Racial Disparities in Emergency Department Length of Stay for Admitted Patients in the United States

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Abstract

Objectives: Recent studies have demonstrated the adverse effects of prolonged emergency department (ED) boarding times on outcomes. The authors sought to examine racial disparities across U.S. hospitals in ED length of stay (LOS) for admitted patients, which may serve as a proxy for boarding time in data sets where the actual time of admission is unavailable. Specifically, the study estimated both the within- and among-hospital effects of black versus non–black race on LOS for admitted patients.

Methods: The authors studied 14,516 intensive care unit (ICU) and non-ICU admissions in 408 EDs in the National Hospital Ambulatory Medical Care Survey (NHAMCS; 2003–2005). The main outcomes were ED LOS (triage to transfer to inpatient bed) and proportion of patients with prolonged LOS (>6 hours). The effects of black versus non–black race on LOS were decomposed to distinguish racial disparities between patients at the same hospital (within-hospital component) and between hospitals that serve higher proportions of black patients (among-hospital component).

Results: In the unadjusted analyses, ED LOS was significantly longer for black patients admitted to ICU beds (367 minutes vs. 290 minutes) and non-ICU beds (397 minutes vs. 345 minutes). For admissions to ICU beds, the within-hospital estimates suggested that blacks were at higher risk for ED LOS of >6 hours (odds ratio [OR] = 1.42, 95% confidence interval [CI] = 1.01 to 2.01), while the among-hospital differences were not significant (OR = 1.08 for each 10% increase in the proportion of black patients, 95% CI = 0.96 to 1.23). By contrast, for non-ICU admissions, the within-hospital racial disparities were not significant (OR = 1.12, 95% CI = 0.94 to 1.23), but the among-hospital differences were significant (OR = 1.13, 95% CI = 1.04 to 1.22) per 10% point increase in the percentage of blacks admitted to a hospital.

Conclusions: Black patients who are admitted to the hospital through the ED have longer ED LOS compared to non–blacks, indicating that racial disparities may exist across U.S. hospitals. The disparity for non-ICU patients might be accounted for by among-hospital differences, where hospitals with a higher proportion of blacks have longer waits. The disparity for ICU patients is better explained by within-hospital differences, where blacks have longer wait times than non–blacks in the same hospital. However, there may be additional unmeasured clinical or socioeconomic factors that explain these results.

ACADEMIC EMERGENCY MEDICINE 2009; 16:403–410 © 2009 by the Society for Academic Emergency Medicine

Keywords: length of stay, crowding, overcrowding, boarding, disparities, emergency

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Received August 3, 2008; revisions received November 21 and November 26, 2008; accepted December 7, 2008.

Presented at the American College of Emergency Physicians (ACEP) Research Forum, October 2007, Seattle, WA.

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Many studies have demonstrated patterns of racial disparities across health care settings.[1–3] Black race is associated with reduced access to regular health care for many reasons, including lower rates of health insurance coverage, less access to primary care, and more frequent use of emergency departments (ED).[4] Once blacks have entered the health care system, they receive lower-quality health care than whites.[5–7] It has been suggested that factors such as lower-quality hospital care and a lower likelihood to receive specific indicated interventions contribute to poorer health outcomes,[8–15] but to understand where

doi: 10.1111/j.1553-2712.2009.00381.x
ISSN 1069-6563
PII ISSN 1069-6563583

interventions should begin to reduce disparities and to achieve the goals of Healthy People 2010, policymakers need to distinguish between disparities that arise out of differences in care by patient race within a hospital and those that reflect differences in care across hospitals that serve varying proportions of minority patients.[16]

The hospital ED is a primary portal of entry into the health care system for many Americans with both emergent and nonemergent medical problems. ED care provides a good opportunity to study disparities because of the pervasive public health problem of ED crowding, where patients often wait for extended periods to be evaluated by a physician for critical testing, treatment, and bed placement.[17–19] ED crowding has been associated with delays in antibiotic therapy in pneumonia, delays in thrombolysis in acute myocardial infarction, and delays in administration of pain medication for patients with severe pain.[20–24] A recent study demonstrated that disparities in waiting times do exist in emergency care and that black patients wait longer to see emergency physicians (EPs) than white patients.[25] While waiting room times are certainly important in understanding disparities, waiting room time in itself has not been associated with poorer outcomes, aside from in anecdotal cases in the popular media.[26,27] By comparison, ED boarding has been directly associated with higher rates of death in intensive care unit (ICU) patients and higher rates of ventilator-associated pneumonia in trauma patients.[28,29] To our knowledge, no studies have documented racial disparities in ED length of stay (LOS) for admitted patients, nor investigated hospital factors that may account for possible disparities.

