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Racial Disparities in the Treatment of Acute Overdose in the Emergency Department

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Abstract

Objectives: Racial and ethnic disparities in the United States continue to exist in many disciplines of medicine, extending to care in the Emergency Department (ED). We sought to examine the relationship between patient race/ethnicity and use of either antidotal therapy or gastrointestinal decontamination for individuals presenting to the ED for acute drug overdose.

Methods: We completed a secondary analysis of a prospective cohort of patients with suspected acute overdose presenting to 2 urban tertiary care hospitals between 2009 and 2014. Race was self-identified during ED registration. Antidote administration (primary outcome) and gastrointestinal decontamination (secondary outcome) were reviewed and verified via agreement between two board certified medical toxicologists. Associations between race and outcomes were analyzed using a logistic regression model.

Results: We reviewed 3252 ED patients with acute overdose. Overall, 542 people were treated with an antidote and 234 cases were treated with activated charcoal, either single or multiple dose. Compared to Whites, Blacks and Hispanics were significantly less likely to receive any antidote. The analysis was underpowered to detect racial disparities in the administration of activated charcoal.

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Conclusions: Blacks and Hispanics are significantly less likely to receive any antidote when presenting to the ED for acute drug overdose. Further studies are needed to determine national prevalence of this apparent disparity in care and to fully characterize how race plays a role in management of acute overdose.

Keywords

Racial disparities; Acute overdose; Drug overdose; antidote

Introduction

Acute drug poisonings are a common emergency department (ED) presentation. According to the CDC, an average of 1.1 million ED visits are made each year for drug poisonings.¹ Approximately one quarter (24.5%) of these visits result in hospital admission. Drug poisoning is the leading cause of injury-related mortality in the United States.¹ The CDC estimates approximately 52,000 deaths annually secondary to drug poisoning, and the number is steadily increasing.¹ These facts highlight the importance of timely and appropriate care for the acute drug poisoned patient in the ED.

Racial disparities in health care in the United States are a source of continuing concern and are well documented over the last 30 years.²⁻⁴ In 1984, the task force on Black and Minority Health was appointed by the Secretary of Health and Human Services, Margaret M. Heckler, to address the inequalities of minorities in the United States. The initial report, referred to as the “Heckler Report”, was one of the first detailed epidemiologic reports on a national scale to document the substantial health inequalities experienced by persons of color in the United States.⁵ Numerous subsequent reports document the persistence of these disparities, most notably the Institute of Medicine’s “Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care”, which detailed extensive racial/ethnic disparities in care that were not due to differences in access or patient preference.⁶⁻⁸ There is ample evidence that racial and ethnic minorities receive lower quality healthcare and have poorer health outcomes than their white counterparts.

There is also evidence that racial/ethnic disparities occur in emergency care.⁹⁻¹⁰ Most recently, a paper in *Medical Care* revealed that Blacks and Hispanics were less likely to receive narcotic analgesics when they presented to the ED with severe abdominal pain.¹¹ In 2016, a study demonstrated that Black patients were less likely than White patients to receive thrombolytics despite the same NIH stroke scale score at primary stroke centers,¹² while a separate study demonstrated how African Americans have significantly longer ED wait times for low severity complaints.¹³

Racial disparities in ED care are particularly troubling, considering that the ED serves as an important health care safety net; at times, the ED represents the only accessible medical care for a subset of some racial minorities and vulnerable socioeconomic groups.^{14,15} To date, racial disparities in clinical toxicology have yet to be evaluated in the literature.

In this study, we aimed to assess racial disparities in the care of patients who presented to the ED with acute drug overdose; specifically, we examined disparities in the administration

of any antidote and oral activated charcoal. We hypothesized that Black and Hispanic patients would be less likely than Whites to receive an antidote or activated charcoal.

Methods

Study design and setting:

Emergency departments (ED) at two urban tertiary care hospitals in the New York metropolitan area were used for enrollment. These EDs have a combined visit volume of greater than 280,000 visits annually and are staffed with board certified emergency physicians. We performed a secondary analysis of a prospective cohort of patients who presented to these EDs between 2009 and 2014. The Icahn School of Medicine at Mount Sinai Institutional Review Board approved the study with a waiver of informed consent.

