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The Effect of Ethnicity on Extremity Fracture Analgesia in Native American Patients at a Regional Children's Hospital

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ABSTRACT

Objectives: To determine whether pediatric Native American patients with long bone fractures are as likely to receive adequate analgesia as non-Native Americans with similar fractures at a regional academic hospital in the Southwest.

Patients and Methods: Charts of 61 Native Americans and 121 non-Native American patients ages 2 months to 15 years discharged from the pediatric emergency department (PED) or the pediatric urgent care (PUC) with long-bone fractures between June 2005 and May 2007 were reviewed. Insurance status, either Indian Health Service or exempt Medicaid, indicated Native American ethnicity. Potential confounders: age, language, gender, need for fracture reduction, previous analgesia, fracture location, and site of treatment were abstracted.

Age, language, gender, pain score, and duration of analgesia at discharge were analyzed. Dose adequacy (mg/kg) and the likelihoods of receiving any analgesia or narcotic analgesia were calculated. Univariate analysis was performed to assess potential confounding variables on the likelihood of receiving analgesia; multivariate analysis was performed to control for variables shown to have an effect.

Results: Neither demographic data nor pain scores differed significantly between the two groups. 61% of Native Americans and 65% of non-Native Americans received analgesia ($p=0.53$). Native Americans were as likely to receive narcotic analgesia ($p=0.24$) and to receive an adequate dose as non-Native Americans ($p=0.24$). Age, language, and gender correlated with the likelihood of receiving analgesia. Pain score did not correlate ($p=0.09$).

Conclusions: Native American ethnicity did not affect quality of analgesia care in this multi-ethnic hospital.

Key words: analgesia, Native Americans, pediatric

INTRODUCTION

Current literature suggests that patients belonging to racial minorities may be at risk of oligoanalgesia when presenting in emergency departments with isolated long bone fractures.[1, 2] Adult Hispanic patients with isolated long bone fractures in at the UCLA Emergency Medicine Center in 1993 were less likely than their white counterparts to receive any analgesia.[1] A similar study at Emory University Emergency Department (ED) in Atlanta, GA in 2000 reported that adult black patients with isolated long bone fractures were less likely than white patients with similar fractures to receive analgesia.[2] In contrast no differences in analgesia administration to Hispanic, African American, and non-Hispanic white patients presenting with isolated long bone fractures to the ED at San Francisco General Hospital were reported.[3]

Most of the current literature examines the adult patient population, and may not be applicable to the pediatric population. Pediatric patients, especially those under the age of two years, have been reported to be less likely to receive narcotic analgesia[4, 7], and general emergency medicine physicians have been reported to prescribe analgesics more frequently than pediatric emergency medicine physicians.[5] In spite of this, the literature on pediatric analgesia is limited, and there has been only one study of analgesia for isolated long bone fractures in the pediatric patient population.[6] This study used ED data from the National Hospital Ambulatory Medical Care Survey to compare analgesia prescribed for patients age 18 years or younger presenting with isolated long bone fractures. This study focused on black, Hispanic white, and non-Hispanic whites and reported that race and ethnicity did not affect the likelihood of receiving any analgesia medication or of receiving narcotic analgesia. Very little data is available regarding narcotic or non-narcotic analgesia in the Native American patient population, and none is available regarding analgesia for long bone fractures in pediatric Native American patients.

The purpose of this study was to determine the likelihood of pediatric Native American patients with isolated extremity fractures receiving analgesia or narcotic analgesia compared to non-Native American patients at a multi-ethnic regional academic hospital. This study also compared pain scores of Native American and non-Native American patients and emergent versus urgent clinical settings.

PATIENTS AND METHODS

Data Collection

A retrospective cohort study was conducted at the Children's Hospital of New Mexico (NM). 182 Pediatric Emergency Department (PED) and Pediatric Urgent Care (PUC) records from June 1, 2005 to May 31, 2007 were reviewed to identify all patients discharged from the PED or PUC with a diagnosis of isolated extremity fracture. Patients with *International Classification of Diseases Ninth Revision* (ICD-9) codes representing extremity fractures were eligible for the study (see table 1), and charts were pulled based on these codes. Exclusion criteria included previously seen patients, the presence of multiple fractures, patients presenting directly to the trauma room, and patients lacking radiographic confirmation of the fracture.

