Analgesic Access for Acute Abdominal Pain in the Emergency Department Among Racial/Ethnic Minority Patients

A Nationwide Examination

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Background: Prior studies of acute abdominal pain provide conflicting data regarding the presence of racial/ethnic disparities in the emergency department (ED).

Objective: To evaluate race/ethnicity-based differences in ED analgesic pain management among a national sample of adult patients with acute abdominal pain based on a uniform definition.

Research Design/Subjects/Measures: The 2006–2010 CDC-NHAMCS data were retrospectively queried for patients 18 years and above presenting with a primary diagnosis of nontraumatic acute abdominal pain as defined by the American Association for the Surgery of Trauma. Independent predictors of analgesic/narcotic-specific analgesic receipt were determined. Risk-adjusted multivariable analyses were then performed to determine associations between race/ethnicity and analgesic receipt. Stratified analyses considered risk-adjusted differences by the level of patient-reported pain on presentation. Secondary outcomes included: prolonged ED-LOS (>6 h), ED wait time, number of diagnostic tests, and subsequent inpatient admission.

Results: A total of 6710 ED visits were included: 61.2% (n = 4106) non-Hispanic white, 20.1% (n = 1352) non-Hispanic black, 14.0% (n = 939) Hispanic, and 4.7% (n = 313) other racial/ethnic group patients. Relative to non-Hispanic white patients, non-Hispanic black patients and patients of other races/ethnicities had 22%–30% lower risk-adjusted odds of analgesic receipt [OR (95% CI) = 0.78 (0.67–0.90); 0.70 (0.56–0.88)]. They had 17%–30% lower risk-adjusted odds of narcotic analgesic receipt ($P < 0.05$). Associations persisted for patients with moderate-severe pain but were insignificant for mild pain presentations. When stratified by the proportion of minority patients treated and the proportion of patients reporting severe pain, discrepancies in analgesic receipt were concentrated in hospitals treating the largest percentages of both.

Conclusions: Analysis of 5 years of CDC-NHAMCS data corroborates the presence of racial/ethnic disparities in ED management of pain on a national scale. On the basis of a uniform definition, the results establish the need for concerted quality-improvement efforts to ensure that all patients, regardless of race/ethnicity, receive optimal access to pain relief.

Key Words: disparities, race/ethnicity, pain, emergency department, minority health

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In the United States, disparities in health care delivery and outcomes are a cause of mounting controversy and concern. Since 1984, when the US Preventative Services Task

Force first began to document "racial prejudice" in medical practice,[1] reports from organizations including the Institute of Medicine and the Agency for Healthcare Research and Quality have found that racial minorities are at increased risk of receiving lower quality medical care relative to white patients.[1,2] In the emergency department (ED), this risk is particularly troubling considering that the ED plays a central role as a primary provider of care for a diverse group of patients. Inadequacies and inconsistencies in the ED have been documented to originate from the very onset of care, the moment that a potential patient arrives.[3] Issues encountered at this point have the potential to shape all subsequent interactions that a patient receives.

For patients presenting with a primary complaint of pain, discrepancies in analgesic management are not uncommon[4–6] and often serve as an indicator of the quality of care.[5,6] Consensus statements from the Joint Commission[5] and the Veterans Health Administration[7] define concrete guidelines for the management and monitoring of pain for all patients, yet, despite these efforts, rampant disparities in the prescription of analgesics for pain management of fractures,[8,9] cancer,[10,11] and postoperative pain[12] remain. Racial minorities, in particular, are at increased risk of inadequate analgesic receipt.[4,13–16] Previous studies have found that minorities are less likely to receive adequate pain medication for back pain,[15] migraines,[17] and long-bone fractures[9] when reporting the same degree of pain severity as comparable, nonminority groups. Similar disparities have also been found in pediatric populations where children belonging to racial and ethnic minorities have been found to be at a similarly increased risk of poor pain management.[14,16]

Interestingly, among ED management of children and adolescents with various forms of abdominal pain, the results are mixed.[14,18] Work by Johnson et al[14] found that among patients 21 years of age and below, non-Hispanic black patients were 39% (95% CI, 13%–57%) less likely than non-Hispanic white patients to receive any analgesic and 62% (95% CI, 19%–82%) less likely to receive a narcotic analgesic. Conversely, work by Caperell et al[18] found no racial difference in the evaluation, treatment, and disposition of children with acute abdominal pain.

Comparable studies among adults presenting with acute abdominal pain, a common cause of ED visits, have not been extensively explored, creating a need for nationally representative data capable of considering the potential problem of disparities in analgesic receipt among adult patients in a meaningful way. The persistence of disparities in the ED, particularly among surgical patients, is concerning considering that under emergency conditions, patients are expected to be treated in similar ways. Presumed equal access to ED services combined with an increasing emphasis on surgical standardization should (in theory) largely mitigate the effect, yet in other surgical and pain management contexts, disparities remain.[17,19–22]

In an effort to better understand these discrepancies, use of the American Association for the Surgery of Trauma (AAST)'s 2013 publication of a uniform set of operative and nonoperative ICD-9-CM-based diagnostic codes for emergency general surgery[23] allows for a novel approach to further understandings of the association between race/ethnicity and analgesic receipt in the ED. On the basis of 5 years of nationally representative ED data (2006–2010) from the Centers for Disease Control and Prevention (CDC) National Hospital Ambulatory Medical Care Survey (NHAMCS), the objective of this study was to evaluate race/ethnicity-based differences in ED analgesic pain management among a national sample of adult patients with acute abdominal pain based on a clearly defined, uniform definition.