We sought to examine racial differences in ED LOS for admitted patients by estimating the within- and among-hospital effects of black versus non–black race in U.S. hospitals. We hypothesized that blacks would have longer LOS than non–blacks. In addition, we thought the disparity would be explained in that hospitals that care for a higher proportion of black patients would have longer wait times (among-hospital effect), not that blacks in a particular hospital would wait longer (within-hospital effect).

METHODS

Study Design

This was a retrospective analysis of the National Hospital Ambulatory Medical Care Survey (NHAMCS) 2003–2005. The institutional review board determined that this protocol was exempt from informed consent.

Study Setting and Population

The NHAMCS is a population-based stratified sample of ED visits in U.S. hospitals. The survey has been conducted annually since 1992 and is overseen by the National Center for Health Statistics (NCHS), which is part of the Centers for Disease Control and Prevention. The combined 2003–2005 data set represented estimates applying to approximately 339.4 million ED visits. The NHAMCS database is a nationwide probability sample of noninstitutional general and short-stay hospitals and excludes federal, Veterans Affairs, and military hospitals. The NHAMCS uses a four-stage probability sample that includes geographic primary sampling units, hospitals within primary sampling units, EDs within hospitals, and patients within EDs. For each of the hospitals in the sample, there is a randomly assigned 4-week period of data collection. Regional staff from the U.S. Bureau of the Census oversee data collection, but it is hospital staff members who actually perform the data collection. For each patient who is sampled, data collection forms are completed directly after or close to the day of the ED visit. The NCHS provides detailed methods of the survey procedures.[30]

The primary study outcome was overall ED LOS before transfer to an inpatient bed. The secondary outcome was whether this time frame exceeded 6 hours. The LOS is the difference between the ED arrival time and the ED departure time. This includes waiting room time, evaluation time, testing time, treatment time, and transfer into an inpatient bed. We chose 6 hours as a reasonable time frame for all these activities. This time frame is supported by empirical data that demonstrate a higher death rate in ICU patients who board for more than 6 hours in the ED.[28] Because the time of admission is unavailable in the 2003–2005 NHAMCS, we used ED LOS as a proxy for boarding time. We define boarding time as the amount of time that a patient waits after a hospital bed has been requested for an admitted patient.

We studied two cohorts of patients in NHAMCS for this analysis: 1) patients admitted from the ED to ICU beds and 2) patients admitted from the ED to non-ICU beds. We excluded patients who were treated and discharged, left without being seen by a physician, left against medical advice, were admitted to ED observation units, and were transferred to other facilities. We excluded patients who did not have complete information on LOS. While the proportion of patients who were admitted who had missing data on LOS was considerable (24.5%), those with complete information on LOS and those with missing information did not differ by race, sex, or age category. However, there was significantly more missing data on non-ICU patients (24.9%) than ICU patients (21.7%). We did not impute missing data.

The primary independent variable was black race. This was coded as a set of dummy variables and included the following categories: white, black, and other/unknown race. Patient race was recorded by hospital staff during registration. In NHAMCS, each patient is only assigned one race category. For this analysis we compared blacks versus non–blacks because of the low proportion (<3%) of the other/unknown category.

We calculated two variables for this analysis: 1) the proportion of blacks who were seen in an individual hospital and 2) proportion of Medicaid patients seen at an individual hospital. These variables included all patients, regardless of admission status. Using the proportion of blacks as an example, if 10 patients were seen at Hospital A and 4 were black, the value for this individual hospital would be 40%. Patient-level confounders included sex, age group (0–18, 19–34, 35–54, 55–64, 65–80, and >80 years), insurance status, and severity of illness. Severity of illness was approximated

by the immediacy by which a patient needed to be seen by a physician and was classified into the following categories: less than 15 minutes, 15–60 minutes, >1–2 hours, and >2–24 hours. Indication for admission was divided into a binary variable whether the visit was related to injury/poisoning or not. Temporal confounders included study year, study month, day of week, and arrival time (00:01–06:00, 06:01–12:00, 12:01–18:00, and 18:01–00:00). Hospital confounders included census region of the United States (Northeast, West, South, Midwest), metropolitan statistical area (urban vs. nonurban), teaching status (teaching vs. nonteaching), hospital ownership type (government, not-for-profit, for-profit), and the proportion of Medicaid patients at the hospital.

