Racial and ethnic disparities in interhospital transfer for complex emergency general surgical disease across the United States

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BACKGROUND: Differential access to specialty surgical care can drive health care disparities, and interhospital transfer (IHT) is one mechanism through which access barriers can be realized for vulnerable populations. The association between race/ethnicity and IHT for patients presenting with complex emergency general surgery (EGS) disease is understudied.

METHODS: Using the 2019 Nationwide Emergency Department Sample, we identified patients 18 years and older with 1 of 13 complex EGS diseases based on *International Classification of Diseases, Tenth Revision*, diagnosis codes. The primary outcome was IHT. A series of weighted logistic regression models was created to determine the association of race/ethnicity with the primary outcome while controlling for patient and hospital characteristics.

RESULTS: Of 387,610 weighted patient encounters from 989 hospitals, 59,395 patients (15.3%) underwent IHT. Compared with non-Hispanic White patients, rates of IHT were significantly lower for non-Hispanic Black (15% vs. 17%; unadjusted odds ratio (uOR) [95% confidence interval (CI)], 0.58 [0.49–0.68]; $p < 0.001$), Hispanic/Latinx (HL) (9.0% vs. 17%; uOR [95% CI], 0.48 [0.43–0.54]; $p < 0.001$), Asian/Pacific Islander (Asian/PI) (11% vs. 17%; uOR [95% CI], 0.84 [0.78–0.91]; $p < 0.001$), and other race/ethnicity (12% vs. 17%; uOR [95% CI], 0.68 [0.57–0.81]; $p < 0.001$) patients. In multivariable models, the adjusted odds of IHT remained significantly lower for HL (adjusted odds ratio [95% CI], 0.76 [0.72–0.83]; $p < 0.001$) and Asian/PI patients (adjusted odds ratio [95% CI], 0.73 [0.62–0.86]; $p < 0.001$) but not for non-Hispanic Black and other race/ethnicity patients ($p > 0.05$).

CONCLUSION: In a nationally representative sample of emergency departments across the United States, patients of minority race/ethnicity presenting with complex EGS disease were less likely to undergo IHT when compared with non-Hispanic White patients. Disparities persisted for HL and Asian/PI patients when controlling for comorbid conditions, hospital and residential geography, neighborhood socioeconomic status, and insurance; these patients may face unique barriers in accessing surgical care. (*J Trauma Acute Care Surg.* 2023;94: 371–378. Copyright © 2022 American Association for the Surgery of Trauma.)

LEVEL OF EVIDENCE: Prognostic and Epidemiologic; Level III.

KEY WORDS: Race/ethnicity; surgical disparities; interhospital transfer; emergency general surgery.

Differential access to specialty care can drive surgical disparities.[1,2] For complex emergency general surgical conditions that pose an immediate threat to life, studies have demonstrated improved outcomes at high-volume tertiary centers with advanced clinical resources such as immediate operating room capabilities, interventional radiology procedures, and intensive care unit availability.[3,4] Because many patients with complex emergency general surgery (EGS) disease will initially present to community hospitals, their ability to access advanced surgical care becomes largely dependent on the process of interhospital transfer (IHT).[5–7]

Standard protocols exist to guide triage and disposition for patients with traumatic injuries, but guidelines for when to initiate IHT for patients with EGS disease are lacking.[6,8] Instead, the decision to admit a patient versus transfer them to a higher-level center depends on providers' discretion about their illness severity and clinical needs, logistical and administrative concerns such as the availability of beds at the referral hospital, and the patient's own preferences.[9,10] The Emergency Medical Treatment and Active Labor Act forbids hospitals from denying or limiting emergency treatment to patients based on their ability to pay.[11] Furthermore, it requires that all patients be transferred to (and must be accepted by) referral hospitals if they require specialized care not available at the original facility.[11]

Still, when guidelines are vague and transfer practices are varied, opportunities for structural and interpersonal discrimination can arise.[12,13] Previous studies have observed an association between race/ethnicity and the likelihood of IHT for certain time-sensitive medical conditions such as acute myocardial ischemia and acute ischemic stroke, suggesting that IHT is a potential mechanism for race-based health disparities.[12,14–16] However, the relationship between race/ethnicity and IHT for patients with surgical disease remains unclear.[7] In some studies, racial and ethnic surgical disparities appear to be driven by unequal social determinants of health such as relative neighborhood deprivation and uninsured or underinsured insurance status.[1] In others,

