

Original Research

Examining Racial, Ethnic, and Gender Disparities in the Treatment of Pain and Injury Emergencies

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Abstract

Background

Racial, ethnic, and gender disparities in effective pain management have been well-documented across healthcare settings. However, discrepancies in the treatment of patients in prehospital pain management settings have not been well researched. The objective of this study was to determine whether Wyoming emergency medical service (EMS) providers' use of opioids to treat prehospital pain or injury varies by patient race/ethnicity or gender.

Methods

This cross-sectional study of EMS records examined 27 448 patient care reports (PCRs) generated during emergency medical responses to pain/injury emergencies in the state of Wyoming between January 2016 and March 2019. We included PCRs in the sample when 1) the primary impression was pain or injury, 2) the type of service was a 911 response, 3) the patient received treatment from and was transported by the EMS unit completing the PCR, and 4) the responding unit included one or more providers authorized to administer opioids.

Results

The analysis identified a disparity in opioid administration by EMS providers during emergency transport (N = 27 448). Logistic regression reveals that EMS providers administered opioids to American Indian/Alaska Native patients (AI/AN) [n = 1610; 5.9%; $P < .001$; OR = 0.44] and those of Hispanic ethnicity (n = 1351; 4.9%; $P = .001$; OR = 0.74) at statistically significant lower rates (n = 14 769; 53.8%; $P = .004$; OR = 0.90) than they administer opioids to White patients. The analysis found EMS providers administer opioids to females at significantly lower rates ($P = .004$) compared to males.

Conclusion

Wyoming EMS providers administer opioids to White and male patients more often than non-White and female patients. Our results do not show a significant difference in the administration of opioids between White to Black patients. However, the data indicate a statistically significant difference between Hispanic, AI/AN, and White patients as well as between male and female patients.

Keywords

healthcare disparities; pain management; emergency medical services (EMS); opioids; opioid analgesics; prehospital pain management

Introduction

Pain is undertreated across medical settings and patient populations.^{1,2} Studies confirm racial, ethnic, and gender disparities in pain management across healthcare settings,³ including hospital emergency rooms, chronic pain treat-

ment centers, and Veteran's Administration hospitals.^{3,4} Poor pain management has substantial consequences for patients, including reduced quality of life, impaired sleep, impaired physical function, and the economic burden of seeking remedies for pain relief.⁵ Pain relief

in prehospital settings should be a priority in prehospital care. Policymakers and the medical community have increasingly scrutinized the use of opioids to treat pain amid the ongoing opioid epidemic. The objective of this study was to determine whether emergency medical service (EMS) providers' use of opioids to treat prehospital pain or injury varies by patient race/ethnicity or gender. We hypothesized that EMS providers administer opioids to White and male patients more often than non-White and female patients.

Methods

Study Oversight and Data Collection

The University of Wyoming Institutional Review Board reviewed and approved this study (Protocol #20190701LW02457). To test our hypothesis, we conducted a cross-sectional study of EMS records generated during emergency medical responses to pain/injury emergencies in the state of Wyoming between January 2016 and March 2019. In 2016, the Wyoming Office of Emergency Medical Services (OEMS) transitioned from the NEMSIS 2.2 data dictionary to NEMSIS 3.4. OEMS provided researchers with data from the Wyoming Ambulance Trip Reporting System (WATRS), an electronic patient care reporting system (ePCR) that stores patient care reports (PCRs). These reports, submitted by EMS providers, include demographic data on the patient (eg, race/ethnicity, gender, vital signs), the EMS response (eg, time of dispatch and arrival, location of pain or injury on the body, and type of service call), and treatment provided (eg, medication administered).

Study Design and Participant Inclusion Criteria

We analyzed PCRs submitted by EMS providers between January 2016 and March 2019 to determine the association between patient race/ethnicity and gender and EMS providers' use of opioids to treat pain in prehospital emergencies. We limited our study to incidents where the EMS provider's primary impression was pain or injury. A primary impression is the EMS provider's characterization of the most significant condition or problem leading to patient treatment. We included PCRs in the sample when 1) the primary impression was pain or injury, 2) the type of service was a 911 response,

3) the patient received treatment from and was transported by the EMS unit completing the PCR, and 4) the responding unit included one or more providers authorized to administer opioids.

Variables

Outcome (Dependent) Variable

EMS providers administered 4 different opioids to patients in the sample (fentanyl, morphine, hydrocodone, and tramadol). The outcome variable was opioid administration where 1 = opioids administered and 0 = no opioids administered.

Independent Variables

We collapsed the independent variable race/ethnicity into 5 categories: Black, Hispanic, American Indian/Alaska Native (AI/AN), White, and Other. We combined Asian, Native Hawaiian, Other Pacific Islander, More Than One Race, and Other Race into a single category, Other Race, due to the small sample size. EMS providers reported gender using 3 categories: male, female, and unknown.