Data Analysis

To distinguish disparities in care within hospitals from those that reflect racial and socioeconomic differences across hospitals, we decomposed the within- and across-hospital effects of race by adding as covariates the proportion of black patients at each hospital.[31,32] Analyses that fail to implement this decomposition can produce biased estimates of the effects of patient-level factors on outcomes because of confounding by hospital.[31] For the binary endpoint of ED LOS 6f >6 hours, the within-hospital parameter represents the odds that an individual black patient, having been admitted to a hospital, will spend 6 or more hours in the ED compared to non–blacks admitted to the same hospital. The among-hospital parameter represents the increase in odds that patients, regardless of race, admitted to an individual hospital must wait for 6 or more hours for each 10 percentage point increase in a hospital's proportion of black patients served. This latter parameter thus represents an ecologic effect of varying patterns of care across hospitals.

We performed separate analyses decomposing the within- and among-hospital effects for each of the cohorts (ICU and non-ICU) and then further divided these into black versus non–black patients. For assessing overall racial differences in LOS without regard to within- and among-hospital effects, we first used linear regression (for survey data) and secondarily used a log-gamma model (again for survey data) as a sensitivity analysis.[33] We then explored patient-level and hospital-level effects of race using logistic regression analysis (for survey data) for the clustered and weighted survey data on the binary outcome of LOS of >6 hours. We used successively more complex models to adjust for both patient- and hospital-level covariates. We used the following sequence for model building: 1) patient characteristics—patient age category, sex, insurance status, and severity (Model 2, Table 1); 2) temporal characteristics—study year, month, day, and arrival time category (Model 3, Table 1); 3) hospital-level confounders—census region, metropolitan statistical area, teaching status, ownership type, and proportion of Medicaid patients (Model 4, Table 1); and 4) all confounders combined (Model 5, Table 1). Statistical analyses were performed using Stata Version 10.0 (StataCorp, College Station, TX). All analyses considered the complex survey design and sampling weights following the guidance of the NCHS documentation.[34]

RESULTS

During the 3 study years (2003–2005), NHAMCS collected data on 14,516 hospital admissions from the ED in 408 hospitals. Using the weighted survey design, these observations made up 44.3 million separate hospital admissions. Of the 14,516 admissions, 1,510 (10.4%) were to ICU beds and 13,006 (89.6%) to non-ICU beds. Data on ED LOS were available for 10,955 patients

Table 1
Odds of ED LOS Greater than 6 Hours: Within- and Among-hospital Effects

	Model 1	Model 2	Model 3	Model 4	Model 5
Non-ICU					
Within-hospital	1.14 (0.97, 1.34)	1.14 (0.97, 1.34)	1.14 (0.97, 1.34)	1.16 (0.97, 1.38)	1.12 (0.94, 1.33)
Among-hospital	1.10 (1.02, 1.19)*	1.10 (1.02, 1.19)*	1.10 (1.02, 1.18)*	1.13 (1.04, 1.23)*	1.13 (1.04, 1.22)*
ICU					
Within-hospital	1.62 (1.18, 2.23)*	1.42 (1.04, 1.97)*	1.48 (1.09, 2.00)*	1.75 (1.24, 2.47)*	1.42 (1.01, 2.01)*
Among-hospital	1.02 (0.91, 1.14)	1.05 (0.94, 1.16)	1.04 (0.92, 1.17)	1.05 (0.91, 1.19)	1.08 (0.96, 1.23)

Values are reported as OR (95% CI).
The within-hospital and among-hospital odds ratios are reported from the same regression analyses. For example, for non-ICU, Model 1, within-hospital OR 1.14 and among-hospital OR 1.10 were from the same model.
Within-hospital represents the odds of an individual black patient spending 6 or more hours in the ED compared to non–blacks.
Among-hospital represents the increase in odds that patients (floor or ICU) admitted to an individual hospital wait for 6 or more hours for each 10% increase in the proportion of black patients seen at that hospital.
Model 1 = represents a model accounting for patient race (black vs. non–black) and the proportion of black patients seen at a hospital.
Model 2 = adjusts for Model 1 + sex, age category, severity, injury/poisoning, and patient insurance status.
Model 3 = adjusts for Model 1 + study year, month, arrival time category, and day of week.
Model 4 = adjusts for Model 1 + United States region, metropolitan statistical area, and hospital type (teaching vs. nonteaching), ownership, and the mean proportion of Medicaid patients who were seen at the hospital.
Model 5 = adjusts for all confounders combined.
CI = confidence interval; ICU = intensive care unit; LOS = length of stay; OR = odds ratio.
*$p \leq 0.05$.