Selection of Participants:

The protocol for this study is described elsewhere.¹⁶ Briefly, patients were screened for inclusion if they presented to the ED with concern for acute ingestion and either the in-house toxicology fellow was consulted or a referral was made to the regional poison control center. Once patients were screened, formal inclusion and exclusion criteria were applied. Inclusion and exclusion criteria are described in detail in the original protocol and itemized in the Results.¹⁶ Translation services were utilized for all patients who did not speak English fluently.

Methods and Measurements:

Data elements were collected from the medical chart as per the original protocol and according to accepted guidelines for medical chart extraction.¹⁶ Data recorded included age, sex, and race/ethnicity. In addition, type of drug/substance/medication taken was recorded, as well as interval from ingestion to arrival to ED, and treatments administered. Patients without racial identification as well as those with missing information were excluded. Data were stored in a deidentified database.

Outcomes Measures:

The primary independent variable was race/ethnicity, using categories defined by The Center for Disease Control, National Hospital Ambulatory Medical Care Survey (CDC-NHAMCS);¹⁷ racial categories were: non-Hispanic White, non-Hispanic Black, and Asian/Pacific Islander; ethnicity was defined as Hispanic or non-Hispanic. Patients who self-identified as Hispanic were included in that category regardless of self-reported race. The primary outcome was administration of any antidote while in the ED. The secondary outcome was administration of activated charcoal within one hour of ingestion. Documentation of antidote administration and gastrointestinal decontamination were reviewed and verified via agreement between two board certified medical toxicologists.

Analysis:

Categorical variables were analyzed with a chi square. Odds ratios were calculated with a 95% confidence interval (CI). Assuming a baseline rate of 25% and $\alpha=0.05$, we had

>80% power to detect an 18% difference in the rate of antidote administration. P-values <0.05 were considered significant. This study's primary/secondary outcomes were analyzed using a logistic regression model implemented in the SAS (version 9.3) procedure LOGISTIC. Two models were developed – one for antidote administration and the second for gastrointestinal decontamination. In each analysis, both the race/ethnicity variable and the covariates of age and gender were entered directly into the model. In addition, since two hospitals provided data for this study, each logistic regression model was estimated using hospital as a clustering factor. The model without clustering is reported below since the results when clustering was used differed from the results reported below only in the 4th decimal place.

Results

Study Enrollment:

During the study period, 3252 overdose patients presented to the two participating sites. Of those, 2785 were included and 467 were excluded. Patients were excluded for having a lack of data (n=267), an alternate diagnosis at discharge or admission (n = 99), pediatric age (n= 53), Department of Corrections patients (n=17), inhalation of drug/substance (n=11), dermatological application of drug/substance (n = 10), overdose not from a drug or medication (n=4), DNR status (n=2), chronic, non-acute ingestion (n=2), and duplicate entry (n=2). The study flow diagram is outlined in Figure 1.

Characteristics of study subjects:

Among included patients, 29.5% (n = 822) were non-Hispanic White, 20.3% (n = 566) non-Hispanic Black, 37.0% (n = 1031) Hispanic, Asian 6.5% (n = 182), and 6.6% (n = 184) other racial/ethnic group patients. Mean age was 41.5 years. 45.0% (n= 1,255) were women, and 54.9% (n= 1,530) were men. (Table 1).

Main outcomes:

542 people were treated with an antidote: naloxone (n=257), N-acetylcysteine IV or PO (n=136), calcium (n=101), sodium bicarbonate (n=91), glucagon (n=39), octreotide (n=29), digoxin immune fab (n=10), high dose insulin therapy (n=6), physostigmine (n=6), fomepizole (n=5), dantrolene (n=2), flumazenil (n=2), or intravenous lipid emulsion (n=1)] with some patients receiving more than one antidote. 234 cases were treated with activated charcoal, either single or multiple dose within an hour of ingestion. Administration of activated charcoal or any antidote is compared by race/ethnicity in Table 2.