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surgical disparities persist when controlling for these variables, suggesting that there are additional unknown mechanisms driving observed disparities that warrant closer examination.[1,2]

In this study, we aimed to determine if race and ethnicity are associated with the odds of IHT for patients with complex EGS disease across the United States. We hypothesized that minoritized patients would be less likely to undergo IHT when compared with White patients and anticipated that these differences would persist after controlling for known predictors of IHT such as age, comorbid conditions, insurance coverage, socioeconomic status, and initial presentation to rural hospitals.[7,17] Understanding the magnitude of racial and ethnic disparities in IHT for surgical patients is imperative if we are to develop more effective and equitable systems to deliver high-quality EGS care.

PATIENTS AND METHODS

This study was approved by the institutional review board; the requirement for informed consent was waived as patient-level data in NEDS are deidentified. The EQUATOR network STROBE guideline was used to ensure proper reporting of methods, results, and discussion (Supplemental Digital Content, Supplementary Data 1, http://links.lww.com/TA/C811).

Data Source and Study Design

A cross-sectional analysis of the 2019 Nationwide Emergency Department Sample (NEDS) was performed. Developed by the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project, NEDS is the largest all-payor emergency department (ED) database in the US and includes variables with clinical, geographic, hospital, and patient information.[18] Nationwide Emergency Department Sample encounters are weighted to provide national estimates of ED care. The 2019 edition of NEDS contains 33,147,251 unweighted ED visits, representing approximately 143 million weighted encounters from 989 hospitals in 40 states and the District of Columbia.[18]

Inclusion Criteria

We included all adult patients (18 years and older) who presented with 1 of 13 complex EGS conditions: appendicitis, cholecystitis, diverticulitis, esophageal perforation, hernia, perforated ulcer, pancreatitis, intestinal obstruction, intestinal ischemia, intestinal colitis, pleural space infection, breast infection, and perirectal abscess. These diagnoses were identified based on *International Classification of Diseases, Tenth Revision* (*ICD-10*), codes that have been previously mapped to the anatomic severity grading system developed by the American Association for the Surgery of Trauma.[19,20] We used the dichotomized schema described by Scott et al.[19] to define "more complex" versus "less complex" disease for each of these 13 diagnoses. Patients with "less complex" disease were excluded from our analysis. Patients who were "treated and released," that is to say, discharged from the ED, were also excluded. All *ICD-10* codes used in our analysis are provided in Supplemental Digital Content (Supplementary Table 1, http://links.lww.com/TA/C812).

Outcome

The primary outcome of interest was IHT, which is designated in NEDS as an ED disposition of "transfer out." Patients who underwent IHT were compared with patients who were directly admitted to the index hospital.

Covariates

Patient and hospital characteristics were extracted from the database to evaluate their associations with the primary outcome. The primary predictor was race/ethnicity, a categorical variable defined in NEDS as White, Black, Hispanic, Asian or Pacific Islander (Asian/PI), Native American, and other. To facilitate comparisons with adequate group sizes, we subsequently grouped patients as non-Hispanic White (NHW), non-Hispanic Black (NHB), Hispanic/Latinx (HL), Asian/PI, and other. The Charlson Comorbidity Index (CCI) was used as a metric of comorbid conditions and was calculated based on *ICD-10* codes.[21]

Primary insurance payor was grouped into public, private, self-pay, and other. Socioeconomic status (SES) was based on median household income of the residential zip code using 2019 American Community Survey estimates.[22] The location of patients' residence was designated metropolitan or nonmetropolitan based on population density in Rural Urban Commuting Area Codes.[23] Metropolitan included the following groups: "Central counties of metro areas of ≥1 million," "Fringe counties of metro areas of ≥1 million," "Counties in metro areas of 250,000–999,999," and "Counties in metro areas of 50,000–249,999." Nonmetropolitan included "Micropolitan counties" and "Not metropolitan or micropolitan counties."[18] Region was assigned by NEDS as West, South, Midwest, and Northeast based on patient state of residence.

