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Impact of Ethnicity in Upper Gastrointestinal Hemorrhage

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Abstract

Goals—To examine ethnicity's role in the etiology and outcome of upper gastrointestinal hemorrhage (UGIH).

Background—UGIH is a serious condition with considerable associated morbidity and mortality.

Study—We analyzed 2196 patients admitted with acute UGIH between January 2006 and February 2012. Complete clinical data was gathered prospectively and entered into our GI Bleed Registry, which captures demographic and clinical variables. Results were analyzed using the Chi-square analyses and the analysis of variance techniques with Tukey multiple comparisons.

Results—Among 2196 patients, 620 (28%) were Black, 625 (29%) White, 881 (40%) Hispanic, and 70 (3%) were members of other ethnicities. Gastroduodenal ulcers (25%), esophageal varices (25%), and esophagitis (12%) were the most frequently identified causes of UGIH. Blacks experienced a high rate of gastroduodenal ulcers (199/620), while Hispanics most commonly had esophageal varices. In all ethnicities, the most common cause of bleeding in patients younger than 35 or older than 65 was gastroduodenal ulcer disease. However, among patients aged 35–64, there were differences in the etiology of UGIH. Blacks aged 50–64 frequently experienced gastroduodenal ulcers, while Hispanics aged 35–49 typically had esophageal varices. Rebleeding rates were significantly lower in Whites (5.8%) than in Hispanics (9.9%) or Blacks (8.7%) ($p=0.02$).

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Conclusions—By examining a diverse population, we conclude that UGIH may follow trends. Hispanics were likely to have esophageal varices and higher rebleeding rates, while Blacks were likely to have ulcers and the highest mortality. Whites were equally likely to have ulcers or varices, but a lower rate of rebleeding.

Keywords

bleeding; varices; peptic ulcer; demographics; mortality

Introduction

Gastrointestinal hemorrhage is a frequent cause of hospitalization, though many advances have been made in diagnosis and treatments. Upper gastrointestinal hemorrhage (UGIH) typically affects 100 to 150 per 100,000 adults in each year¹⁻³ and usually causes death in 6-14% of those it affects.^{3, 4} Patient morbidity and mortality is typically proportional to the degree of initial blood loss, the rate of rebleeding after endoscopy, underlying illnesses, and importantly, the patient's age⁴⁻⁷

Data to date suggest that all ethnic groups are affected by UGIH across most, if not all, age ranges.^{5, 7-10} However, some variations in the etiology of bleeding may be present in different ethnic groups. For example, previous reports have noted that Hispanic as well as Black ethnic groups will typically bleed from gastric and duodenal ulcers.⁹ On the other hand, other reports have emphasized that Asian patients will experience hemorrhages from esophageal varices as well as gastric ulcers.¹⁰⁻¹² Peptic ulcer disease has been reported to be the most common cause of UGIH in Whites.¹³

We have noted in our clinical practice that there appear to be different patterns associated with UGIH in different ethnic groups. Therefore, we have specifically postulated that certain causes of UGIH vary among different ethnic groups, and moreover, that outcomes may differ in some of these populations. Since we care for an ethnically diverse population, we aimed to analyze patients with UGIH in order to (1) understand how ethnicity correlates with the cause of the UGIH, (2) evaluate whether the identified diagnoses vary in different age groups, and (3) to determine whether ethnicity may play a role in UGIH morbidity and mortality.

Materials and Methods

Materials

The study evaluated patients who presented to Parkland Memorial Hospital (Dallas, TX) and UT Southwestern University Hospital (Dallas, TX) with an acute upper gastrointestinal hemorrhage between January 1, 2006, and February 27, 2012. Patients with all forms of gastrointestinal bleeding are identified, and extensive data is prospectively gathered and recorded in a Gastrointestinal HealthCare Registry database (Microsoft Access, Microsoft Corporation, Redmond, WA). Such data included demographic, historical, and clinical information (gender, age, ethnicity, aspirin (ASA) and non-steroidal anti-inflammatory drugs (NSAID) use, and presentation type), as well as American Society of

Anesthesiologists (ASA) score on physical status (1-3 = normal to severe; 4-5 = life threatening to moribund), medications, laboratory and endoscopic data (endoscopic diagnosis, stigmata of recent or active hemorrhage, and therapies). Primary hemostasis rates, treatment failures, 30 day rebleeding, and 30 day mortality events are also collected.