Control Variables

To isolate the effect of race/ethnicity and gender on the likelihood of opioid administration (dependent variable), the analysis included 5 control variables in our regression model: 1) age of the patient (collapsed into 6 categories: under 5, 5 to 17, 18 to 24, 25 to 44, 45 to 64, and 65+), 2) the amount of time the EMS provider spent with the patient (the number of minutes from the time the provider first arrived at the patient's side to the time the patient arrived at the healthcare facility), 3) the location of the pain or injury on the body (chronic pain, extremities, head/neck, spine/back, torso, or unspecified), 4) whether the EMS provider was likely able to observe the pain and injury (observable, not observable, unlikely, or unknown) as categorized by OEMS, and 5) the patient's self-reported pain score. EMS providers recorded the patient's self-reported pain severity using a Numerical Rating Scale (NRS) that measures pain on a scale from 0 to 10, (0 = no pain and 10 = severe pain). We categorized NRS pain scores into 5 categories (no score; no pain, 0; mild, 1-3; moderate, 4-6; and severe, 7-10).

The data included 42 unique primary impressions (30 for injury and 12 for pain). The major-

Table 1: Demographics and PCR Characteristics

		n	%
Opioids	No	21 889	79.7
	Yes	5559	20.3
Age	Under 5	151	0.6
	5 to 17	1473	5.4
	18 to 24	2071	7.5
	25 to 44	5856	21.3
	45 to 64	7386	26.9
	65+	10 511	38.3
Gender	Male	12 660	46.1
	Female	14 769	53.8
	Unknown	19	0.1
Race/Ethnicity	Black	459	1.7
	Hispanic	1351	4.9
	AI/AN	1610	5.9
	Other	2606	9.5
	White	21 422	78.0
Primary impression	Pain	15 568	56.7
	Injury	11 880	43.3
Location of body pain or injury	Chronic	705	2.6
	Extremities	5068	18.5
	Head/Neck	5508	20.1
	Spine/Back	361	1.3
	Torso	8868	32.3
	Unspecified	6938	25.3
Observability of pain or injury	Not observable	17 990	65.5
	Observable	3052	11.1
	Unknown	6239	22.7
	Unlikely	167	0.6
Pain score	No score	11 960	43.6
	No pain (0)	855	3.1
	Mild (1-3)	1643	6.0
	Moderate (4-6)	3263	11.9
	Severe (7-10)	9727	35.4

ity identified the specific location of the injury or pain on the patient’s body (eg, injury-elbow, pain-eye). We used the *ICD-10-CM Injury Diagnosis Matrix* to assign each primary impression to a general body location.⁶ The matrix organizes injury diagnosis to groupings on body regions. For example, the matrix locates “injury-elbow” on the extremities and locates “pain-eye” on the head/neck. The resulting variable included 4 body locations (extremities, head/

neck, spine/back, and torso). We categorized chronic pain (a primary impression included in the sample) as “chronic”. We categorized unspecified pain as “unspecified.”

Each of the 42 primary impressions was categorized by OEMS into four categories: 1) observable, 2) not observable, 3) may or may not be observable, and 4) not observable, but may have an associated observable injury.

Statistical Analysis

We began our analysis by calculating descriptive statistics including frequencies, percentages, and cross-tabulations. We conducted a binary logistic regression analysis to evaluate the relationship between race/ethnicity and gender and the EMS providers' use of opioids to treat pain during pain and injury emergencies. We controlled for patient age, the number of minutes the EMS provider spent with the patient, the location of the pain or injury on the body, the observability of the pain or injury, and the reported pain score to isolate the effects of race, ethnicity, and gender.⁷⁻⁹ We assessed for multicollinearity using tolerance and Variance Inflation Factors (VIF) and detected none. We completed the analysis using Microsoft Access, SPSS Version 25, and STATA 16.

Results

Sample Population

Our sample included 27 448 PCRs that met the study inclusion criteria and had complete demographic information. The sample included 21 422 White (78%) patients and 14 769 females (54%). Almost two-thirds, 65% ($n = 17\,897$ patients), were age 45 or older. The mean age was 54.6 ($SD \pm 23.6$). Nearly one-third, 32% ($n = 8868$), of PCRs were for pain or injury to the torso (eg, abdomen, genitals, or non-cardiac chest). The majority, 66% ($n = 17\,990$ patients), did not display observable pain or injury (eg, pain-eye, pain-tooth, or injury-upper back). **Table 1** presents demographics and other PCR characteristics.