The hospital location and teaching status was designated as urban teaching, urban nonteaching, or rural based on NEDS groupings. The urban-rural location of the hospital is determined at the county level, with categorization based on Urban Influence Codes.[24] An ED is considered a teaching hospital if it has one or more Accreditation Council for Graduate Medical Education–approved residency programs, is a member of the Council of Teaching Hospitals, or has a ratio of full-time equivalent interns and residents to beds of 0.25 or higher. Teaching status is only used to stratify EDs in metropolitan areas; in NEDS, hospitals in rural or micropolitan areas are considered nonteaching by default. Of note, NEDS captures only hospital-owned EDs; therefore, "transfer" implies that a patient was transferred from the ED to a different hospital, separate from the facility by which it is owned.[18]

Day of admission is a binary variable provided by NEDS and is defined as a weekday (Monday to Friday) or weekend (Saturday and Sunday). Of note, patients were excluded if they were missing information on sex, race, insurance payor, or zip code. In this cohort, 34,947 (3.1%) of patients had missing data and were excluded.

Statistical Analysis

All statistical analyses were performed using R (version 4.2.1; R Foundation for Statistical Computing, Vienna, Austria).[25] Univariate analyses were performed using χ^2 tests for categorical variables and Kruskal-Wallis rank sum tests for continuous variables. Hypotheses were tested using a two-sided approach with $p < 0.05$ considered significant. The R package "survey" was used to incorporate the NEDS-provided discharge weights.[26]

Univariate logistic regressions were used to calculate the unadjusted odds of IHT by race/ethnicity. We then developed

TABLE 1. Patient and Hospital Characteristics

	Admitted (n = 328,215)	Transferred (n = 59,395)	*p*
Age group, n (%)			<0.001
18–44 y	96,728 (29.5)	6,571 (11.1)	
45–64 y	128,517 (39.2)	15,576 (26.2)	
65–84 y	88,894 (27.1)	27,573 (46.4)	
≥85 y	14,076 (4.3)	9,675 (16.3)	
Sex, n (%)			<0.001
Female	157,071 (47.9)	31,348 (52.8)	
Race/ethnicity, n (%)			<0.001
NHW	223,523 (68.1)	45,711 (77.0)	
NHB	37,060 (11.3)	6,373 (10.7)	
HL	47,850 (14.6)	4,719 (8.0)	
Asian/PI	7,552 (2.3)	887 (1.5)	
Other	12,229 (3.7)	1,706 (2.9)	
CCI			<0.001
0	204,109 (62.2)	23,003 (38.7)	
1	74,801 (22.8)	16,754 (28.2)	
2	31,280 (9.5)	11,411 (19.2)	
3+	18,025 (5.5)	8,226 (13.9)	
Primary payor, n (%)			<0.001
Private	131,530 (40.1)	11,150 (18.8)	
Medicare	47,544 (14.5)	5,913 (10.0)	
Medicaid	107,423 (32.7)	38,787 (65.3)	
Other	11,313 (3.5)	1,239 (2.1)	
Self-pay	30,406 (9.3)	2,305 (3.9)	
Median household income quartile, n (%)			<0.001
1st	86,817 (26.5)	17,839 (30.0)	
2nd	80,859 (24.6)	15,581 (26.2)	
3rd	83,264 (25.4)	14,269 (24.0)	
4th	77,274 (23.5)	11,705 (19.7)	
Residential location, n (%)			<0.001
Urban	281,398 (85.7)	45,322 (76.3)	
Day of transfer, n (%)			0.3
Weekend	85,320 (26.0)	15,691 (26.4)	
Disease, n (%)			<0.001
Appendicitis	104,336 (31.8)	7,605 (12.8)	
Cholecystitis	3,961 (1.2)	1,040 (1.8)	
Diverticulitis	83,879 (25.6)	13,805 (23.2)	
Esophageal perforation	4,193 (1.3)	2,642 (4.5)	
Hernia	110,996 (33.8)	23,002 (38.7)	
Perforated ulcer	6,249 (1.9)	2,918 (4.9)	
Pancreatitis	17,903 (5.5)	3,674 (6.2)	
Intestinal obstruction	2,980 (0.9)	1,232 (2.1)	
Intestinal ischemia	10,808 (3.3)	4,336 (7.3)	
Intestinal colitis	5,109 (1.6)	2,357 (4.0)	
Pleural space infection	3,967 (1.2)	2,159 (3.6)	
Breast infection	373 (0.1)	52 (0.1)	
Perirectal abcess	5,883 (1.8)	3,141 (5.3)	
Hospital location and teaching status, n (%)			<0.001
Urban teaching	225,395 (69)	34,709 (58)	
Urban nonteaching	69,152 (21)	12,886 (22)	
Rural	33,667 (10)	11,799 (20)	
Hospital region, n (%)			<0.001
Midwest	72,403 (22)	15,994 (27)	
Northeast	64,082 (20)	11,271 (19)	
South	124,656 (38)	21,331 (36)	
West	67,074 (20)	10,800 (18)	