Methods

UGIH was defined as reported or witnessed melena, hematemesis, coffee ground emesis, or hematochezia (in patients with hematochezia, upper gastrointestinal hemorrhage is considered to be present only in the setting of a concomitant documented upper gastrointestinal tract lesion) in the setting of at least a 4-point drop in hematocrit from baseline or normal.

By design, for the purposes of prospective inclusion into the registry, a bleeding lesion or a lesion with stigmata of recent bleeding in any given case is designated as the primary diagnosis. When more than one lesion or diagnosis is present in addition to the primary lesion, it is considered a secondary lesion, but not deemed to be the cause of hemorrhage. Primary bleeding lesions are assigned to one of the following: esophageal varices, erosive esophagitis, esophageal ulcers, Mallory Weiss tear, gastric varices, portal hypertensive gastropathy, gastric ulcer, erosive gastritis, duodenal ulcer, erosive duodenitis, Dieulafoy (any location), vascular ectasias (any location), neoplasia (any location), other, or no source identified. The etiology of bleeding is routinely assigned by the attending physician responsible for the procedure. In situations in which there is disagreement between such assignment and the study team, a three-panel group adjudicates the bleeding lesion (in a blinded fashion).

Each UGIH event in which a patient was admitted into the hospital was considered a new index event. Patients were divided into 4 distinct patient self-reported ethnic groups as follows (at Parkland Memorial Hospital, patients are routinely asked to provide their ethnicity and this is entered into the electronic medical record administratively) – Black, White, Hispanic, and other (including Native American, Alaskan Native, Asian, East Indian, and Pacific Islander).

Patient-reported alcohol (greater than 2 drinks per day for men and one drink per day for women) and illicit drug use, smoking, as well as any NSAID or ASA use within the previous year were recorded. We used the time frame of 30 days after the initial hemorrhage event to identify outcomes. The infections we chose to recognize included urinary tract infections (UTI), pneumonia, spontaneous bacterial peritonitis (SBP), and bacteremia. If a patient contracted at least one of these infections, we noted the patient “positive” for infections. The lesion responsible for UGIH was determined by the endoscopy team at the time of endoscopy.

Helicobacter pylori status was determined by employing one or more of the following techniques: (1) serological testing for *Helicobacter pylori* antibodies, (2) stool samples for antigens, (3) random biopsies taken during endoscopy, and (4) the *Campylobacter*-like Organism (CLO) Test or Rapid urease test. If any of the tests were positive for *Helicobacter pylori* the patient was presumed to have a *Helicobacter pylori* mediated ulcer.

Hepatitis C status was determined by the presence of HCV antibody and/or RNA testing as per standard practice. Hepatitis B status was determined by serologic testing for antibodies against hepatitis B surface antigen and/or DNA testing as per standard practice. Prospective collection of these data began in January 2010, and previous time frames were excluded from the study to prevent biases in reporting.

Rebleeding is defined as visualization of vomited red blood, a drop in hematocrit of 9 points (or hemoglobin 3g/dL) after endoscopy or by development of hypotension (systolic blood pressure 90) more than 2 hours after endoscopy.

Causes of death for all patients are classified into 8 groups (also adjudicated by the study group) which include the following: gastrointestinal bleeding, cardiorespiratory failure, renal failure, liver failure, sepsis, multiorgan system dysfunction (MODS), malignancy, or other. The study was approved by the institutional IRB.

Statistical analyses included frequency distributions for the categorical measurements and calculation of summary statistics (mean and standard deviation) for continuous variables. Comparisons between ethnic groups for categorical measurements utilized likelihood ratio Chi-Square analyses. For numerical measurements, one way analysis of variance was utilized followed by pairwise comparison employing the Tukey technique.