METHODS

The CDC-NHAMCS is a national survey designed to provide objective, reliable information on the utilization and provision of ambulatory care services in hospital emergency and outpatient departments and in ambulatory surgery centers across the United States.[24] Findings are based on a national sample of annual visits to general and short-stay hospitals. A 4-stage probability sampling design is used by trained clinical reviewers to attain nationally representative effects and provide an abstracted sample of annual ED visits. The survey is conducted by the CDC's National Center for Health Statistics. Data are collected over a 4-week period before which census representatives train hospital personnel in the proper collection of data using standardized forms. Inclusion of CDC-NHAMCS-defined design weights allow for the use of statistical weighting to produce unbiased national estimates of trends in health care utilization. Details on data collection procedures and survey reports can be obtained directly from the CDC.[24]

Between 2006 and 2010, the CDC-NHAMCS surveyed 175,351 ED visits, representing a weighted national sample of 625,670,520 ED visits. We queried the corresponding CDC-NHAMCS database for patients 18 years of age and above with a primary diagnosis of acute abdominal pain, defined under the realm of acute care emergency general surgery by the AAST[23,25–28] (ICD-9-CM diagnosis codes: 789.00, 789.01, 789.02, 789.03, 789.04, 789.05, 789.06, 789.07, 789.09, 789.30, 789.31, 789.32, 789.33, 789.34, 789.35, 789.36, 789.37, 789.39, 789.40, 789.41, 789.42, 789.43, 789.44, 789.45, 789.46, 789.47, 789.49, 789.60, 789.61, 789.62, 789.63, 789.64, 789.65, 789.66, 789.67, 789.69). To protect the integrity of the analysis, patients with a documented pain score of "zero" as well as those with missing pain information were excluded.

The primary explanatory variable was race/ethnicity. In the CDC-NHAMCS, race/ethnicity is (commonly) reported based on hospital-staff observation. The CDC-NHAMCS categorizes included patients into non-Hispanic white, non-Hispanic black, Hispanic, and "other" racial/ethnic groups.

The primary dependent variables or outcome measures consisted of any analgesic and narcotic-specific analgesic receipt while in the ED. Receipt of analgesics was identified using unique drug codes specified by the National Drug Code Directory.[29] Any analgesic use included use of both nonnarcotic (e.g. acetaminophen, ibuprofen, and ketorolac) and narcotic (e.g. morphine, hydrocodone, and oxycodone) analgesics. Considered secondary outcome measures included:

prolonged ED length of stay (LOS) (defined as LOS greater than the 75th percentile; >6 h), ED wait time, number of diagnostic tests (laboratory and radiologic workup), and subsequent inpatient admission.

Patients' pain scores on presentation to the ED were reported using an integer-based numeric gradient from 0 to 10 with "no pain" defined as a value of 0, "mild" pain 1–3, "moderate" pain 4–6, and "severe" pain as values ≥ 7 out of 10. Risk-adjusted associations between race/ethnicity and any/narcotic-specific analgesic receipt were considered for adult patients presenting to the ED with acute abdominal pain overall and stratified by the initial level of pain reported.

Other considered covariates (potential confounders/predictors of analgesic receipt), included age (categorized as 16–25, 26–35, 36–45, 46–55, 56–65, 66–75, or >75 y), sex, immediacy of presentation (determined by triage level and categorized as immediate/emergent, urgent, or semiurgent/nonurgent/no triage), insurance status (categorized as private, government, or uninsured), metropolitan designation (categorized as metropolitan and nonmetropolitan based on the metropolitan statistical area identification), income quartile (categorized as <$32,793, $32,794–$40,626, $40,627–$52,387, $\geq$ $52,388, and unknown), geographic location (Northeast, Midwest, South, or West), hospital ownership (categorized as voluntary/nonprofit, government/nonfederal, or proprietary), percent of regional population below the poverty line (categorized as <5.00%, 5.00%–9.99%, 10.00%–19.99%, $\geq$ 20.00%, and unknown), and Charlson Comorbidity Index (CCI) (categorized as 0, 1, 2, and ≥ 3). Additional variables were generated to account for the proportion of minority patients seen and the proportion of patients reporting severe pain within a given ED (categorized by tertile with the lowest tertile representing the smallest percentage of patients).

Descriptive statistics were used to summarize the severity of patients' pain along with information regarding patient demographic/socioeconomics, hospital characteristics, and unadjusted outcome measures by CDC-NHAMCS-determined racial/ethnic group. Non-normally distributed continuous data were reported as population medians and interquartile ranges—compared using Kruskal-Wallis tests. Categorical data were reported as the number of occurrences (n) and the corresponding population percent—compared using Pearson χ^2 tests. CDC-NHAMCS-defined design weights were used with Stata's "svy" command to attain nationally weighted percentages[24] and account for clustering of patients within hospitals. Data reported throughout the manuscript reflect observed frequencies and nationally weighted percentages.

Multivariable logistic regression was used to determine independent predictors of analgesic and narcotic analgesic receipt as well as to assess potential associations between race/ethnicity and the 2 primary outcome measures, adjusting for the influence of the indicated covariates. Risk-adjusted results are reported as odds ratios (OR) and corresponding 95% confidence intervals (95% CI). Stata Statistical Software: Release 12 (StataCorp LP, College Station, TX) was used for all analyses. Two-sided P-values <0.05 were considered significant. The Johns Hopkins University School of Medicine Institutional Review Board approved the study.