Antidotes Model:

Results of the logistic regression model are summarized in Table 3. After adjusting for age, gender, non-Hispanic Black patients had a 48% lower odds of receiving any antidote compared to non-Hispanic White patients [OR (95% CI) = 0.52 (0.38–0.69)]. Hispanic patients had a 25% lower odds of receiving an antidote than non-Hispanic White patients [OR (95% CI) = 0.75 (0.59–0.940)]. Asian patients were equally as likely to receive an antidote compared to Whites [OR (95% CI) = 1.03 (0.71–1.51)].

Activated Charcoal Model:

Results of the logistic regression model are summarized in Table 4. Non-Hispanic Black patients had a 34% lower relative rate of receiving activated charcoal within one hour of ingestion compared to non-Hispanic White patients [OR (95% CI) = 0.75 (0.49–1.14)]. Similarly, Hispanic patients had a 5% lower relative rate of receiving activated charcoal compared to non-Hispanic White patients [OR (95% CI) = 0.80 (0.57–1.12)].

Discussion

This analysis suggests a pattern of uneven care in racial and ethnic minorities relative to non-Hispanic Whites in an ED patient population with acute toxic exposures. Both Non-Hispanic Black and Hispanic patients were less likely to receive an antidote when presenting with acute overdose. While these results are consistent with previous studies documenting disparities in the delivery of medical care based on race,^{6–8} we have not found any previous studies in toxicology literature that use race or ethnicity as independent predictor variables for antidotal treatment. Our data supports a growing body of evidence that racial and ethnic disparities are present in the acute care of the ED patient.^{9,10} This dataset raises important questions but does not necessarily imply that health care workers are “withholding” antidotes based on race/ethnicity. Much of the literature on health care disparities attributes differential treatment to unconscious bias rather than deliberate “withholding” of needed care. Regardless, further study is warranted to confirm and build upon these important findings.

Interestingly, age was a statistically significant predictor of antidote administration, with 2.1% higher odds (Adjusted OR 1.021, CI 1.015–1.026) per year of life to receive any antidote (see Table 3). Clinical indications were not specifically assessed however providers may have been more likely to treat elderly patients with an antidote for acute poisonings because of concern for worse outcomes due to medical co-morbidities or advanced age. It is also possible that elderly patients take medications that are more likely to require an antidote, e.g., opioids, digoxin, anti-hypertensives, diabetes medications, etc.

Our secondary outcome of administration of activated charcoal within an hour of ingestion also suggested racial/ethnic disparities though the observed difference did not reach statistical significance. There were relatively few patients who arrived in the ED within one hour of acute ingestion so it is likely that the study was underpowered for this secondary outcome. Interestingly, activated charcoal administration rates were lower than expected across all patients. Potential reasons for this include presence of contraindications (e.g. altered mental status, airway protection, caustics) in these patients; specific contraindications were not available in the study database. Official position statements of the American Academy of Clinical Toxicology and the European Association of Poisons Centres and Clinical Toxicologists support the use of activated charcoal in acute poisonings.¹⁸ We observed that activated charcoal was twice as likely to be administered to women compared to men in our sample population, though no gender difference in antidote administration was observed. It is unclear exactly which factors contribute to gender differences in charcoal administration. Additional studies are needed to investigate the extent and causes of racial/ethnic and gender disparities in activated charcoal administration.