Results

Among the 2196 patients admitted with an acute UGIH, 2069 patients presented at Parkland, while 127 patients presented at University hospital. Within the entire group, 620 (28.2%) were Black, 881 patients (40.1%) were Hispanic, 625 (28.5%) were White, and 70 (3.2%) were members of another ethnic group (Table 1). Of the total 2196, 1920 patients were single episodes, while 276 patients were admitted more than once, with 191 experiencing only one recurrent event. Male patients outnumbered females by roughly 2:1 ($p = 0.01$). The average age of the patient was approximately 52 years, with little meaningful variation among ethnic groups. There were minor deviations among the lifestyle variables in each of the races. ASA and NSAID use was relatively common across ethnic groups, as was alcohol and cigarette use. Smoking and illicit drug use was highest in Whites (63% and 31% respectively), and Blacks (62% and 27% respectively). Alcohol consumption was essentially the same in Hispanics (63%) and Whites (63%).

Clinical features were similar in all groups (Table 2). Melena (63%) was the most common mode of presentation. As expected, hematochezia (around 8% for all major ethnic groups) was not as frequent as the other bleeding presentations. The pre-endoscopy Rockall score (2.0) was analogous across all ethnic groups, with only minor deviations. Measures of hemodynamic stability were comparable for all ethnic groups. Notably, laboratory abnormalities were similar across the ethnic groups, and included the findings of anemia, elevated BUN, and slight elevations in INR, consistent with UGIH. ASA scores were comparable (2.5) for all ethnic groups, with only minor variations. As might be expected, patients with variceal hemorrhage had slightly higher ASA scores.

Across all ethnicities, the most common etiologies of UGIH included gastric and duodenal ulcers (26%), esophageal varices (25%), and esophagitis (12%) (Table 3). However, there were differences in the causative lesions of UGIH across the various ethnic groups. Hispanics more frequently experienced esophageal varices (34%) when compared with Whites (25%) and Blacks (12%) (and others) ($p < 0.001$). In contrast, gastric and duodenal ulcers were more commonly identified in Blacks (32%) ($p < 0.001$). While gastric and duodenal ulcers were notably less common in Hispanics ($p < 0.001$). Interestingly, ulcer disease and esophageal varices were found in equal frequencies in Whites (25% each, respectively).

Causative bleeding lesions also varied with age (Figures 1A-D, Figures 2A-B, Supplemental Table 1). First, all ethnicities experienced a majority of their hemorrhages between the ages of 35-49 and 50-64, with approximately 75% of our patients falling in that range. Very few patients bled between 18-34 years (9%), and over 65 years (16%). However, different races bled more commonly at different ages. Black and White patients more frequently bled in the 50-64 age group (50% of all Black UGIH patients, and 44% of all White UGIH patients), while Hispanic patients experienced more UGIH between the ages of 35-49 (40% of all Hispanic UGIH patients). However, as a whole, the Hispanic group bled younger, with 51% of all Hispanic patients between the years of 18-34 and 35-49. Further, White and Hispanic patients had a high incidence of esophageal varices, especially in the 35-49 and 50-64 age groups. Esophageal varices were extremely uncommon in Black and White patients younger than 35, and over 65. Blacks had a notably high incidence of ulcer mediated UGIH in the 50-64 age group. Lastly, in patients over the age of 65, there were more incidences of gastroduodenal ulcer mediated bleeding than variceal mediated bleeding, regardless of ethnicity.

Out of 2196 patients, 731 (33%) had determination of *H. pylori* status. As would be predicted, *H. pylori* was not tested for in patients with variceal bleeding, or in those with bleeding from other lesions. Of those with bleeding gastroduodenal ulcer ($n = 559$), *H. pylori* was positive in 198 (35%), negative in 218 (39%), and not tested in 143 (26%). Among the 198 patients who tested positive, a majority were Hispanic (43%) and Black (38%), while few were White (15%). Conversely, of the 218 who tested negative, the patients were more evenly distributed with 67 Black patients (31%), 57 Hispanics (26%), and 80 White patients (37%). Interestingly, Hispanics bleeding from gastroduodenal ulcer (176) are more likely to be *H. pylori* positive (50%), while Whites bleeding from gastroduodenal ulcer (155), are more likely to be *H. pylori* negative (52%). Blacks, on the other hand, are equally likely to be positive or negative for *H. pylori* when hemorrhaging from a gastroduodenal ulcer.