Data abstracted from charts included radiographic confirmation of the fracture, insurance status, location of treatment (PED or PUC), preferred language, age, gender, pain score, whether any previous analgesia was given, location of fracture (upper or lower extremity), need for fracture reduction, type and dose of analgesic administration in the PED or PUC, type and dose of analgesic prescribed at discharge, and duration of analgesia prescribed at discharge. Insurance status was used as a proxy for Native American ethnicity and is a reliable predictor of ethnicity due to the fact that all Native American patients presenting to the PED or PUC are covered under Indian Health Services (IHS)

insurance or exempt Medicaid (personal communication with PED clerks and billing office). Language was characterized as either English speaking or non-English speaking. Non-English speaking patients were expected to be primarily Hispanic, but this was not used as a proxy for Hispanic ethnicity because of the number of English-speaking Hispanic patients who are seen in the ED. Pain score, on a scale from one to ten, was recored, using either the Numeric Rating Scale (McCaffery, M., & Beebe, A. (1993). Pain: Clinical Manual for Nursing Practice. Baltimore: V.V. Mosby Company) or Wong-Baker Faces (Wong, D. and Whaley, L. (1986). Clinical handbook of pediatric nursing, ed., 2, p. 373. St. Louis: C.V. Mosby Company). The need for fracture reduction was used as an indicator of more painful fractures. Analgesic administration was noted as narcotic or non-narcotic. Analgesic dose was recorded in mg/kg and compared to standard doses (see table 2); if a dose was equal to or greater than the standard dose it was considered adequate.

This study was reviewed and approved by the University of New Mexico Health Sciences Center Human Subjects Research Review Committee.

Statistical Analysis

Our estimated sample size of 182 patient charts, including 61 Native Americans and 121 non-Native Americans produced a two-tailed study with 80% power and 5% type one error. We assumed that the rate of no analgesia in non-Native American patients would be 20%. This is the estimate used in the study that reported a lack of association between patient ethnicity and analgesia.[3] We also assumed that Native Americans would have a relative risk for no analgesia of approximately 2.0. This estimate is based on previous studies that showed that both Hispanics and African Americans had relative risks of no analgesia of approximately 2.0.[1,2]

Data abstracted from charts were placed in an Excel (Microsoft Corp., Redmond, WA) spreadsheet and then analyzed by SAS version 9.1 (SAS Institute, Cary, NC) for the univariate analyses; the multivariate analyses were done using binomial regression in STATA version 9 (StataCorp LP, College Station, TX).

Demographic data, including language, age, and gender were compared between groups using Chi-Square and t-test. Pain scores were compared using the Wilcoxan Signed Rank test.

The frequencies of receiving the following: 1) narcotic and non-narcotic analgesia 2) an adequate dose of analgesia, 3) a prescription for narcotic or non-narcotic analgesia at discharge and, 4) an adequate dose of analgesia at discharge, were compared in Native Americans versus non-Native Americans seen at any location using the Chi-Square test. The duration of analgesia prescribed to the two groups at discharge was compared using the Wilcoxan Signed Rank test.

As our study included patients seen at two locations, we used the Chi-Square test to compare the frequencies of receiving any analgesia, narcotic analgesia, and an adequate dose of analgesia in the PED versus the PUC.

Univariate analysis was used to study the likelihood of receiving analgesia and the associations of ethnicity, location of treatment, language, age, gender, pain score, whether any previous analgesia was given, location of fracture, and need for fracture reduction on receiving analgesia. Subsequently a multivariate model with the primary variable as ethnicity adjusted for those variables shown to be associated with receiving analgesia enabled us to calculate a corrected difference between the percentage of Native Americans and non-Native Americans who received analgesia.

RESULTS

Data from 182 pediatric patient charts was included in this study, including 121 (66.9%) non-Native Americans and 61 (33.7%) Native Americans seen at either the PED or PUC. The characteristics of these patients are reported in table 3.

Demographic data, including, age, language, and gender, was similar between the Native Americans and non-Native Americans (table 4). The mean pain score of Native American patients was 6.4 on a scale of 0-10, with a standard deviation of 3.0 while that of non-Native Americans was 6.4, with a standard deviation of 2.9 (p=0.82).