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TABLE 1. *(Continued)*

two successive multivariable logistic regression models to determine the association of race/ethnicity and IHT and evaluate the influence of covariates. The selection of covariates was made a priori based on factors known to influence IHT.[1,2,7,12,13,27] In our first multivariable model (Model 1), the following covariates were included: age, sex, EGS disease, CCI, metropolitan versus nonmetropolitan residence, hospital region, hospital rurality, and hospital teaching status. Based on previous surgical disparities research,[1,2] we hypothesized that SES and insurance payor would be key mechanisms underlying the association between race/ethnicity and IHT. Therefore, a second model (Model 2) was constructed, adding insurance and median household income quartile by zip code to the variables in Model 1.

Multicollinearity was assessed using variance inflation factors; all variance inflation factor values were less than 5, and no covariates were eliminated or combined due to multicollinearity.[28] Discrimination was measured using the area under the receiver operating characteristic curve, and calibration was assessed with the Brier score.[29]

Sensitivity Analysis

Because smaller nonacademic hospitals are more likely to initiate IHT,[13] we performed a sensitivity analysis wherein we analyzed only patients first presenting to rural hospitals or urban nonteaching hospitals, hereafter referred to as "community" hospitals. For this subgroup, we performed the same series of logistic regression analyses described previously (univariable model, multivariable Model 1, and multivariable Model 2).

RESULTS

A total of 89,850 patient encounters from 989 EDs were available for analysis, representing a nationally weighted population of 387,610 patients with complex EGS disease. Of the 387,610 weighted patient encounters, 59,395 (15.3%) underwent IHT. Patient and hospital characteristics of the admitted versus transferred groups are presented in Table 1. Compared with admitted patients, transferred patients were more likely to be NHW (77.0% vs. 68.1%, $p < 0.001$), 65 years and older (62.7% vs. 31.4%, $p < 0.001$), and female (52.8% vs. 47.9%, $p < 0.001$); have a CCI score of 3 or greater (13.9% vs. 5.5%, $p < 0.001$); have Medicaid insurance (65.3% vs. 32.7%, $p < 0.001$); live in a zip code with median household incomes in the top two quartiles (56% vs. 51%, $p < 0.001$); live in a nonmetropolitan residence (24% vs. 14%, $p < 0.001$), present to a rural hospital (20% vs. 10%, $p < 0.001$); and present to a hospital in the Midwest (27% vs. 22%, $p < 0.001$).

The results of our univariable and multivariable logistic regression models are presented in Table 2. The rates of IHT were