Of the 847 patients with bleeding from 2010 to 2012 in whom hepatitis status was prospectively collected, Blacks and Whites had similar frequencies of hepatitis at 24% and 27%, respectively, while Hispanics had the lowest frequency of hepatitis at 15% (Figure 3A). Hepatitis B was relatively uncommon, being present in less than 1% of patients overall. The proportion of patients with bleeding and hepatitis was similar in Blacks and Whites, again being lowest in Hispanics (Figure 3B).

Blood transfusions were common in all groups (Table 4). Across all ethnic groups, approximately 58% of all patients required blood transfusions, while the average number of units of packed red blood cells (PRBCs) given was approximately four. Interestingly, Hispanics had more ICU transfers (9%) ($p = 0.01$) than other groups, while both Whites and Hispanics were equally likely to develop infections such as bacteremia, SBPs, pneumonia, and UTIs (2% each, respectively). All of the ethnic groups were equally likely to need an additional surgery (3%) after their endoscopy procedure, as well as additional support from a mechanical ventilator (5%), though these differences were not statistically significant across the groups. In Whites, rebleeding rates (6%) were statistically significantly lower than in Hispanics (10%) or Blacks (9%) ($p = 0.02$). However, for all causative lesions of upper gastrointestinal hemorrhage, mortality rates (6%) were similar for all ethnic groups.

When outcomes were considered specifically in patients with variceal and gastroduodenal ulcer mediated bleeding, we found that mortality rates were higher for Blacks than all the other ethnic groups (Figures 4A-B, Supplemental Tables 2 & 3), although these differences were not statistically significantly different. Interestingly, although Hispanics with varices had the highest rebleeding rate (13%), they had the lowest mortality rate (6%); however, this difference was not statistically significant across the groups. Further still, whether they bled from ulcers or varices, Hispanics had the lowest mortality rate (4% and 6%, respectively) though these differences were not statistically significant. Whether initially they bled from ulcers or varices, Whites had the lowest rebleeding rates (5% for each, respectively). Differences in outcomes were the same in the 2 hospital systems.

Discussion

Here, we have identified differences and similarities in the clinical features of UGIH among individuals of different ethnicities. Importantly, the demographics of patients presenting to our hospitals are representative of the demographics of Dallas County.¹⁴ Men were more likely to experience an acute UGIH consistent with previous literature,^{6, 8, 15, 16} outnumbering women by at least a 2:1 margin (male Hispanics with UGIH outnumbered Hispanic women approximately 3:1). Regardless of their gender or ethnicity, patients with UGIH were typically in their middle adulthood, which is consistent with previous literature.^{6, 17} The incidence of alcohol use, drug use, and cigarette smoking varied slightly with ethnicity. As might be expected, variceal bleeding was associated with higher alcohol consumption in all races.¹⁸

We have also shown that the causative lesions associated with UGIH vary among different ethnic groups. Hispanics were significantly more likely to bleed from esophageal varices, while gastroduodenal ulcers were most common causative lesion in Blacks. Other ethnic groups were also likely to have ulcers, consistent with previous studies reporting ulcers to be prominent in Asians.^{8, 11} Additional research could be done to determine if additional factors are at play, namely the presence of *H. pylori* as this entity has a well-known association with gastroduodenal ulcers and UGIH, that influence the etiology of hemorrhage.^{19, 20} We also found that UGIH etiology and patient age had important relationships. As previously reported, UGIH is most common between the ages of 34-49 and 50-64.^{6, 17} However, we found that patients over 65 were more likely to bleed from ulcers

than other diagnoses, particularly esophageal varices. These data suggests that further research may help elucidate the reason for this finding; including, perhaps, that ulcer mediated bleeding more frequently occurred in our elderly patients simply because their cirrhosis and variceal counterparts had previously died.