(75.5%). The mean overall ED LOS for all admissions was 349 minutes (95% confidence interval [CI] = 326 to 372 minutes). A total of 45.8% (95% CI = 40.9% to 50.7%) of patients spent 6 or more hours in the ED. With the ED as the unit of analysis, the mean proportion of black patients seen at an individual ED was 13.2% (95% CI = 12.7% to 13.7%).

Across all hospitals, mean LOS for blacks was 367 minutes compared to non–blacks, 290 minutes (difference of means = 77 minutes, 95% CI = 16 to 139 minutes). For ICU admissions, whites were 79.3%- blacks, 17.3%; and others, 3.2%. The mean LOS was 301 minutes (95% CI = 271 to 332 minutes), and 39.1% (95% CI = 33.8% to 44.4%) stayed for more than 6 hours in the ED (Table 2). There were differences in patient and hospital characteristics that were associated with ED LOS for ICU patients (Table 3). Pediatric patients (<19 years of age) had a shorter mean LOS than adults (205 vs. 308 minutes, difference of means = 103 minutes, 95% CI = 62 to 145 minutes). Patients admitted to ICUs in the Northeast United States had a longer mean ED LOS than those in other regions (374 vs. 286 minutes,

Table 2
Patient and Hospital Characteristics of Patients by Race (Black vs. non–Blacks) Who Were Admitted to the Hospital from U.S. EDs in the NHAMCS (2003–2005)

	Non-ICU admissions (%) (n = 9,772)		ICU admissions (%) (n = 1,183)	
	Blacks	Non–Blacks	Blacks	Non–Blacks
Age category (years)				
<19	10.9	7.3	6.0	6.1
19–34	16.8	11.1	11.9	7.4
35–54	31.6	23.4	20.1	22.6
55–64	12.4	13.8	19.2	17.4
65–80	18.6	24.9	28.5	28.2
>80	9.8	19.5	14.3	18.3
Female	54.6	54.2	43.9	47.6
Anticipated source of payment				
Private insurance	22.4	30.0	15.1	29.9
Medicare	28.6	41.6	32.5	44.1
Medicaid	28.9	13.6	35.7	12.2
Worker's compensation	0.2	0.3	0.8	0.1
Self-pay	10.9	7.6	10.4	8.0
Other/unknown	9.0	6.9	5.5	5.7
Region				
Northeast	24.6	24.7	23.6	23.7
Midwest	25.9	27.3	27.2	25.7
South	42.9	29.5	43.9	30.4
West	6.6	18.5	5.3	20.2
Urban hospital location	94.4	86.0	92.5	87.1
Teaching hospital	26.7	13.6	27.2	16.8
Hospital owner				
Voluntary (nonprofit)	76.3	79.9	80.8	78.5
Government, nonfederal	14.7	12.3	15.5	14.7
Proprietary (for-profit)	8.0	7.8	3.7	6.8
Immediacy of visit				
Less than 15 minutes	27.0	29.5	50.3	48.1
15–60 minutes	39.3	39.9	32.1	33.9
>1–2 hours	15.0	11.9	6.9	4.6
>2–24 hours	3.7	3.7	3.2	1.3
Unknown	15.0	15.0	7.5	12.2
Visit related to injury or poisoning	17.6	20.3	23.6	23.9
Time of arrival				
00:01–06:00	12.4	11.6	20.8	11.9
06:01–12:00	23.8	25.3	33.5	25.4
12:01–18:00	34.9	35.1	17.9	37.7
18:01–00:00	28.9	28.0	27.8	25.0
Weekend	27.7	27.2	21.5	28.3
Month of service				
January–March	25.9	26.9	24.3	25.6
April–June	21.4	22.6	16.7	20.3
July–September	25.8	26.5	23.0	25.9
October–December	26.9	24.0	36.0	28.2
Year of service				
2003	36.6	36.3	25.0	31.9
2004	33.9	34.2	18.7	24.5
2005	29.5	29.5	56.3	43.6

ICU = intensive care unit; NHAMCS = National Hospital and Ambulatory Medical Care Survey.

difference of means = 88 minutes, 95% CI = 6 to 169 minutes). Teaching hospitals had longer mean LOS than nonteaching hospitals (358 vs. 290 minutes, difference of means = 68 minutes, 95% CI = 12 to 124). For-profit hospitals had a shorter mean LOS than other types of hospitals (226 vs. 307 minutes, difference of means = 81 minutes, 95% CI = 22 to 140 minutes).