It is not clear exactly how or why race/ethnicity may drive the administration of antidote and activated charcoal, though one might speculate that the observed disparity may be provider driven and implicit bias may be a contributing factor.¹⁹ Based on our analysis by antidote in **Table 5**, race also appeared to be a factor in the administration of antidotes which have standardized, objective criteria for administration, such as naloxone and NAC (percent Naloxone, Non-Hispanic Black 5.8%, Non-Hispanic Whites 13.0%. Percent N-Acetylcysteine Non-Hispanic Black 2.5%, Non-Hispanic Whites 5.5%). While it is possible that non-Hispanic White patients were given treatments inappropriately or that Whites presented with more severe overdoses, neither of these possibilities seem likely. However, the aforementioned interpretation is admittedly a matter of pure speculation because there is no validated definition of poison severity score. Further research will be required to explore underlying factors that may drive provider decisions to administer or withhold treatment with an antidote in the ED. Additionally, there is evidence that there are racial and ethnic differences in how people commit suicide and use illicit drugs.^(20,21) However it is not likely that differences in ingested substance by race/ethnicity can account for Blacks and Hispanics having an overall lower absolute rate of receiving any antidote and/or activated charcoal.

To our knowledge, there are no prior studies which examine treatment of acute overdose in the context of race. Additional studies exploring race, ethnicity and antidote administration in other cohorts with greater clinical detail are necessary to determine the national prevalence of disparities in the management of acute overdose in the ED and the potential impact of any such disparities on patient outcomes. While patients with limited English proficiency are routinely evaluated in both participating EDs, data on patients' language preferences and use of language interpreter services were not available in the database. Additional studies should explore the impact of limited English proficiency on ED care of overdose patients.

Lastly, assessment for possible additional factors such as insurance status, provider race/ethnicity, and hospital level barriers must also be explored in future research. As we move forward with new models to improve healthcare delivery, we must ensure that patients of all ethnic and racial backgrounds receive quality healthcare at every access point in our system, including the ED.

Limitations.

Our analysis was limited to data available in the original cohort study, which did not assess whether patients had specific clinical indications for treatment nor any clinical factors that may have influenced the decision to administer treatment. It is the policy of both EDs to ask patients to self-identify race and ethnicity during the registration process however these variables may have been assigned by ED staff if the patient's mental status did not allow for proper registration; this may have led to some level of misidentification and should be considered a limitation of our study.

Conclusions

In conclusion, we found a significant racial/ethnic disparity in the administration of any antidote to ED patients with acute drug overdose. Blacks and Hispanics were less likely than Whites to receive any antidote when presenting to the ED with acute drug overdose. Blacks and Hispanics appeared to be less likely to receive activated charcoal within an hour of ingestion. Additional studies exploring race, ethnicity and antidote administration in other cohorts are necessary to determine national prevalence and the potential impact on patient outcomes.

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Figure 1:
Study Flow Diagram

Table 1.

Clinical Characteristics of 2785 Patients with Acute Overdose 2009–14

	Total N=2785	Non-Hispanic White N = 822(29.5%)	Non-Hispanic Black N= 566(20.3%)	Hispanic N= 1031(37.0%)	Asian N= 182(6.5%)	Other N= 184(6.6%)
Female	1255 (45.1%)	356 (43.3%)	224(39.6%)	465 (45.1%)	114 (62.6%)	96 (52.2%)
Male	1530 (54.9%)	466 (56.7%)	342 (60.4%)	566 (54.9%)	68 (37.4%)	88 (47.8%)
Age 18–45	1720 (61.8%)	468 (56.9%)	311 (54.9%)	692 (67.1%)	118 (64.8%)	131 (71.2%)
Age 46–65	800 (28.7%)	267 (32.4%)	205 (36.2%)	254 (24.6%)	36 (19.8%)	38 (20.7%)
Age 66 +	265 (9.5%)	87 (10.6%)	50 (8.8%)	85 (8.2%)	28 (15.4%)	15 (8.1%)

Table 2.

Antidote and Activated Charcoal Received by Race

	Total (N=2785)	Received Activated Charcoal (N= 234)	Received Any Antidote(N=542)	No Antidote/Charcoal(N =2075)
Non-Hispanic White	822 (29.5%)	73 (31.2%)	197 (36.3%)	573 (27.6%)
Non-Hispanic Black	566 (20.3%)	33 (14.1%)	72 (13.3%)	467 (22.5%)
Hispanic	1031 (37.0%)	87 (37.2%)	182 (33.6%)	785 (37.8%)
Asian	182 (6.5%)	20 (8.5%)	45 (8.3%)	125 (6.0%)
Other	184 (6.6%)	21 (8.9%)	46 (8.5%)	125 (6.0%)

Table 3.