Hispanic patients, the ethnic group that most commonly had varices, also had the greatest amount of alcohol consumption – consistent with previous data suggesting that alcohol use is correlated with variceal bleeding.^{18, 21} Interestingly, Whites, who also had a similar amount of alcohol consumption, did not experience an equivalent amount of variceal bleeding as the Hispanics, as the literature might suggest.^{18, 21} Further research may need to be done to determine if there are ethnic factors at play that induce certain diagnoses. We were surprised to find that Blacks, whose alcohol consumption was close to that of the White population, hemorrhaged from esophageal varices much less frequently than did their White or Hispanic counterparts. The other remarkable finding was that although variceal bleeding was more frequent in Whites and Hispanics than in Blacks, mortality was greater in Blacks (Figures 4A-B). This was unexpected since it is well known that variceal bleeding is associated with poorer outcomes than bleeding from other causes.²²⁻²⁴ Further studies may help us better understand why Blacks appear to have poorer outcomes with UGIH than other ethnic groups, including, perhaps, a confounding variable, such as a diagnosis of chronic hepatitis or other comorbid conditions.

Notably, Hispanic patients appeared to have the highest frequency of esophageal variceal hemorrhage (Table 3), yet, they had the lowest mortality rate (Figures 4A-B). A possible contributing factor could be the age at the time of bleeding. It has previously been shown that age appears to be an independent risk factor for an increase in morbidity and mortality gastrointestinal hemorrhage.⁷ For example, it was reported that the risk for mortality increases with age as follows: 3.3% for ages 21-30, 10.1% for ages 41-50, and 14.4% for ages 71-80.⁷ We found that Blacks and Whites bled more frequently in the 50-64 age group, while Hispanics bled more frequently in the 18-34 and 35-49 age groups (Figures 1A-1D). Further, Black patients who bled from esophageal varices did so at an older age than Hispanics (Figures 2A-2B). Thus, we speculate that the age of patients could have impacted the mortality, with younger Hispanic patients having lower mortality rate than Black and White patients who typically bled at an older age.

Of note, the distribution of hepatitis burden across ethnicities correlated with current literature, with Hispanics seeming to have a lower burden than Whites or Blacks.^{25, 26} We noted that patients of Hispanic ethnicity appeared to have the lowest prevalence of hepatitis also had the highest frequency of variceal bleeding (Figure 3A-B, Table 3). Patients of Black or White ethnicity had a higher burden of hepatitis, but a similar proportion of bleeding from ulcers and varices (Figure 3A-B, Table 3). Since varices most commonly result from portal hypertension and cirrhosis, this finding suggests that Hispanic patients have non-viral forms of liver disease, consistent with a higher rate of fatty liver disease, and possible non-alcoholic steatohepatitis in this group^{27, 28}. We considered the possibility that alcohol use could explain the difference, but we noted that alcohol use was just as frequent in White and Hispanic patients (Table 1). These data further raise the possibility that sparks the opportunity for further research to determine the correlation of chronic liver conditions

and the types of hemorrhaging, and if various ethnicities are more susceptible to certain lesions.

Of note, we collected data from our two hospital systems, Parkland Memorial Hospital and UT Southwestern University Hospital. Though both hospitals draw patients from Dallas County, inherent differences may be present that influenced patient morbidity, including a higher proportion of Hispanics presenting at Parkland. Because a smaller sample presented to University Hospital than compared to Parkland (127 patients vs. 2069), we are unable to definitively state whether there were inherent differences among the populations in the hospitals.

Further, though we included patients who had multiple events, the proportion of this group compared to the larger group is small (276 patients) and additionally, the characteristics of patients with recurrent bleeding appeared to be similar to those with single bleeding episodes – 24% were Black, 41% Hispanic, 25% were White, and 2% other ethnicities, with 8% (22 patients) reporting a different ethnicity on at least one bleed. Overall, Hispanic patients tended to rebleed more frequently (10%) with Black patients a close second (9%) (Table 4); interestingly, of the group with multiple events, Blacks tended to rebleed more frequently (20%) than Hispanics (16%). Further still, of those who rebled, Hispanic patients were most likely to rebleed from varices, while Blacks did not tend to rebleed from ulcers. We found this intriguing, and raises the possibility that there could be ethnic differences in the likelihood or cause of rebleeding.