TABLE 2. Unadjusted and Adjusted Odds of IHT by Race/Ethnicity

	Univariate Model			Multivariable Model 1			Multivariable Model 2		
Characteristic	**OR**	**95% CI**	***p***	**aOR**	**95% CI**	***p***	**aOR**	**95% CI**	***p***
Race/ethnicity									
NHW	—	—		—	—		—	—	
Asian/PI	0.57	0.49–0.68	<0.001	0.73	0.60–0.89	0.002	0.76	0.63–0.91	0.004
Hispanic/Latino	0.48	0.43–0.54	<0.001	0.77	0.70–0.86	<0.001	0.76	0.69–0.84	<0.001
NHB	0.84	0.78–0.91	<0.001	0.97	0.89–1.05	0.4	0.92	0.84–1.00	0.05
Other	0.68	0.57–0.81	<0.001	0.92	0.79–1.08	0.3	0.93	0.80–1.09	0.4
Age group									
18–44 y				—	—		—	—	
45–64 y				1.40	1.29–1.52	<0.001	1.35	1.24–1.47	<0.001
65–85 y				3.17	2.88–3.49	<0.001	2.16	1.95–2.40	<0.001
85+ y				6.76	6.03–7.59	<0.001	4.54	4.01–5.13	<0.001
Sex									
Female				—	—		—	—	
Male				0.90	0.87–0.94	<0.001	0.93	0.89–0.97	<0.001
Disease									
Appendicitis				—	—		—	—	
Breast infection				2.02	1.05–3.92	0.04	1.94	1.00–3.76	0.05
Cholecystitis				2.27	1.85–2.78	<0.001	2.20	1.79–2.70	<0.001
Diverticulitis				1.63	1.44–1.83	<0.001	1.61	1.42–1.81	<0.001
Esophageal perforation				6.91	5.79–8.23	<0.001	6.61	5.54–7.89	<0.001
Hernia				1.69	1.51–1.89	<0.001	1.60	1.43–1.79	<0.001
Infectious colitis				4.15	3.23–5.34	<0.001	3.85	2.99–4.96	<0.001
Intestinal ischemia				3.20	2.64–3.88	<0.001	3.05	2.52–3.69	<0.001
Intestinal obstruction				3.98	3.13–5.07	<0.001	3.76	2.97–4.78	<0.001
Pancreatitis				2.18	1.85–2.56	<0.001	2.05	1.75–2.41	<0.001
Perforated ulcer				3.36	2.88–3.92	<0.001	3.30	2.82–3.86	<0.001
Perirectal abscess				6.71	5.65–7.95	<0.001	6.23	5.24–7.40	<0.001
Pleural space infection				4.75	3.96–5.69	<0.001	4.54	3.79–5.44	<0.001
CCI									
0				—	—		—	—	
1				1.34	1.26–1.43	<0.001	1.28	1.21–1.36	<0.001
2				1.79	1.66–1.93	<0.001	1.67	1.55–1.81	<0.001
3+				2.06	1.90–2.24	<0.001	1.91	1.76–2.08	<0.001
Residential location									
Rural				—	—		—	—	
Urban				0.92	0.83–1.02	0.1	0.97	0.87–1.08	0.6
Hospital location teaching status									
Urban teaching				—	—		—	—	
Rural				2.47	2.09–2.93	<0.001	2.46	2.07–2.92	<0.001
Urban nonteaching				1.36	1.21–1.53	<0.001	1.35	1.20–1.52	<0.001
Hospital region									
Midwest				—	—		—	—	
Northeast				0.82	0.71–0.93	0.003	0.83	0.72–0.95	0.01
South				0.78	0.69–0.89	<0.001	0.78	0.69–0.89	<0.001
West				0.80	0.67–0.94	0.01	0.80	0.67–0.95	0.01
Insurance payor									
Private							—	—	
Medicaid							1.38	1.26–1.51	<0.001
Medicare							1.87	1.72–2.03	<0.001
Other							1.18	1.00–1.38	0.05
Self-pay							0.99	0.87–1.13	0.9

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TABLE 2. *(Continued)*

	Univariate Model			Multivariable Model 1			Multivariable Model 2		
Characteristic	OR	95% CI	p	aOR	95% CI	p	aOR	95% CI	p
Median household income quartile									
1st							—	—	
2nd							0.94	0.86–1.02	0.2
3rd							0.92	0.83–1.02	0.1
4th							0.87	0.78–0.97	0.01

significantly lower for NHB (15% vs. 17%; unadjusted odds ratio [uOR] [95% confidence interval (CI)], 0.58 [0.49–0.68]; $p < 0.001$), HL (9.0% vs. 17%; uOR [95% CI], 0.48 [0.43–0.54]; $p < 0.001$), Asian/PI (11% vs. 17%; uOR [95% CI], 0.84 [0.78–0.91]; $p < 0.001$), and other race/ethnicity (12% vs. 17%; uOR [95% CI], 0.68 [0.57–0.81]; $p < 0.001$) patients when compared with NHW patients. In multivariable Model 1, when compared with NHW patients, the adjusted odds of IHT were significantly lower for HL (adjusted odds ratio [aOR] [95% CI], 0.76 [0.72–0.83]; $p < 0.001$) and Asian/PI patients (aOR [95% CI], 0.73 [0.62–0.86]; $p < 0.001$). The aOR for IHT was not statistically different for NHB ($p = 0.4$) and other race/ethnicity patients ($p = 0.2$). In multivariable Model 2, zip code–based median household income and insurance status were added as additional covariates. All trends observed in Model 1 were preserved in Model 2 for all racial/ethnic minority groups; there was no significant attenuation of the adjusted odds of IHT when comparing Models 1 and 2 (Table 2).