Logistic Regression Analysis of Antidote Administration

Predictor Variables	Wald Chi-Square	p-value	Adjusted Odds Ratios	95% CI
Race/Ethnicity:				
Black	18.85	<0.0001	0.516	0.383,0.696
Hispanic (Latino)	6.00	0.0143	0.746	0.589,0.943
Asian	0.030	0.8613	1.034	0.708,1.510
Other	0.24	0.6271	1.098	0.753,1.599
Caucasian (Ref)	0	0	0	
Age	54.72	<0.0001	1.021	1.015,1.026
Males vs. Females	0.1190	0.7301	1.035	0.853,1.255

Abbreviations – [CI: Confidence Interval] [REF: Reference Value]

Age: In the model should be interpreted as odds per additional year of life

Table 4.

Logistic Regression Analysis of Activated Charcoal Administration

Predictor Variables	Wald Chi-Square	p-value	Adjusted Odds Ratios	95% CI
Race/Ethnicity:				
Black	1.82	0.1774	0.748	0.491,1.140
Hispanic (Latino)	1.68	0.1953	0.800	0.571,1.121
Asian	0.008	0.9265	0.976	0.580,1.643
Other	0.024	0.8758	0.959	0.571,1.613
Caucasian (Ref)	0	0	0	
Age	26.32	<0.0001	0.976	0.967,0.985
Males vs. Females	24.70	<0.0001	0.492	0.372,0.651

Abbreviations – [CI: Confidence Interval] [REF: Reference Value]

Age: In the model should be interpreted as odds per additional year of life

Table 5:

Antidote Administration by Ethnicity/Race

	Total (N) by Race	Naloxone (N = 257)	N-AC (N = 136)	Ca+ (N =101)	NaHCO3 (N= 91)	Glucagon (N=39)	Ocreotide (N= 29)	Digoxin Immune fab (N=10)	Insulin (N=6)	Physostigmine (N=6)	Fomepizole (N=5)	Dantrolene (N= 2)	Flumazenil (N=2)	Intravenous Lipid emulsion (N=1)
Race														
White	822	107 (13.0%)	45(5.5%)	31(3.7%)	36(4.4%)	9(1.1%)	7(0.85%)	5(0.6%)	4(0.5%)	2(0.2%)	3(0.4%)	1(0.1%)	2(0.2%)	0(0.0%)
Black	566	33(5.8%)	14(2.5%)	14(2.5%)	7(1.2%)	7(1.3%)	1(0.2%)	0(0.0%)	0(0.0%)	0(0.0%)	1(0.2%)	0(0.0%)	0(0.0%)	0(0.0%)
Asian	182	6(3.3%)	13(7.1%)	11(6.0%)	9(4.9%)	2(1.1%)	8(4.4%)	2(1.1%)	1(0.5%)	1(0.5%)	0(0.0%)	1(0.5%)	0(0.0%)	0(0.0%)
Other	184	17(9.2%)	16(8.7%)	6(3.2%)	8(4.3%)	7(3.8%)	6(3.3%)	1(0.5%)	1(0.5%)	1(0.5%)	1(0.5%)	0(0.0%)	0(0.0%)	0(0.0%)
Ethnicity-Hispanic														
Yes	1031	67(6.5%)	41(3.9%)	33(3.2%)	27(2.6%)	12(1.2%)	7(0.7%)	3(0.3%)	1(0.1%)	2(0.2%)	0(0.0%)	0(0.0%)	0(0.0%)	1(0.1%)
No	1439	162(11.3%)	88(6.1%)	62(4.3%)	60(4.2%)	25(1.7%)	22(1.5%)	70(5%)	5(0.3%)	4(0.3%)	5(0.3%)	2(0.1%)	2(0.1%)	0(0.0%)
Unknown	315	28(8.9%)	7(2.2%)	6(1.9%)	4(1.3%)	2(0.6%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)