These differences were confirmed in not only the log-gamma model with minutes of stay as the outcome, but also in logistic regression with LOS of >6 hours as the outcome. Over all hospitals, 49.6% of blacks stayed for more than 6 hours in the ED compared to 37.1% of non–blacks (difference = 12.5%, 95% CI = 4.6% to 20.6%).

For non-ICU admissions, whites made up 79.4% of admissions; blacks, 17.4%; and others, 3.3% (Table 2). The mean LOS was 355 minutes (95% CI = 331 to 379 minutes), and 45.1% stayed for greater than 6 hours in the ED. Across all hospitals, the mean LOS in the ED was 397 minutes, compared to 345 minutes for black versus non–black non-ICU patients (difference of means = 52 minutes, 95% CI = 1 to 98 minutes). Hospitals in urban areas had longer mean ED LOS for non-ICU patients than those in nonurban areas (367 minutes vs. 280 minutes, difference of means = 87 minutes, 95% CI = 16 to 157 minutes; Table 1). These associations were confirmed in the log-gamma models. A total of 51.1% stayed for 6 or more hours in the ED compared to 43.5% of non–black patients (difference = 7.3%, 95% CI = 2.6% to 12.0%).

Within-hospital Comparisons

In the within-hospital analysis (accounting for patient race and the proportion of patients who were black in the hospital), blacks admitted to ICU beds were more likely to spend 6 or more hours in the ED than non–blacks (OR = 1.62, 95% CI = 1.21 to 2.31). While some of this difference in black race could be explained by patient-level, temporal-level, and hospital-level factors, this within-hospital effect of race and overall ED LOS of >6 hours for ICU patients remained significant (OR = 1.42, 95% CI = 1.01 to 2.01; Table 1). By contrast, non-ICU black patients were not significantly more likely to spend 6 or more hours in the ED than non–blacks (OR = 1.12, 95% CI = 0.94 to 1.33). Thus, the association of race and outcome within hospital differed by the type of patient (ICU vs. non-ICU).

Among-hospital Effects

For the ICU patients, the proportion of black patients seen at a hospital (the among-hospital effect) did not predict an LOS greater than 6 hours (OR = 1.08 per 10% increase the proportion, 95% CI = 0.96 to 1.23). For non-ICU patients, by contrast, hospitals with higher proportions of blacks (the among-hospital effect) were more likely to board patients for 6 or more hours in the ED (OR = 1.13 for each additional 10% of black patients, 95% CI = 1.04 to 1.22).

DISCUSSION

We found that racial disparities exist in ED LOS for both ICU- and non-ICU–level hospital admission from

Table 3
Mean ED LOS (minutes) for Non-ICU and ICU Admissions by Hospital and Patient Characteristics in the NHAMCS (2003–2005)