In the PED or PUC, 60.7% (37/61) of Native American patients received some type of analgesia, compared with 65.3% (79/121) of non-Native American patients (p=0.54). Of those patients that received any analgesia, 86.5% (32/37) of Native Americans received some type of narcotic analgesia, as did 77.2% (61/79) of non-Native Americans (p=0.24). Rates of receiving an adequate dose of analgesia were similar between the two groups, with 89.2% (33/37)of Native American patients and 83.5% (66/79) of non-Native American patients receiving an adequate dose of analgesia (p=0.24).

At discharge, 55.2% (32/61) of Native American and 51.3% (58/121) of non-Native American patients were prescribed analgesia (p=0.63). Of patients that were prescribed analgesia at discharge, 80.7% (25/32) of Native Americans and 75.9% (44/58) of non-Native Americans were prescribed some type of narcotic analgesia (p=0.61). 65.6% (21/32) of Native American and 69.0% (40/58) of non-Native American patients were prescribed an adequate dose of analgesia at discharge (p=0.73). The mean duration of the prescription for analgesia at discharge given to Native American patients was 103 hours, with a standard deviation of 85 hours while that for non-Native Americans was 106 hours with a standard deviation of 95 hours (p=0.84).

As shown in table 5, 77.5% (93/120) of patients seen in the PED, regardless of ethnicity, received some type of analgesia, compared to 37.1% (23/62) of those seen in the PUC (p<0.0001). Of those patients, regardless of ethnicity, who received some type of analgesia, 90.3% (84/93) of PED patients received narcotic analgesia, compared to 39.1% (9/23) of PUC patients (p=0.0001). 83.9% (78/120) of PED and 91.3% (21/23) of PUC patients received an adequate dose of analgesia (p=0.42).

Results of univariate analysis are shown in table 6. The factors found to be associated with risk of receiving less analgesia were female gender (p=0.001), fractures not requiring reduction (p<0.001), receiving care in the PUC (p>0.001), and a lower mean age (p=0.02). Ethnicity, language, previous analgesia, location of fracture, and pain score did not affect the likelihood of receiving analgesia. The percentage of Native American patients receiving analgesia was 4.6% lower (95% confidence interval -19.5%, 10.3%) than the percentage of non-Native Americans receiving analgesia.

The multivariate analysis adjusting for gender, fracture reduction, and age, corrected the difference between non-Native Americans and Native Americans receiving analgesia from -4.6% to -2.7% (95% confidence interval -15.6%, 10.3%).

DISCUSSION

The demographic data were very similar, with both groups in our study being similar in age, sex, and language, all previously shown oligoanalgesia risk factors. Non-Native American patients were slightly less likely to speak English, which is likely due to our significant Spanish-speaking population.

The results of this study suggest that Native American pediatric patients are not at risk for receiving

inadequate analgesia when treated at an academic regional hospital in a multicultural area accustomed to encountering Native American patients. Our results support those which found no association between ethnicity and analgesia, although Native Americans were not specifically addressed.[3] This is a favorable finding given that minorities have been shown to be less likely to receive analgesia than non-minorities.[1,2] Some view Native Americans as a more stoic culture, however our results suggest that Native Americans report similar pain scores for their fractures when compared with non-Native Americans. These findings are in opposition to those previously reporting the pain score in adult patients varied significantly with ethnicity, including Native American ethnicity.[8]

This study also examined previously identified risk factors for oligoanalgesia: gender and age.[9, 10, 11] Adult data comparing prehospital analgesia among men and women are conflicting and adult female patients with painful conditions treated in the emergency department have been reported to receive more analgesia than men.[9,10,11] Our results lend evidence to the argument that female patients are at continued risk of oligoanalgesia, regardless of ethnicity

Other studies have shown younger patients to be at risk of oligoanalgesia.[4,7] Children under five years of age are reported to be less likely to receive analgesia for isolated extremity burns and injuries than their older counterparts at an Australian emergency department.[12] Our results support other current literature in identifying young age as a risk factor associated with oligoanalgesia.