RESULTS

Between 2006 and 2010, 6710 ED visits for adults with acute abdominal pain were identified from 350 EDs across the United States, representing 25,535,431 weighted visits from 4722 EDs on a national scale over the same time span. Among included ED visits, 61.2% (n = 4106) represented non-Hispanic white, 20.1% (n = 1352) non-Hispanic black, 14.0% (n = 939) Hispanic, and 4.7% (n = 313) other racial/ethnic group patients.

Table 1 provides a comparison of demographic, socioeconomic, and hospital characteristics among racial/ethnic groups. The majority of presenting patients were young (46.1% between the ages of 18 and 35 y) and female (68.8%). Most presented with moderate (32.6%) to severe (57.7%) pain. Differences in patient and hospital characteristics varied by the racial/ethnic group considered ($P < 0.05$) (Table 1). Variations in the percentage of the regional population below the poverty line were not significant ($P = 0.087$) nor were differences in the proportion of patients reporting severe pain ($P = 0.301$).

Non-Hispanic white patients were more likely to receive analgesics (56.8%) than non-Hispanic black (50.9%), Hispanic (52.8%), and "other" race/ethnicity (46.6%) patients ($P = 0.002$) (Table 2). Narcotic analgesics were also administered more frequently to non-Hispanic white (44.2%) than to non-Hispanic black (39.5%), Hispanic (38.5%), or other (35.8%) patients ($P = 0.002$) (Table 2). Non-Hispanic white and non-Hispanic black patients reported severe pain with the same frequency (58.4% vs. 59.7%, $P = 0.830$), yet despite similar frequencies of severe pain presentation, non-Hispanic black patients received analgesia less often (56.8% vs. 50.9%, $P < 0.001$). In terms of secondary outcome measures, relative to non-Hispanic white patients, non-Hispanic black, Hispanic, and other patients were more likely to experience a prolonged ED-LOS ($P = 0.006$), lower percentages of inpatient admissions ($P = 0.001$), and longer ED waiting times ($P = 0.005$) (Table 2). Differences in the number of diagnostic tests were not significant (Table 2).

Assessment for independent predictors of analgesic and narcotic analgesic receipt among considered patient-level and hospital-level factors (Table 3) revealed significant differences related to sex, age, insurance status, level of pain on presentation, hospital ownership, metropolitan status of township, geographic location, proportion of minority patients seen at a facility, and proportion of patients with severe pain treated at a facility. Female patients were more likely to receive analgesics for acute abdominal pain [OR (95% CI) = 1.16 (1.04–1.30)] as were patients with increasing pain scores and from any geographic region relative to the American Northeast ($P < 0.05$). Interestingly, patients over the age of 75 years had significantly lower odds of receiving analgesics [OR (95% CI) = 0.68 (0.55–0.84)] relative to patients aged 18–25 years. Patients with public insurance also had lower risk-adjusted odds of analgesic receipt in the ED

TABLE 1. Patient and Hospital Characteristics by Race/Ethnicity (Weighted Percentages)

	Total (N = 6710)	Non-Hispanic White (n = 4106)	Non-Hispanic Black (n = 1352)	Hispanic (n = 939)	Other (n = 313)	*P*
Female (%)	68.8	67.7	72.4	69.3	67.1	0.001*
Age category (%)						0.019*
18–25 y	24.3	22.1	28.9	27.8	23.3	
26–35 y	21.8	20.4	23.5	25.6	20.8	
36–45 y	18.3	18.2	19.3	17.5	16.9	
46–55 y	15.9	15.9	16.6	15.4	14.4	
56–65 y	8.1	9.0	5.9	6.1	11.8	
66–75 y	5.7	6.9	3.1	4.3	5.8	
>75 y	5.9	7.5	2.7	3.4	7.0	
Insurance status (%)						0.028*
Private	42.8	49.8	28.8	30.8	47.6	
Government	32.5	28.6	40.5	37.4	34.8	
Uninsured	19.8	17.5	24.6	24.9	15.0	
Unknown	4.9	4.2	6.2	6.9	2.6	
Income quartile (%)						0.014*
<$32,793	28.08	20.6	50.7	30.1	22.7	
$32,794–$40,626	24.7	26.8	18.9	24.9	21.1	
$40,627–$52,387	22.2	24.4	16.4	20.7	22.0	
≥$52,388	19.8	22.7	9.4	19.4	28.4	
Unknown	5.3	5.5	4.6	4.9	5.8	
Pain on presentation (%)						0.002*
Mild	9.7	9.8	8.3	10.9	10.5	
Moderate	32.6	31.8	32.0	35.7	37.1	
Severe	57.7	58.4	59.7	53.5	52.4	
Triage level (%)						0.001*
Immediate/Emergent	12.97	12.7	13.1	14.4	11.2	
Urgent	59.3	59.0	60.7	57.2	63.6	
Semiurgent/nonurgent/none	27.7	28.2	26.3	28.4	25.2	
Metropolitan status (%)						<0.001*
Metropolitan	87.8	83.1	95.0	95.0	96.5	
Nonmetropolitan	12.2	16.9	5.0	5.0	3.5	
Hospital ownership (%)						0.021*
Voluntary/nonprofit	75.0	78.9	75.4	59.5	68.7	
Government/nonfederal	14.8	11.8	17.3	21.6	22.7	
Proprietary	10.2	9.3	7.3	18.9	8.6	
CCI (%)						<0.001*
0	96.1	96.5	95.5	96.2	93.9	
1	2.9	2.4	3.5	3.3	4.2	
2	0.8	0.8	0.8	0.4	1.6	
≥3	0.2	0.3	0.2	0.1	0.3	
Geographic location (%)						0.014*
Northeast	21.3	22.0	15.2	26.1	24.6	
Midwest	21.7	25.0	22.4	11.1	7.7	
South	37.2	34.8	55.1	30.4	12.1	
West	19.8	18.2	7.3	32.5	55.6	
Year (%)						0.681
2006	18.5	17.9	19.8	18.9	19.2	
2007	20.2	20.5	19.8	20.0	19.2	
2008	19.9	19.6	19.4	21.3	21.7	
2009	18.7	18.8	19.6	17.8	15.7	
2010	22.8	23.3	21.5	22.0	24.3	
Area population below poverty line (%)						0.087
<5.00%	14.6	19.4	4.9	8.7	11.5	
5.00%–9.99%	26.7	31.6	15.2	21.7	27.8	
10.00%–19.99%	34.0	33.9	33.1	36.2	33.2	
≥20.00%	19.3	9.6	42.2	28.4	21.7	
Unknown	5.3	5.5	4.6	4.9	5.8	
Proportion of presenting minorities (%)						<0.001*
Lowest tertile	33.7	42.5	17.7	18.0	36.9	
Intermediate tertile	34.1	34.4	32.3	33.3	40.7	
Highest tertile	32.2	23.2	50.1	48.7	22.4	