In the sensitivity analysis of nonteaching community hospitals, there were 127,505 weighted ED encounters total, with 24,686 (19.3%) resulting in IHT. The results of our univariable and multivariable logistic regression models for this subgroup are presented in Table 3. All trends observed for the full cohort were preserved in this subgroup: in the unadjusted model, NHW patients were more likely to be transferred when compared with all other minority race/ethnicity groups ($p < 0.001$). The associations between race/ethnicity and IHT were attenuated but still significantly different for HL ($p < 0.001$) and Asian/PI patients ($p < 0.001$) in sequential multivariable Models 1 and 2 (Table 3).

DISCUSSION

In a nationally representative sample of EDs across the United States, patients of minority race/ethnicity presenting with complex EGS disease were less likely to undergo IHT when compared with NHW patients. For HL and Asian/PI patients, the associations between IHT and race/ethnicity were attenuated but not completely diminished in our multivariable models. Our findings suggest that additional mechanisms beyond age, comorbid conditions, hospital and residential location, SES, and insurance may drive disparities in IHT for HL and Asian/PI patients. These populations may face unique barriers to accessing advanced surgical care that warrant close examination.

Racial and ethnic disparities in IHT have been previously observed for patients in medical specialties. For example, Shannon et al.[12] studied patients with Medicare who presented with common medical conditions that are known benefit from higher levels of care, including acute myocardial infarction, stroke, sepsis, and respiratory diseases. Minoritized patients experienced overall lower rates of transfer.[12] Similarly, in their study of mechanically ventilated patients with sepsis, Tyler et al.[30] found that NHB and HL patients were significantly less likely to be transferred to another hospital when compared with NHW patients, disparities not explained by medical diagnoses or illness severity. Vaughan Sarrazin et al.[16] found that HL patients with acute ischemic stroke who are transferred for potential thrombectomy are less likely to be transported by helicopter (vs. ambulance) when compared with their NHW peers.

For surgical patients, the relationship between race/ethnicity and IHT directly from the ED has not been established. Ingraham et al.[13] studied surgical patients who were admitted to a hospital as inpatients and subsequently transferred to another facility; NHB and HL patients were less likely to be transferred when compared with NHW patients, although hospital-level characteristics had the strongest associations with IHT. In a subsequent study, using NEDS data for the years 2010 to 2014, Fernandes-Taylor and colleagues[7] studied EGS patients who underwent IHT directly from ED and found that patients who were older, had complex medical conditions, and initially presented at small rural hospitals were more likely to be transferred. However, race/ethnicity data were not available in previous editions of NEDS, and so their associations with IHT were unable to be determined.[7] Our findings add to this literature by demonstrating an independent association between race/ethnicity and IHT in a contemporary cohort of patients presenting to US EDs with complex EGS disease, a disparity that persists after multivariable adjustment specifically for HL and Asian/PI patients.

There are several possible reasons for why minority race/ethnicity patients with complex EGS disease may experience lower rates of IHT. Longstanding structural inequities in the health care system affect the type of facility where minoritized patients first present and to where they are referred for both elective and urgent/emergent surgical care.[31,32] Khubchandani et al.[33] examined national EGS capacity and found that counties with greater percentages of NHB, HL, uninsured, and low-education individuals and rural counties disproportionately lacked access to EGS care. Dimick et al.[32] found a strong relationship between racial segregation and the likelihood that minoritized patients underwent surgery at low-quality hospitals, suggesting that race-based differences in referral patterns significantly affect access to specialty surgical care. Minoritized patients may be less likely than NHW patients to present to hospitals that are members of large health care systems, which can streamline transfers to specialized centers.[12,32] In our study, we attempted to control

TABLE 3. Sensitivity Analysis Demonstrating the Unadjusted and Adjusted Odds of IHT by Race/Ethnicity for Patients Presenting to Nonteaching Hospitals