	Non-ICU admissions (n = 9,772) (95% CI)	ICU admissions (n = 1,183) (95% CI)
Age (years)		
0–18	319 (285, 354)	205 (165, 245)
19–34	363 (324, 402)	305 (218, 392)
35–54	386 (351, 420)	312 (260, 363)
55–64	356 (323, 388)	315 (273, 357)
65–80	334 (309, 358)	331 (283, 379)
>80	352 (319, 386)	260 (226, 295)
Race		
White	346 (321, 370)	290 (257, 322)
Black	397 (348, 445)	367 (309, 424)
Other/unknown	386 (317, 455)	270 (191, 350)
Sex		
Male	345 (320, 369)	304 (266, 341)
Female	364 (336, 391)	299 (264, 334)
Insurance		
Private insurance	368 (330, 405)	288 (254, 321)
Medicare	351 (315, 387)	291 (234, 349)
Medicaid	375 (326, 424)	352 (248, 453)
Self-pay	407 (355, 460)	288 (187, 389)
Region		
Northeast	371 (335, 408)	374 (299, 448)
Midwest	323 (275, 371)	243 (199, 287)
South	365 (316, 413)	292 (244, 340)
West	374 (323, 424)	332 (248, 415)
Hospital location		
Urban	367 (340, 393)	309 (276, 341)
Nonurban	280 (214, 346)	248 (154, 342)
Hospital type		
Teaching hospital	387 (351, 423)	358 (300, 417)
Nonteaching hospital	349 (322, 376)	290 (259, 320)
Hospital owner		
Voluntary nonprofit (nonprofit)	344 (320, 369)	310 (279, 342)
Government, nonfederal	323 (262, 383)	255 (190, 320)
Proprietary (for-profit)	387 (260, 513)	226 (179, 273)
Immediacy of visit		
Less than 15 minutes	356 (318, 394)	272 (232, 312)
15–60 minutes	353 (321, 385)	339 (300, 377)
>1–2 hours	376 (341, 412)	366 (272, 459)
>2–24 hours	333 (298, 367)	335 (235, 435)
Unknown	357 (305, 409)	262 (198, 326)
Visit related to injury or poisoning		
Yes	343 (315, 371)	303 (250, 356)
No	359 (334, 383)	301 (269, 333)
Time of arrival		
00:01–06:00	387 (318, 456)	471 (299, 643)
06:01–12:00	394 (316, 472)	319 (229, 409)
12:01–18:00	351 (302, 399)	302 (239, 367)
18:01–00:00	324 (286, 362)	262 (185, 340)
Weekend/weekday		
Weekend	336 (307, 365)	294 (257, 331)
Weekday	363 (338, 387)	304 (270, 339)
Month of service		
January–March	336 (303, 369)	247 (213, 281)
April–June	355 (293, 416)	311 (249, 374)
July–September	367 (326, 408)	335 (288, 382)
October–December	365 (326, 404)	309 (266, 351)
Year of service		
2003	376 (335, 417)	277 (234, 321)
2004	360 (312, 407)	319 (260, 379)
2005	327 (307, 347)	307 (274, 341)

CI = confidence interval; ICU = intensive care unit; NHAMCS = National Hospital and Ambulatory Medical Care Survey.

the ED when we examined the effects across all hospitals. Blacks wait about an hour longer than non–black patients in both cohorts, indicating that racial disparities do exist in ED LOS.

The picture became more complex when we decomposed racial effects by their within- and among-hospital components and when we considered non-ICU as well as ICU patients. For ICU patients, the within-hospital racial disparities persisted, indicating that black patients stay longer in the ED than the non–black patients in the same hospital. For non-ICU patients, within-hospital differences were not statistically significant, and the disparity is explained by among-hospital differences. That is, hospitals with a higher proportion of ED visits by blacks tend to have longer ED LOS for non-ICU patients.

Emergency department LOS from arrival to transfer to an inpatient bed entails a number of steps requiring high-level care and coordination. Some of these steps include: 1) triage nurse evaluation; 2) ED room or hallway placement; 3) EP evaluation; 4) test ordering, test completion, and diagnosis; 5) treatment initiation for the primary reason for admission; 6) request by the ED for an inpatient bed; 7) transfer of care to another physician; 8) admissions staff search for available beds (ICU or non-ICU); and 9) transport to the bed. When there are no beds available, or beds are reserved for other patients (e.g., elective admissions), patients board in the ED before transfer to their inpatient beds. ED boarding impedes overall ED flow because the boarders occupy ED beds for long periods, which reduces the capacity to care for new patients.[35,36] When patients board for long periods, they often do not receive the highest quality care.[28,29] The issue is that boarders are traditionally cared for either by EPs who are busy with other patients or by inpatient doctors whose admitted patients are geographically in a different part of the hospital. Furthermore, ED nurses must often care for boarders as inpatients while attending to new patients. This can reduce the quality of care for both the boarders and the new patients.[37] This boarding hazard makes the observed racial disparity in ED LOS in this study a measurable quality issue in U.S. hospital care.

We were unable to directly measure the boarding times in this study because the data were not available in NHAMCS. It is certainly possible that differences could be accounted for because other aspects of care may be prolonged, such as longer waiting times to be seen, for test results, and for decisions to admit. However, the one study that did measure differences in waiting times in NHAMCS for blacks versus non–blacks found only a 7-minute difference in waiting room time across all ED patients and no differences in waiting times for more severely ill patients.[25] Therefore, it is possible that the observed 52- to 77-minute difference in LOS may be accounted for by ED boarding.