(*Continued*)

TABLE 1. Patient and Hospital Characteristics by Race/Ethnicity (Weighted Percentages) (*continued*)

	Total (N = 6710)	Non-Hispanic White (n = 4106)	Non-Hispanic Black (n = 1352)	Hispanic (n = 939)	Other (n = 313)	*P*
Proportion of patients with severe pain (%)						0.301
Lowest tertile	34.0	34.2	33.4	33.8	34.9	
Intermediate tertile	32.8	33.7	31.4	31.2	31.1	
Highest tertile	33.2	32.1	35.2	35.0	34.0	

*Two-sided *P*-values <0.05 considered significant; taken from Pearson χ^2 tests.
CCI indicates Charlson Comorbidity Index.

[OR (95% CI) = 0.86 (0.76–0.97)]. Similar results were observed with narcotic analgesic receipt (Table 3).

On risk-adjusted analysis (Table 4), non-Hispanic black patients and patients of other race/ethnicity continued to be less likely to receive analgesia [OR (95% CI) = 0.78 (0.67–0.90) and 0.70 (0.56–0.88), respectively] relative to non-Hispanic white patients. Hispanic patients demonstrated comparable risk-adjusted results [OR (95% CI) = 0.93 (0.79–1.10)]. Demographic, socioeconomic, and hospital-level drivers of disparities are presented in Table 5. When stratified by the severity of pain on ED presentation, no differences were found for patients with mild pain. Non-Hispanic black patients with moderate-severe pain had 29% and 24% lower risk-adjusted odds of analgesic receipt, respectively, relative to non-Hispanic white patients [OR (95% CI) = 0.71 (0.55–0.90); 0.76 (0.63–0.92)]. Similarly, non-Hispanic black patients and patients of other races/ethnicities had significantly lower risk-adjusted odds of narcotic analgesic receipt when compared with non-Hispanic white patients: 0.83 (0.71–0.96) and 0.70 (0.54–0.90), respectively (Table 4). As with any analgesic receipt, only non-Hispanic black patients with moderate-severe pain and patients of other races/ethnicities with severe pain demonstrated significant risk-adjusted differences in terms of narcotic analgesic receipt in the ED. Risk-adjusted rates of receipt of analgesia and narcotic analgesia for each race/ethnicity are tabulated in Supplemental Table 1 (Supplemental Digital Content 1, http://links.lww.com/MLR/B37), further stratified by pain severity.

Examination of risk-adjusted trends in administration of analgesia (all and narcotic) over time revealed no changes in dispensation habits of US hospitals to minority patients between 2006 and 2010 (Figs. 1A, B). Unadjusted results presented in Table 1 were also nonsignificant for racial/ethnic differences by year ($P = 0.681$). Table 5 further demonstrates the likelihood of receipt of analgesia based on the proportion of minority patients managed by a corresponding ED and the proportion of patients reporting severe pain at a given ED facility. Non-Hispanic black patients presenting to facilities treating the highest proportion of minority groups were less likely to receive analgesia and narcotic analgesia relative to non-Hispanic white patients [OR (95% CI) = 0.66 (0.51–0.85) and 0.68 (0.53–0.88), respectively]. Non-Hispanic black patients treated at a facility that typically sees the highest proportion of patients reporting severe pain were also less likely to receive analgesia [OR (95% CI) = 0.73 (0.60–0.90)]; all minority groups presenting to such facilities were less likely to receive narcotic analgesia ($P < 0.05$).

Risk-adjusted consideration of secondary outcome measures revealed that non-Hispanic black and Hispanic patients were more likely to have a prolonged ED-LOS

TABLE 2. Outcome Measures by Race/Ethnicity (Weighted Percentages)

	Total (n = 6710)	Non-Hispanic White (n = 4106)	Non-Hispanic Black (n = 1352)	Hispanic (n = 939)	Other (n = 313)	*P*
Primary outcome measures						
Analgesic receipt (%)	54.5	56.8	50.9	52.8	46.6	0.002*
Narcotic analgesic receipt (%)	42.1	44.2	39.5	38.5	35.8	0.002*
Secondary outcome measures						
Prolonged ED visit (>6 h) (%)	25.8	23.0	30.6	30.5	28.7	0.006*
Inpatient admission (%)	14.7	16.9	11.2	10.2	15.3	0.001*
Median ED waiting time (IQR) (min)	38 (17–88)	35 (16–79)	50 (21–113)	40 (15–96)	40 (19–86)	0.005*
Median no. diagnostic tests (IQR)	1 (0–4)	1 (0–2)	1 (0–1)	1 (0–1)	1 (0–1)	0.999

*Two-sided *P*-values <0.05 considered significant; taken from Pearson χ^2 tests for categorical variables, Kruskal-Wallis tests for non-normally distributed ED wait times and number of diagnostic tests.
ED indicates emergency department; IQR, interquartile range.