While not statistically significant in our study, the ability to speak English was weakly associated with a decreased likelihood of receiving analgesia. Language was solely categorized as either English speaking or non-English speaking, and we did not take into account fluency or proficiency in English, or whether it was a second language. It is possible that a more detailed assessment of language might change our data in this area. A previous study reported that patients who did not designate English as their first language were more likely to experience at least a 50% reduction in their visual analog pain score than those whose first language was English.[8]

The strongest association with oligoanalgesia was location of treatment. Those patients seen in the PUC were much less likely to receive any analgesia or narcotic analgesia than those seen in the PED. This may be partly due to the fact that patients with fractures requiring reductions were both more likely to be treated in the ED and to receive analgesia and narcotic analgesia. Fracture reduction was related to location of treatment, with 88% of patients with fracture reductions treated in the PED. Of the fractures requiring reduction, 87.9% were seen in the PED. In order to better understand the apparent risk of oligoanalgesia associated with receiving treatment in the PUC, we controlled for the effect of fracture reduction, as well as age and gender, which were both associated with a higher incidence of fracture reductions. After controlling for age, gender, and fracture reduction, PED patients were 1.8 times as likely to receive analgesia than PUC patients (95% confidence interval 1.3, 2.5), leaving an unexplained association between oligoanesthesia and PUC treatment which has been poorly studied, and representing an area where future study should focus.

In our study, pain score did not appear to affect the likelihood of receiving analgesia, a finding which is in agreement with other published studies.[8] The effect of pain score on likelihood of receiving analgesia has been reported to be statistically, but not clinically, significant with only a small difference in pain score between patients who received analgesia and those who did not.[8] A separate study reported that emergency providers did not primarily base their decisions about pain management of suspected long-bone fractures on patient self-reported of pain, and speculated that this practice might contribute to oligoanalgesia.[13]

Lastly, our study showed that the majority of analgesics, both narcotic and non-narcotic were dosed correctly, regardless of patient ethnicity or location of treatment. This is an important finding given that under dosing of narcotic analgesia has been prevalent historically, and that a more recent study showed the average dose of acetaminophen given to pediatric patients in a PED to be only 67% of the optimal dose.[14,15]

CONCLUSIONS

Our study suggests that Native American ethnicity may not be a risk factor for oligoanesthesia, however the literature on Native Americans remains sparse. We have identified age, gender, and language as continued risks for oligoanesthesia, suggesting that more work needs to be done in this area in order to decrease oligoaneshesia. Treatment in an urgent care setting is a newly identified risk for oligoanesthesia and this association should be studied further.

COMMENT

Although we had sufficient numbers with respect to our power calculation, this is a small study, and conclusions should be tested by more and larger studies. We conducted our study at the University of New Mexico Children's Hospital in Albuquerque, New Mexico.

Our hospital may be unique in its' location and patient population in that approximately one-third of our patients are Native American, which may change the way Native Americans are treated compared to their non-Native American counterparts. Thus, the ability to generalize the findings from this study to other pediatric or general emergency departments who lack Native American patients may be limited.

Our study compared a minority population, Native Americans to a non-Native American population that was largely Hispanic. Since Hispanics are themselves a minority, our study may be skewed by comparing a minority population to another population, which itself has a significant, but separate minority component.

ICD-9 code	*Corresponding fracture of*
812.2	Humerus, shaft or unspecified part, closed
812.4	Humerus, lower end, closed
813.0	Radius and/or ulna, upper end, closed
813.2	Radius and/or ulna, shaft, closed
813.4	Radius and/or ulna, lower end, closed
813.8	Radius and/or ulna, unspecified part, closed
814.0	Carpal bone(s), unspecified, closed
815.0	Metacarpal bone(s), unspecified, closed
823.0	Tibia and/or fibula, upper end, closed
823.2	Tibia and/or fibula, shaft, closed
823.8	Tibia and/or fibula, unspecified part, closed
824.0	Medial malleolus, closed
824.2	Lateral malleolus, closed
824.4	Bimalleolar, closed
824.6	Trimalleolar, closed
825.0	Calcaneus, closed
825.2	Other tarsal and metatarsal bones, closed

Table 1 *ICD-9 codes included in the study*.