	Univariate Model			Multivariable Model 1			Multivariable Model 2		
Characteristic	**OR**	**95% CI**	***p***	**aOR**	**95% CI**	***p***	**aOR**	**95% CI**	***p***
Race/ethnicity									
NHW	—	—		—	—		—	—	
Asian/PI	0.46	0.33–0.65	<0.001	0.55	0.37–0.80	0.002	0.59	0.41–0.83	0.003
Hispanic/Latino	0.54	0.46–0.64	<0.001	0.80	0.67–0.95	0.01	0.78	0.65–0.94	0.009
NHB	0.81	0.71–0.93	0.002	0.90	0.79–1.04	0.2	0.84	0.73–0.97	0.02
Other	0.73	0.56–0.96	0.02	0.91	0.67–1.22	0.5	0.91	0.68–1.23	0.6
Age group									
18–44 y				—	—		—	—	
45–64 y				1.29	1.14–1.45	<0.001	1.25	1.11–1.41	<0.001
65–85 y				2.43	2.13–2.79	<0.001	1.73	1.48–2.03	<0.001
85+ y				4.92	4.10–5.90	<0.001	3.44	2.82–4.20	<0.001
Sex									
Female				—	—		—	—	
Male				0.91	0.85–0.97	0.003	0.93	0.87–0.99	0.03
Disease									
Appendicitis				—	—		—	—	
Breast infection				1.41	0.52–3.87	0.5	1.34	0.50–3.60	0.6
Cholecystitis				1.64	1.23–2.20	<0.001	1.61	1.20–2.17	0.002
Diverticulitis				1.50	1.28–1.75	<0.001	1.48	1.26–1.73	<0.001
Esophageal perforation				8.63	6.56–11.4	<0.001	8.21	6.22–10.8	<0.001
Hernia				1.61	1.37–1.89	<0.001	1.52	1.30–1.79	<0.001
Infectious colitis				3.16	2.02–4.95	<0.001	2.91	1.87, 4.55	<0.001
Intestinal ischemia				3.52	2.58–4.78	<0.001	3.36	2.47–4.58	<0.001
Intestinal obstruction				2.92	2.00–4.26	<0.001	2.78	1.91–4.06	<0.001
Pancreatitis				1.94	1.57–2.39	<0.001	1.82	1.47–2.24	<0.001
Perforated ulcer				3.33	2.63–4.21	<0.001	3.28	2.58–4.16	<0.001
Perirectal abscess				6.46	5.09–8.19	<0.001	5.94	4.67–7.55	<0.001
Pleural space infection				5.15	3.74–7.09	<0.001	4.86	3.53–6.68	<0.001
CCI									
0				—	—		—	—	
1				1.10	1.00–1.21	0.05	1.05	0.96–1.16	0.3
2				1.40	1.24–1.58	<0.001	1.31	1.16–1.48	<0.001
3+				1.54	1.35–1.76	<0.001	1.44	1.26–1.64	<0.001
Residential location									
Rural				—	—		—	—	
Urban				0.55	0.48–0.64	<0.001	0.62	0.53–0.73	<0.001
Hospital region									
Midwest				—	—		—	—	
Northeast				0.71	0.56–0.89	0.004	0.74	0.59–0.94	0.01
South				0.72	0.58–0.89	0.003	0.70	0.56–0.87	0.001
West				0.82	0.62–1.09	0.2	0.84	0.63–1.12	0.2
Insurance payor									
Private							—	—	
Medicaid							1.23	1.08–1.40	0.002
Medicare							1.70	1.50–1.93	<0.001
Other							0.93	0.73–1.18	0.5
Self-pay							1.12	0.94–1.33	0.2
Median household income quartile									
1st							—	—	
2nd							0.90	0.78–1.05	0.2
3rd							0.81	0.68–0.97	0.02
4th							0.69	0.56–0.84	<0.001

for geography and hospital type by including metropolitan versus nonmetropolitan location and teaching status in our multivariable modeling. However, it is likely that there are institutional and community-level differences within these groups that are not adequately captured by these data.