TABLE 3. Considered Predictors of Any/Narcotic Analgesic Receipt Among Patients With Nontraumatic Acute Abdominal Pain

	Any Analgesic Receipt	Narcotic Analgesic Receipt
Descriptors	**Odds Ratio (95% Confidence Interval)**	
Female sex	1.16 (1.04–1.30)*	1.08 (0.97–1.21)
Age category (reference: $^{18–25}$y)		
26–35 y	1.15 (0.99–1.34)	1.29 (1.10–1.50)*
36–45 y	1.09 (0.94–1.26)	1.29 (1.09–1.51)*
46–55 y	1.05 (0.90–1.22)	1.29 (1.09–1.52)*
56–65 y	1.00 (0.81–1.24)	1.23 (1.00–1.51)*
66–75 y	0.94 (0.73–1.19)	1.28 (0.99–1.63)
>75 y	0.68 (0.55–0.84)*	0.87 (0.70–1.10)
Race/ethnicity (reference: non-Hispanic white)		
Non-Hispanic black	0.77 (0.67–0.89)*	0.81 (0.69–0.94)*
Hispanic	0.91 (0.78–1.08)	0.86 (0.72–1.01)
Non-Hispanic others	0.70 (0.56–0.88)*	0.70 (0.54–0.91)*
Insurance type (reference: private)		
Public	0.86 (0.76–0.97)*	0.82 (0.72–0.93)*
Uninsured	1.06 (0.92–1.22)	1.00 (0.87–1.15)
Unknown	0.89 (0.71–1.12)	0.95 (0.75–1.19)
Income quartile (reference: <^{32,793})		
$32,794–$40,626	1.07 (0.93–1.23)	1.06 (0.92–1.22)
$40,627–$52,387	1.02 (0.88–1.18)	0.95 (0.82–1.11)
≥ $52,388	1.00 (0.86–1.18)	0.98 (0.83–1.15)
Unknown	1.09 (0.86–1.38)	1.10 (0.84–1.44)
Pain level (reference: severe)		
Mild	0.35 (0.29–0.42)*	0.30 (0.24–0.36)*
Moderate	0.59 (0.53–0.66)*	0.55 (0.49–0.61)*
Triage level (reference: immediate/emergent)		
Urgent	1.04 (0.88–1.23)	1.07 (0.91–1.26)
Semiurgent/nonurgent/none	0.99 (0.82–1.19)	0.98 (0.81–1.18)
Metropolitan status (reference: metropolitan)		
Nonmetropolitan	0.92 (0.78–1.08)	0.78 (0.65–0.93)*
Hospital ownership (reference: voluntary/nonprofit)		
Government/nonfederal	0.87 (0.74–1.02)	0.77 (0.65–0.92)*
Proprietary	1.04 (0.85–1.27)	0.96 (0.77–1.18)
Charlson Comorbidity Index (reference: 0)		
1	0.87 (0.65–1.16)	1.01 (0.76–1.36)
2	1.04 (0.60–1.81)	1.38 (0.80–2.37)
≥ 3	0.37 (0.13–1.08)	0.46 (0.15–1.43)
Geographic location (reference: Northeast)		
Midwest	1.11 (0.96–1.28)	1.23 (1.05–1.46)*
South	1.39 (1.20–1.61)*	1.71 (1.47–1.99)*
West	1.20 (1.00–1.42)*	1.58 (1.31–1.91)*
Year (reference: 2006)		
2007	0.89 (0.74–1.07)	0.95 (0.79–1.13)
2008	0.95 (0.80–1.12)	1.04 (0.86–1.26)
2009	0.86 (0.73–1.02)	0.85 (0.71–1.00)
2010	0.97 (0.81–1.15)	0.98 (0.82–1.17)
Proportion of presenting minorities (reference: lowest tertile)		
Intermediate tertile	0.97 (0.86–1.09)	0.96 (0.86–1.08)
Highest tertile	0.76 (0.67–0.86)*	0.75 (0.66–0.84)*
Proportion of patients with severe pain (reference: lowest tertile)		
Intermediate tertile	0.86 (0.76–0.97)*	0.84 (0.74–0.95)*
Highest tertile	0.74 (0.66–0.83)*	0.76 (0.68–0.86)*

*Statistical significance (2-sided $P < 0.05$).

compared with non-Hispanic white patients [OR (95% CI) = 1.26 (1.08–1.48) and 1.25 (1.04–1.51), respectively]. They were also less likely to be admitted to the hospital following presentation in the ED [OR (95% CI) = 0.73 (0.57–0.93) and 0.72 (0.56–0.92), respectively]. Non-Hispanic black patients were more likely to wait for prolonged periods of time in the ED [OR (95% CI) = 0.85 (0.74–0.99)]. No differences were observed in the number of diagnostic procedures performed.