Opioid Administration and Race/Ethnicity and Gender

EMS providers did not use opioids to treat the majority (80%; $n = 21\,889$) of patients in the sample. Of the 21 422 White patients treated with opioids, 22% ($n = 4610$) received opioids compared to only 192 (12%) of AI/AN patients and 16% ($n = 211$) of Hispanic patients (Table 2). The logistic regression model reveals that EMS providers administer opioids to AI/AN ($P < .001$; OR = 0.44) and those of Hispanic ethnicity ($P = .001$; OR = 0.74) at statistically significant lower rates than they administer opioids to White patients (**Table 3**). We found no significant differences in the rate of opioid administration to Black or Other Race patients com-

pared to White patients. The analysis found EMS providers administer opioids to females at significantly lower rates ($P = .004$; OR = 0.90) compared to males (**Table 3**). We found no significant difference in the rate of opioid administration to patients of unknown gender.

Discussion

This study supports, in part, our hypothesis that EMS providers administer opioids to White and male patients more often than to non-White and female patients. Some of our results are consistent with previous research showing the disparate administration of opioids during pain and injury emergencies based on race/ethnicity and gender. For example, a review of 2012-2014 National Emergency Medical Services Information System (NEMSIS) data found that pre-hospital providers are less likely to treat Black patients who experience burns, penetrating injuries, or fractures with pain medication than White patients.¹⁰ Another study found providers less likely to use pain medication when treating Black and Hispanic patients experiencing blunt trauma compared to White patients.¹¹ Additionally, analysis of Oregon NEMSIS data found that Black, Asian, Other Race, and unknown race patients treated for traumatic injury or complaining of pain are less likely to receive pain medication than White patients.⁷ While our results do not show a significant difference in the administration of opioids between White and Black patients, as might be expected given the findings of prior studies, the small sample size of Black patients may have contributed to this result. The data indicate a statistically significant difference between Hispanic, AI/AN, and White patients. This difference reinforces the importance of disaggregating data on racial and ethnic groups to illuminate disparities in treatment.

A 2020 study found women regularly receive inadequate treatment for pain despite reporting more pain than their male counterparts.¹² Another study using EMS data examined the impact of several factors, including gender, ethnicity, age, and income on prehospital administration of opioids for isolated extremity injuries. The study found statistically significant differences in the proportion of men receiving opioids compared to women.¹³

Table 2: Patient Demographics and PCR Characteristics and Opioid Administration

		Opioids not given		Opioids given	
		n	%	n	%
Age	Under 5	143	94.7	8	5.3
	5 to 17	1141	77.5	332	22.5
	18 to 24	1648	79.6	423	20.4
	25 to 44	4642	79.3	1214	20.7
	45 to 64	5856	79.3	1530	20.7
	65+	8459	80.5	2052	19.5
Gender	Male	10 086	79.7	2574	20.3
	Female	11 786	79.8	2983	20.2
	Unknown	17	89.5	2	10.5
Race/Ethnicity	Black	380	82.8	79	17.2
	Hispanic	1140	84.4	211	15.6
	AI/AN	1418	88.1	192	11.9
	Other	2139	82.1	467	17.9
	White	16 812	78.5	4610	21.5
Primary impression	Pain	12 914	78.8	2654	21.2
	Injury	8975	73.6	2905	26.4
Location of body pain or injury	Chronic	624	88.5	81	11.5
	Extremities	3177	62.7	1891	37.3
	Head/Neck	5147	93.4	361	6.6
	Spine/Back	230	63.7	131	36.3
	Torso	7178	80.9	1690	19.1
	Unspecified	5533	79.7	1405	20.3
Observability of pain or injury	Not observable	14 661	81.5	3329	18.5
	Observable	2354	77.1	698	22.9
	Unknown	2139	82.1	467	17.9
	Unlikely	11 138	93.1	822	6.9
Pain score	No score	844	98.7	11	1.3
	No pain (0)	1591	96.8	52	3.2
	Mild (1-3)	2789	85.5	474	14.5
	Moderate (4-6)	5527	56.8	4200	43.2
	Severe (7-10)	12 914	78.8	2654	21.2
Total		21 889	79.7	5559	20.3

Explanations for these disparities are complex, with patient, healthcare provider, and health-care system factors all playing a role.¹⁴ Some researchers have linked the dismissal and undertreatment of pain in women to the gender stereotypes held by their healthcare providers.¹² EMS providers may hold similar beliefs and misconceptions that negatively impact the care they provide to different demographics. Modi-

fying the attitudes of EMS providers may offer opportunities for increasing the use of prehospital analgesia for these disparately affected groups.¹⁵

EMS providers practice within the broader context of the ongoing opioid crisis and may be influenced by “opioid pharmacovigilance” or the increased surveillance of opioid prescriptions