We know that some transfers occur because of patients' requests rather than providers' recommendations.[9] Patients and their proxy decision makers who experience effective communication with providers develop a detailed understanding of their options for treatment and can subsequently advocate for IHT may be at a distinct advantage.[12] Although we could not capture these dimensions in the current study, racial/ethnic minority patients may have cultural or language barriers that can significantly affect this process. For example, insufficient access to medical interpreters and translated materials can contribute to poor communication and disparate care.[34,35] This may partially explain why IHT disparities persisted for HL and Asian/PI patients in our multivariable model where they did not for NHB patients, as HL and Asian/PI patients are much more likely to have limited English proficiency.[36] Relatedly, there may be significant distrust in the health care system bred by experiences of discrimination, immigration challenges, and the underrepresentation of minority patients in health care professions.[1,37]

Emergency and surgical providers may be affected by implicit biases against minoritized patients, leading them to underestimate the severity of their illnesses and recommend IHT less often.[12,38,39] Unfortunately, implicit biases are widespread in the United States, and they can affect patient-provider interactions, treatment decisions, treatment adherence, and patient health outcomes.[38,39] It is well established that providers are more likely to have negative biases against non-White patients.[39]

Calls for well-defined EGS transfer criteria and integrated systems of care have been made to ensure that high-risk patients are rapidly identified at initial presentation and efficiently transferred to hospitals with appropriate resources.[6,8] The development of standardized care algorithms has proven successful for other time-sensitive conditions such trauma and acute myocardial infarction for improving outcomes and reducing disparities.[8,40] For example, in North Carolina, after the implementation of a state-wide system for ST-segment-elevation myocardial infarction, preexisting disparities in time to reperfusion NHB patients when compared with NHW patients were reduced.[40] Going forward, careful monitoring of how systemic changes affect disparities for EGS patients is crucial to ensure that all patients are benefitting in an equitable manner. Organized systems of EGS care will need to address both initiation of IHT and ensuring that patients with complex disease are transferred to high-quality hospitals.[8]

Preventing unnecessary transfers for patients with less complex disease will be an important component of systemic improvement as well.[8,41,42] National data have shown lower mortality rates for EGS patients at high-volume hospitals, but the benefit is primarily experienced by high-acuity patients with a predicted risk mortality of 4% or greater.[3,4] Interhospital transfer requires substantial health care resources and significantly impacts patients and families who often have to travel far from home.[6,8] In addition, if beds at tertiary centers are used for low-risk patients who could have received high-quality care at their index hospitals, the overall transfer capacity of the system is limited.[10] Optimizing IHT to high-quality hospitals for patients with complex disease and minimizing unnecessary transfers will be crucial to improving patient outcomes and minimizing disparities.[8,41,42]

This study has several limitations. First, there is significant potential for unmeasured confounding, which is inherent to administrative databases. We included the CCI as a covariate to reflect comorbid conditions and only included patients with *ICD-10* codes for complex EGS disease to minimize the effect of unmeasured severity of illness. However, incomplete adjustment for hospital and clinical factors may still contribute to our findings.

Second, our observed outcomes are not generalizable to all minoritized communities. In part, this was due to small group sizes of certain racial designations including American Indian/Alaskan Native patients that were combined into a single "other" category. As well, each minoritized group represents significant cultural and socioeconomic diversity: HL Americans represent ethnic heritage from more than 20 different countries,[37] while the Asian American group includes more than 50 ethnicities and 100 languages.[43] It is unreasonable to make inferences about such heterogenous groups, and closer examination of individual communities is warranted to better understand their lived experiences of EGS care.

Last, we were unable to compare clinical outcomes with this data set. Therefore, whether IHT was ultimately beneficial for these patients is unknown. Our findings highlight significant racial and ethnic disparities in the transfer process itself; future work comparing clinical outcomes for patients with these complex EGS conditions who are transferred with those who are treated at the index facilities will be crucial to determine which patients most benefit from transfer and therefore where system-level interventions should focus.

CONCLUSIONS

In a nationally representative sample of EDs across the United States, patients of minority race/ethnicity presenting with complex EGS disease were less likely to undergo IHT when compared with NHW patients. Age, comorbid conditions, hospital type, rural versus urban geography, SES, and insurance did not fully explain the disparities observed for HL and Asian/PI patients, who may face unique barriers in accessing surgical care.

AUTHORSHIP

S.E.I., B.T.B., and M.L.M. participated in the literature search, study design, data collection, data analysis, data interpretation, writing, and critical revision of the manuscript. J.J.H. participated in the study design, data analysis and interpretation, and critical revision of the manuscript.

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DISCLOSURE

The authors declare no conflicts of interest.

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