DISCUSSION

The present analysis of national patterns of pain management in the ED reports worse results for racial and ethnic minorities presenting with an emergency general surgery diagnosis of acute abdominal pain relative to non-Hispanic white patients. Non-Hispanic black patients, in particular, were found to have the greatest increased odds of undertreatment for pain among the groups considered; they were also more likely to have a prolonged ED-LOS and were less likely to be admitted. Hispanic patients were similarly less likely to receive analgesics or narcotic analgesics overall but did not exhibit the same extent of undermanagement for pain as non-Hispanic black patients when records restricted to severe cases of pain were analyzed. Accounting for triage and immediacy of presentation did little to alter the effects observed. However, when stratified by (1) the proportion of minority patients treated and (2) the proportion of patients reporting severe pain, significant discrepancies in both analgesic and narcotic analgesic receipt between non-Hispanic black and white patients were found to be concentrated in hospitals treating the highest percentages of both.

Such results are consistent with previously demonstrated race-based differences in health care delivery and outcomes,[19,21,22,30–33] providing mounting evidence that racial/ethnic disparities are endemic in health care settings and are present in acute conditions as well. Multiple studies have shown that black patients suffer from higher rates of diseases, morbidity, and premature mortality compared with white patients.[6,34] They are also more likely to receive less than ideal interventions, such as limb amputations for diabetes.[34]

With regard to pain, management of the "fifth vital sign" reveals similarly documented differences among patients of varied racial backgrounds.[5] Low-quality pain management care dispensed to racial minorities has been most extensively documented in the ED[3,5,8,9,14–16,20,21] where racial minorities, particularly black patients, have been shown to receive pain medications less often and in lower quantities than white patients across a range of presentations including migraines,[17] long-bone fractures,[8,9] musculoskeletal pain,[13] and back pain.[15] Our results demonstrate consistent findings for adult patients presenting with surgical causes of abdominal pain, thereby corroborating prior work and extending existing analyses to consider a novel aspect of adult pain on a national level. Relative to pediatric reports of abdominal pain,[14,18] our results are consistent with the work of Johnson et al,[14] who reported disparities on a national scale among children/adolescents but markedly different from the findings of Caperell et al,[18] who found a lack of difference restricted to a single pediatric specialty academic ED.

In our analysis, pain management with analgesics and narcotic analgesics was insufficient for racial/ethnic minorities: non-Hispanic black and Hispanic patients. This is

TABLE 4. Risk-adjusted Relative Odds of Any/Narcotic Analgesic Receipt by Race/Ethnicity, Stratified by Level of Patient-reported Pain on Emergency Department Presentation

	Odds Ratio (95% Confidence Interval)			
Race/Ethnicity	**Overall**	**Mild Pain (1–3)**	**Moderate Pain (4–6)**	**Severe Pain (7–10)**
Any analgesic receipt				
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Non-Hispanic black	0.78 (0.67–0.90)*	1.08 (0.65–1.79)	0.71 (0.55–0.90)*	0.76 (0.63–0.92)*
Hispanic	0.93 (0.79–1.10)	0.67 (0.41–1.10)	0.95 (0.73–1.24)	0.93 (0.74–1.16)
Other	0.70 (0.56–0.88)*	1.09 (0.49–2.43)	0.56 (0.36–0.86)*	0.74 (0.53–1.04)*
Narcotic analgesic receipt				
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Non-Hispanic black	0.83 (0.71–0.96)*	0.89 (0.48–1.63)	0.71 (0.54–0.94)*	0.83 (0.70–0.99)*
Hispanic	0.88 (0.73–1.04)	0.83 (0.47–1.50)	0.84 (0.63–1.13)	0.86 (0.69–1.07)
Other	0.70 (0.54–0.90)*	1.25 (0.54–2.93)	0.63 (0.40–0.99)*	0.70 (0.50–0.98)*

Risk-adjusted for age, sex, race/ethnicity, immediacy of presentation, pain score (for overall group of patients), insurance status, year, Charlson Comorbidity Index, income, geographical location, metropolitan status of hospital township, hospital ownership, proportion of minorities treated, and proportion of patients with severe pain treated by tertile.
*Statistical significance (2-sided $P < 0.05$).

consistent with a related study by Pletcher et al,[16] who demonstrated that even though opioid analgesic prescription has steadily increased over a decade for all causes of pain presenting to the ED, differences in prescription of analgesics between racial minorities and their non-Hispanic white counterparts continue to prevail. Assessment of trends between 2006 and 2010 revealed no risk-adjusted changes in analgesic receipt for acute abdominal pain. The potential for provider bias on the basis of race in acute care analgesic administration may play a role in the management of pain among minority patients. Prior studies have demonstrated that emergency physicians prescribe analgesics less frequently to minority patients than to non-Hispanic white patients with similar pain ratings.[8,9,17] However, recent work by Haider et al[32,33] reports an overall lack of association between implicit biases for race and vignettes for clinical decision involving analgesic administration among acute care nurses and clinicians. While higher levels of analgesic receipt for acute abdominal pain are considered beneficial, the possibility of misuse, overuse, and dependency among more privileged non-Hispanic white patients also, theoretically, remains.

Identified disparities are not limited to the management of pain. Within the ED, James and colleagues noted that wait times and subsequent lengths of stay were longer for black and Hispanic patients compared with white patients.[35] This is again consistent with our analysis in which non-Hispanic black and Hispanic patients were found to have prolonged ED-LOS and were less likely to be hospitalized for their ailments. Robbins and colleagues report a similar disparity in rates of admission in their analysis of hospitalization rates for diabetes among a population of >18,000 patients obtained from the Philadelphia Department of Public Health.[36] Interestingly, Johnson et al[14] report no such differences in terms of hospitalization rates among children presenting to the ED with abdominal pain on a national scale.

