td>
<td>3 (1-5)</td>
</tr>
<tr>
<td>Pain score, mean (SD)</td>
<td>7.8 (2.2)</td>
<td>7.7 (2.1)</td>
</tr>
</tbody>
</table>

*IQR, Interquartile range.

*Paediatric Canadian Triage and Acuity Scale: level 1, patient requires immediate evaluation and care; level 2, patient requires evaluation and care within 15 minutes; level 3, patient requires evaluation and care within 30 minutes; level 4, patient requires evaluation and care within 60 minutes; and level 5, patient requires evaluation and care within 120 minutes.
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Author contributions: IS and ME conceived the idea for the study. IS designed the study, performed the statistical analysis, and drafted the article. EB and DS collected the data. IS, EB, IPS, and ME contributed to interpretation of the study results. CS coordinated and supervised data collection. All authors approved the final article and agree to be accountable for all aspects of the work. IS takes responsibility for the paper as a whole.

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REFERENCES

APPENDIX E1
Protocol for pain assessment and management in triage

**PAIN ASSESSMENT**
Wong Baker FACES Scale: 3-7 year olds
Visual Analog Scale: 8-15 year olds

<table>
<thead>
<tr>
<th>Pain score 1-2</th>
<th>Pain score 3-4</th>
<th>Pain score 5-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>No treatment or Paracetamol 15 mg/kg</td>
<td>Paracetamol 15 mg/kg</td>
<td>Dyprone 15 mg/kg</td>
</tr>
<tr>
<td></td>
<td>Ibuprofen 5 mg/kg</td>
<td>Ibuprofen 10 mg/kg</td>
</tr>
</tbody>
</table>

**Pain score 7-10**

- IV Morphine 0.1 mg/kg
- Oxycodone 0.2 mg/kg