Analgesia name	*Dose range considered to be adequate*
Ibuprofen	4-10 mg/kg
Acetaminophen with codeine	0.5-1 mg codeine/kg
Acetaminophen with hydrocodone	0.5-1 mg hydrocodone/kg
Acetaminophen with oxycodone	5-10 mg oxycodone[1]
Fentanyl	1-2 mcg/kg

Table 2 Adequate doses of analgesia. Taken from: Green SM, ed in chief, *Tarascon Pocket Pharmacopoeia: 2005 Classic Shirt-Pocket Edition.* Lompoc, CA: Tarascon Publishing;2005.
[1]Used in children and teens able to take typical adult doses.

Characteristic	*Number (%)*
Native American	61 (33.7)
Non-Native American	121 (66.9)
English-speaking	157 (86.7)
Male	119 (65.7)
Fractures requiring reductions	66 (36.5)
Previous analgesia	24 (13.3)
Lower extremity fracture	29 (16.0)
Upper extremity fracture	153 (84.5)
Seen in PED	120 (66.3)
Seen in PUC	62(34.3)
Mean age (years)	7.76
Received analgesia in PED or PUC	116 (64.1)
Received narcotic analgesia	93 (51.2)
Pain score recored	145 (90.1)
Mean pain score (of 10)	6.43

Table 3 Study population characteristics

Characteristic	*Native Americans*	*Non-Native Americans*	*P value*
Mean age in yrs (SD)	7.1 (3.8)	8.1 (3.9)	0.11
English-speaking (percentage)	57 (93.4)	100 (82.6)	0.05
Male (percentage)	37 (60.7)	82 (67.8)	0.34
Pain score[1] (SD)	6.4 (3.0)	6.4 (2.9)	0.82
Received any analgesia in PED/PUC (percentage)	37 (60.7)	79 (65.3)	0.54
Received narcotic analgesia in PED/PUC (percentage)	32 (86.5)	61 (77.2)	0.24
Received adequate dose in PED/PUC (percentage)	33 (89.2)	66 (83.5)	0.24
Prescribed any analgesia at D/C (percentage)	32 (55.2)	58 (51.3)	0.63
Prescribed narcotic analgesia at D/C (percentage)	25 (80.7)	44 (75.9)	0.61
Prescribed adequate dose of analgesia at d/c (percentage)	21 (65.6)	40 (69.0)	0.73
Mean duration of analgesia at D/C in hours (SD)	103.0 (85.0)	106.1 (94.9)	0.84

Table 4 Study population characteristics by ethnicity
Abbreviations: SD, standard deviation; D/C, discharge
[1] Pain score reported on a scale from 0-10

	PED	*PUC*	*P value*
Number of patients receiving any analgesia (percentage)	93 (77.5)	23 (37.1)	<0.0001
Number of patients receiving narcotic analgesia given (percentage)	84 (90.3)	9 (39.1)	<0.0001
Number of patients receiving an adequate dose of analgesia (percentage)	78 (84.8)	21 (91.3)	0.42

Table 5 Analgesia use by location

Variable	***N***	***Received analgesia N (%)***	***No analgesia N (%)***	***P-value***
Native American	61	37 (61%)	24 (39%)	0.54
Non-Native American	121	79 (65%)	42 (35%)	
English speaking	157	96 (61%)	61 (39%)	0.07
Non-English speaking	25	20 (80%)	5 (20%)	
Female	63	30 (48%)	33 (52%)	0.001
Male	119	86 (72%)	33 (28%)	
Fracture reduced	66	55 (83%)	11 (17%)	<0.001
Not reduced	116	61 (53%)	55 (47%)	
PED	120	93 (78%)	27 (22%)	<0.001
PUC	62	23 (37%)	39 (63%)	
Previous analgesia	24	15 (62%)	9 (38%)	0.89
No previous analgesia	158	101 (64%)	57 (36%)	
Lower extremity fracture	29	19 (66%)	10 (34%)	0.83
Upper extremity	153	97 (63%)	56 (37%)	
Mean pain score out of 10 (SD)		6.8 (2.8)	5.8 (3.1)	0.09
Mean age in years (SD)		8.3 (3.8)	6.8 (4.0)	0.02

Table 6 Results of univariate analysis
Abbreviation: N, number; SD, standard deviation

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