Disparities in ED boarding are particularly concerning because of the known associations between longer boarding times and higher death rates (over 4% absolute risk difference) in patients admitted to the ICU who are boarded in the ED for 6 or more hours after admission.[28] Our study found that half of black ICU patients are exposed to prolonged ED LOS compared to 37% of non–blacks. The fact that almost 40% of ICU patients in the United States spend more than 6 hours in the ED and that blacks are 12.5% more likely to experience longer ED stays than non–blacks is indicative of the widespread nature of ED crowding and its disparate impact on underrepresented minorities.

How best to remedy these disparities depends on the source of the differences in care times. If disparities exist by race within individual hospitals, the remedies will lie in the education of hospital staff and the implementation of policies about treatment of patients without regard to their background or economic status. If disparities exist among hospitals, then their resolution lies in the improvement of practices at hospitals that serve larger number of racial minorities.

Other work has documented racial disparities in ED care.[38–41] However, these studies did not explicitly decompose the within- and among-hospital components of disparities in the same analysis. When studies have integrated the hospital effects into the analysis, such as in a recent study of time to intervention for acute myocardial infarction, they have found that disparities represent among-hospital effects, not different treatment of patients within the same hospital.[42] By contrast, in our study, we found that within-hospital disparities persisted after controlling for other patient-level factors and after ensuring that these disparities were not confounded or confused with among-hospital racial disparities. It is possible that other factors that we did not measure, such as indication for admission, bed type (medical vs. surgical), severity of illness, crowding levels, ED-based testing, or other unmeasured confounders such as socioeconomic status might account for these differences. However, it is still not clear to us exactly why this disparity persists after adjusting for many factors. We were unable to conclude from these data whether individual-level racial bias or residual confounding accounts for this effect. Future studies in this area should further delineate reasons for these disparities. Furthermore, policymakers should consider broad measurement and reporting of ED boarding times to assure that disparities are eliminated for measurable elements of hospital care that are known to be hazardous.

We also found other notable differences in ED LOS by patient and hospital characteristics in our study. For ICU patients, pediatric patients had the shortest LOS, perhaps because pediatric ICUs have more available capacity than adult ICUs or are able to prepare beds more rapidly for new patients. There were also some notable geographic disparities in LOS. ED patients admitted to ICUs in the Northeast United States had longer LOS, perhaps because of a greater supply–demand mismatch for ICU care in Northeastern hospitals. Teaching hospitals also had longer ED boarding times for ICU patients, perhaps because of either a shortage of ICU beds in teaching facilities or competing demands for the same resources for direct admissions. For-profit hospitals were more efficient in moving ICU patients out of the ED. The same differences were not observed for non-ICU patients. However, urban hospitals had longer LOS than nonurban hospitals, indicating

that overall hospital crowding might be a larger problem in urban areas.

LIMITATIONS

Categorization of black compared to non–black might result in miscategorization of patients with mixed ethnicity. We also have no assurances that racial designations are assigned consistently across hospitals. We did not adjust for admission diagnosis, which also might confound this analysis. We also did not assess delays in other unmeasured times, such as time from bed request to ED departure, which may be more accurate measures of ED boarding. In addition, there was a considerable amount of data where LOS was missing, which may introduce selection bias into the analysis. This selection bias was greater in non-ICU patients than ICU patients. We also used triage category as a proxy for severity, which might not accurately reflect true severity of illness uniformly across hospitals. In addition, while we did adjust for indication for admission with injury/poisoning in the modeling strategy, because of the heterogeneity in ED patients' diagnoses, we did not adjust further for ICD-9-CM code or reason for visit. Because blacks may be admitted with different admission diagnoses and may have a different spectrum of diseases, this may have biased our results. Finally, we are unable to validate the accuracy of the LOS variable in NHAMCS because it is a national sample collected from multiple EDs and data are deidentified. This might have introduced measurement error into this study.

CONCLUSIONS

Blacks who are admitted to U.S. hospitals through the ED wait for about an hour longer than non–blacks before transfer to inpatient beds. These differences are concerning because they may reflect differences in ED boarding times, which are known to be associated with adverse outcomes in ICU patients. Our analysis revealed conflicting results depending on the type of patient and whether the focus of comparison was patients of different races at the same hospital, or hospitals that served different proportions of minority patients. Health policy and interventions to remediate any disparities, regardless of the source, must consider carefully the complexities of the problem and potential for differences in within- and between-hospital effects.

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