Table 3: Logistic Regression Results*

		B	P	Exp(B)	95% C.I. for Exp(B)	
	Constant	-4.285	<.001	0.014		
Location of body pain or injury	Chronic		<.001			
	Extremities	-0.683	<.001	0.505	0.388	0.658
	Head/Neck	0.879	<.001	2.409	2.098	2.767
	Spine/Back	-1.044	<.001	0.352	0.305	0.407
	Torso	0.723	<.001	2.060	1.563	2.716
	Unspecified	-0.271	<.001	0.762	0.694	0.837
Observability of pain or injury	Not observable		<.001			
	Observable	-0.350	<.001	0.705	0.597	0.833
	Unknown	0.099	.095	1.105	0.983	1.241
	Unlikely	0.259	.428	1.296	0.683	2.459
Pain score	No score		<.001			
	No pain (0)	-2.061	<.001	0.127	0.068	0.239
	Mild (1-3)	-1.379	<.001	0.252	0.181	0.350
	Moderate (4-6)	0.526	<.001	1.692	1.480	1.934
	Severe (7-10)	2.247	<.001	9.460	8.646	10.351
Time with EMS	Time in minutes	0.040	<.001	1.041	1.038	1.043
Age	Under 5		.005			
	5 to 17	1.076	.010	2.934	1.288	6.682
	18 to 24	0.860	.040	2.364	1.041	5.367
	25 to 44	0.890	.032	2.435	1.080	5.490
	45 to 64	0.819	.048	2.267	1.006	5.109
	65+	0.798	.054	2.222	0.987	5.004
Gender	Male		.013			
	Female	-0.107	.004	0.899	0.835	0.967
	Unknown	-0.647	.421	0.524	0.108	2.531
Race/Ethnicity	White		<.001			
	Black	-0.140	.336	0.869	0.654	1.156
	Other	-0.089	.169	0.914	0.805	1.039
	AI/AN	-0.819	<.001	0.441	0.366	0.531
	Hispanic	-0.297	.001	0.743	0.621	0.889

* The dependent variable in this analysis is opioid administration coded 0 = opioid analgesic administered and 1 = no opioid analgesic administered.

among clinicians treating chronic non-cancer pain.¹⁶ Previous research has demonstrated that clinicians' concerns around possible litigation and disciplinary action may cause providers to alter opioid prescribing and dispensing practices in ways that harm patients with pain management needs, especially for racial and ethnic minority populations.¹⁷ EMS providers may experience similar concerns and subsequently, reduce their administration of opioids to their

patients. If so, such hesitation in administering opioids could result in the unintended consequence of leaving pain untreated across all groups and further exacerbate the racial, ethnic, and gender disparities previously noted.

These findings indicate the need for increased EMS provider awareness of disparities in pain management practices associated with patient race/ethnicity and gender.^{23,27} In addition,

training and educational interventions directed toward healthcare providers, including implicit bias training, have shown to be effective in reducing implicit bias among other health professionals and trainees.^{28,29} EMS administrators and policymakers should develop and deliver implicit bias training tailored specifically to EMS providers to reduce implicit biases and promote equitable care for all patients.

Strengths

This study contributes to the larger discussion of prehospital pain management by EMS providers. The majority of the findings confirm previous findings regarding disparities between different gender and racial/ethnic groups within the U.S. context, specifically noting the significant differences in opioid administration for Hispanic and AI/AN patients. This nuance of disparities beyond the White/non-White binary contributes to the complexity of how race/ethnicity and gender affect health outcomes. This study specifically examined the use of opioids in prehospital pain management, which is vital as the country continues to address the opioid epidemic and the acceptability of opioid use for acute pain management. EMS providers may be aware of the heightened concerns with using opioids as pain management tools and may be cautious to avoid contributing to the opioid crisis.

Limitations

This study used data reported by individuals, meaning the data likely suffered from human error and inconsistencies in provider-to-provider use and application of data codes. Additionally, EMS providers did not always report insurance status or the payment method (a proxy for socioeconomic status [SES]), thereby precluding the inclusion of SES as a control variable. Previous studies have identified a relationship between SES and the administration of opioids, using insurance status and payment method as a proxy measure.⁷⁻⁹ Most records in our sample were missing these data; 23 331 (85%) records did not include insurance status, and 18 939 (69%) did not include the payment method.

Finally, we were unable to explore the impact of other covariates that may influence the administration of opioids, including, for example,

patient comorbidities, the race and ethnicity of the EMS provider, and the nature of prior interactions between the patient and the EMS provider.

Conclusion

EMS providers are more likely to treat White and male patients with opioids during pain and injury emergencies than to use these medications to treat Hispanic, AI/AN, and female patients. More research is needed to explore the cause of the disparities observed and to identify and implement strategies to improve current practice to ensure EMS providers provide the same level of care to all patients.

Conflicts of Interest

The authors declare they have no conflicts of interest.

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