As reported previously, prolonged ED wait times can be partially explained by the fact that some minority groups are more likely to experience language barriers when accessing care, making it more difficult for them to articulate their concerns effectively.[35,37] Time required to arrange for appropriate interpreters may also further account for delays in administration of care.[35,37] Given that we found no disparities in the number of diagnostic and screening procedures administered, it would not be wrong to surmise that increased ED stays could stem from logistical issues. However, verification of this supposition cannot be sufficiently ascertained in the present analysis.

Since the inception of the Joint Commission initiative for pain management in 2001, Pletcher et al[16] have noted a steady increase in the use of prescription pain medications among ED patients, yet disparities in management of pain remain and efforts to study the causes of biases among providers are limited.[19,20] The stressful and fast-paced environment of the ED frequently necessitates the use of heuristics among health care providers when under pressure and presented with limited information; racial biases and stereotypes have been shown to influence clinical decision making under such conditions.[38] The subjective nature of a patient presenting with "abdominal pain" could be certainly imagined to lead to the use of such measures under specific conditions. Additional research examining the root causes of disparities among providers will be necessary to determine the extent of such an occurrence. Future studies are also warranted to consider whether there are EDs or aspects of ED care in which race/ethnicity does not play a role and, if so, what characteristics distinguish analgesic receipt in such a place. The finding of reduced disparities in analgesic receipt among EDs treating a lower proportion of minority patients and among those with a lower proportion of patients reporting severe pain may suggest important associations related to acute care factors acting at the provider (eg, lower provider biases and/or less reliance on triage-treatment heuristics when less frequently exposed to minority patients and/or less commonly managing severe abdominal pain) or facility level (eg, hospital policies to more cautiously prescribe pain medications among populations with higher frequencies of severe reported pain).

Despite the importance of these observations, our study does come with some inherent limitations that need to be

TABLE 5. Independent Predictors of Disparities, Stratified and Risk-adjusted Relative Odds of Any/Narcotic Analgesic Receipt by Race/Ethnicity

	Proportion of Minority Patients Treated		Proportion of Patients Reporting Severe Pain		
Emergency Department Proportions	**Lowest Tertile**	**Highest Tertile**	**Lowest Tertile**	**Highest Tertile**	
Any analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
Non-Hispanic black	0.91 (0.69–1.18)	0.66 (0.51–0.85)*	0.83 (0.67–1.03)	0.73 (0.60–0.90)*	
Hispanic	1.08 (0.79–1.48)	0.83 (0.62–1.10)	0.79 (0.62–1.01)	0.92 (0.72–1.17)	
Other	0.67 (0.46–0.98)*	0.82 (0.57–1.17)	0.72 (0.49–1.07)	0.62 (0.42–0.93)*	
Narcotic analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
Non-Hispanic black	1.07 (0.79–1.45)	0.68 (0.53–0.88)*	0.86 (0.70–1.07)	0.72 (0.58–0.90)*	
Hispanic	0.92 (0.65–1.32)	0.90 (0.67–1.21)*	0.75 (0.58–0.96)*	0.76 (0.59–0.97)*	
Other	0.82 (0.55–1.20)	0.56 (0.31–0.99)	0.74 (0.50–1.10)	0.59 (0.38–0.90)*	
Demographic	**Male**	**Female**	**Adults 18–64 y**	**Adults > 64 y**	
Any analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
Non-Hispanic black	0.74 (0.57–0.96)*	0.78 (0.66–0.92)*	0.81 (0.69–0.94)*	0.51 (0.29–0.90)*	
Hispanic	0.84 (0.67–1.12)	0.97 (0.78–1.19)	0.94 (0.79–1.13)	0.84 (0.49–1.44)	
Other	0.57 (0.37–0.92)*	0.77 (0.58–1.01)	0.62 (0.49–0.78)*	1.79 (0.83–3.84)	
Narcotic analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	
Non-Hispanic black	0.73 (0.59–0.96)*	0.83 (0.71–0.99)	0.83 (0.73–0.97)*	0.46 (0.25–0.83)*	
Hispanic	0.81 (0.62–1.06)	0.90 (0.72–1.12)	0.88 (0.73–1.05)	0.75 (0.42–1.34)	
Other	0.57 (0.34–0.94)*	0.77 (0.58–1.03)	0.63 (0.49–0.82)*	1.58 (0.73–3.43)	
Socioeconomic	**Private Insurance**	**Public Insurance**	**Uninsured**	**Highest Income**	**Lowest Income**
Any analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Non-Hispanic black	0.77 (0.62–0.99)*	0.73 (0.58–0.92)*	0.86 (0.62–1.19)	0.72 (0.56–0.93)*	0.94 (0.66–1.35)
Hispanic	0.88 (0.67–1.16)	1.07 (0.81–1.41)	0.88 (0.62–1.24)	0.80 (0.57–1.11)	0.94 (0.68–1.31)
Other	0.78 (0.56–1.09)	0.75 (0.50–1.13)	0.62 (0.21–1.24)	0.79 (0.49–1.28)	0.79 (0.51–1.21)
Narcotic analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Non-Hispanic black	0.81 (0.63–1.04)	0.78 (0.61–0.99)*	0.92 (0.67–1.24)	0.76 (0.62–0.97)*	0.76 (0.55–1.05)
Hispanic	0.86 (0.65–1.15)	1.01 (0.77–1.34)	0.76 (0.54–1.08)	0.71 (0.51–0.99)*	1.11 (0.80–1.53)
Other	0.72 (0.51–1.01)	0.76 (0.47–1.21)	0.70 (0.35–1.42)	0.89 (0.51–1.54)	1.14 (0.67–1.94)
Hospital level	**Metropolitan**	**Nonmetropolitan**	**Nonprofit**	**Government**	**Proprietary**
Any analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Non-Hispanic black	0.77 (0.66–0.90)*	0.70 (0.37–1.31)	0.72 (0.61–0.86)*	0.95 (0.67–1.32)	0.99 (0.56–1.75)
Hispanic	0.94 (0.79–1.11)	0.65 [0.34–1.24)	0.98 (0.80–1.20)	0.93 (0.63–1.38)	0.89 (0.57–1.38)
Other	0.71 (0.56–0.89)*	0.56 (0.15–2.10)	0.82 (0.62–1.08)	0.45 (0.26–0.80)*	0.64 (0.29–1.40)
Narcotic analgesic receipt					
Non-Hispanic white	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Non-Hispanic black	0.81 (0.70–0.95)*	0.68 (0.37–1.23)	0.77 (0.65–0.92)*	0.81 (0.57–1.15)	1.03 (0.58–1.84)
Hispanic	0.88 (0.73–1.05)	0.53 (0.25–1.12)	0.95 (0.77–1.16)	0.75 (0.50–1.14)	0.78 (0.50–1.21)
Other	0.71 (0.55–0.92)*	0.51 (0.10–2.55)	0.81 (0.60–1.08)	0.40 (0.20–0.79)*	1.07 (0.46–2.48)

Risk-adjusted for age, sex, race/ethnicity, immediacy of presentation, pain score (for overall group of patients), insurance status, year, Charlson Comorbidity Index, income, geographical location, metropolitan status of hospital township, hospital ownership, proportion of minorities treated, and proportion of patients with severe pain treated by tertile.
*Statistical significance (2-sided $P < 0.05$).

considered when interpreting the results. Despite adjusting for triage level in our multivariable models, it is likely that less sick white patients may have received a higher urgency score. Studies have shown that white patients with chest pain are more likely to be triaged immediately relative to black and Hispanic patients.[5,6,22,36] If true, this systematic discrepancy could have led us to underestimate the observed relationship between race and pain control. However, this also further lends credence to the assertion that white patients are at an advantage compared with minority groups at receiving adequate therapeutic intervention at US health care facilities. Further, we were unable to systematically ascertain the presence of drug and alcohol abuse among patients. The CDC-NHAMCS also does not account for pain medications taken before presentation to the ED. As the survey only documents medications administered during the course of a patient's ED stay, it is possible that pain medication intake before ED presentation may have influenced pain resolution in some patients. Finally, the survey consists mainly of administrative data. As a result clinical parameters could not be used for risk-adjustment purposes. Triage status was used to gauge disease severity and comorbidities using the CCI were used to adjust for prehospital functional and physiological status of patients.

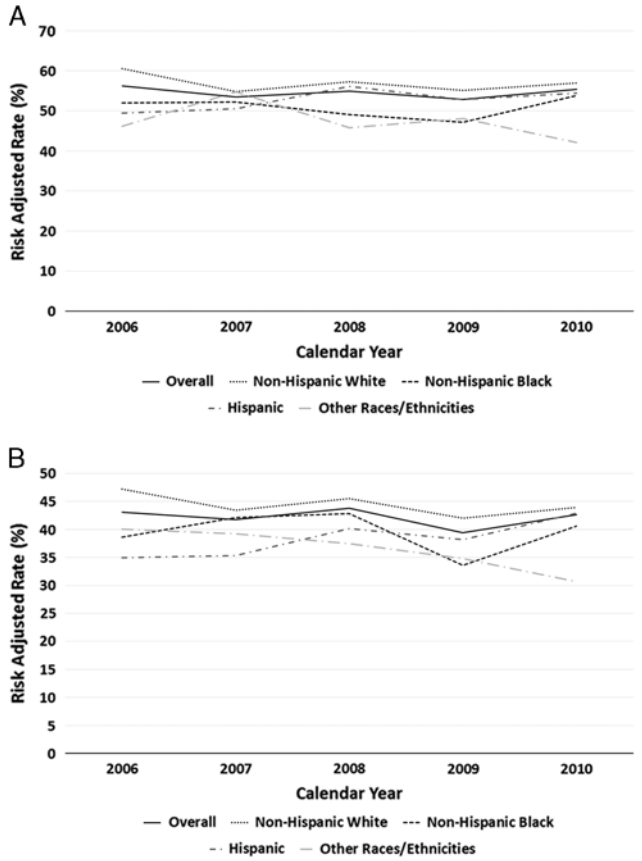

FIGURE 1. Risk-adjusted trends in treatment with any (A) and narcotic (B) analgesics from 2006 to 2010, stratified by race/ethnicity. Risk-adjusted for age, sex, immediacy of presentation, pain score (for overall group of patients), insurance status, Charlson Comorbidity Index, income, geographical location, metropolitan status of hospital township, hospital ownership, proportion of minorities treated, and proportion of patients with severe pain treated in tertiles.

The strength of our study lies in its ability to extend its findings to EDs across the United States; because it comprehensively examined surgical causes of abdominal pain, the results may also speak about biases encountered by patients admitted to other branches of surgery as well. Viewed in conjunction with results of previous studies, our findings indicate that disparities in health care delivery continue to represent an area of important concern, for as recognized by the Joint Commission, the American Academy of Pain Management, and the World Health Organization, adequate pain management is a patient's right to which providers of care must take heed while dealing with patients from different racial backgrounds.[4,5] In the present era of continually improving health care delivery models, it is essential that we as a medical community work to ensure that every patient receives unbiased empathy and the highest standard of care, regardless of his/her racial heritage.

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