As evidenced by these findings, different ethnicities may be innately predisposed to different lesions. Reducing external risk factors, including smoking or alcohol use, may influence the overall risk of hemorrhage from an ethnicity's most likely lesion. Further, Hispanics and Blacks have a higher rate of rebleeding and other complications after hemorrhage and perhaps should be monitored more closely after the index bleed. It could be speculated that Blacks, especially, whose mortality was highest regardless of etiology, and might benefit from careful monitoring after bleeding, especially after bleeding from high-risk lesions. Further, different age groups are at risk for different lesions – older individuals are at risk for ulcers more so than for varices. Since different age groups and ethnicities are more correlated with different diagnoses, it is may be possible to implement preventative measures in these groups.

Although this study has a number of strengths, including its large size, prospective design, and diverse population, we recognize potential limitations of this study. First, we used several patient-reported variables including ethnicity, history of smoking, alcohol and drug use, which various patients may be reluctant to disclose. However, many of these self-reported variables have been validated in other settings,²⁹⁻³¹ so we believe that they are robust. While the patient population that we studied is diverse, including as many or more White and Hispanic patients as Blacks, it did not include a large number of patients from other ethnic groups. Thus, we are unable to comment on many of these other groups. However, the data raise the possibility that there may be inherent differences among various populations.

In summary, while we have found many similarities, we also discovered many important differences in the clinical features of UGIH among various ethnicities. Hispanics were more likely to have esophageal varices, while Blacks were more likely to bleed from gastric and duodenal ulcers. In contrast, White patients were equally likely to experience hemorrhaging from esophageal varices as gastroduodenal ulcers. UGIH frequently occurs between the ages of 34-49 and 50-64,^{6, 17} with 75% of our patients in that age range. We found that patients over 65 years of age were more likely to bleed from gastroduodenal ulcers than other diagnoses, particularly esophageal varices. Varices, in particular, were common in younger Hispanic patients. Further, Hispanics with varices had the highest rebleed rates, but the lowest number of deaths. Finally, whether bleeding from esophageal varices or ulcers, Blacks experienced higher mortality rates, while Whites tended to have the lowest rebleeding and moderate mortality rates.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Distribution of diagnoses across ethnic groups and age

The absolute frequency of gastroduodenal ulcers, esophageal varices, and all diagnoses are shown for Blacks (A), Hispanics (B), Whites (C), and all patients (D). *Includes gastric and duodenal ulcers († $p < 0.001$; ‡ $p < 0.01$ vs. other ethnic groups).

Figure 2. Distribution of varices or ulcers across age and ethnic groups

The absolute frequency of patients with gastroduodenal ulcers (A) and esophageal varices (B) within each ethnic group in different age groups is depicted († $p < 0.001$ vs. other ethnic groups).

Figure 3. Frequency of hepatitis among ethnic groups

In (A) the overall hepatitis rate (for hepatitis B and hepatitis C), diagnosed by antibody, RNA or DNA testing, is shown. In (B), the number of patients with bleeding, overall, and in those with hepatitis, among the different ethnic groups is shown. Hepatitis status was collected from 1/2010 until the conclusion of the study, including 847 patients.

Figure 4. Frequency of complications among ethnic groups with ulcer and variceal bleeding
The rebleeding (A) and mortality (B) rate among the patients presenting with gastroduodenal ulcers and esophageal varices among the various ethnic groups is shown.

Table 1

Patient demographics

	Black (N=620) n(%) / Mean $\pm$ SD	Hispanic (N=881) n(%) / Mean $\pm$ SD	White (N=625) n(%) / Mean $\pm$ SD	other* (N=70) n(%) / Mean $\pm$ SD	All (N=2196) n(%) / Mean $\pm$ SD	p-value
Demographics						
Male	397 (64)	632 (72)	414 (66)	47 (67)	1490 (68)	0.01
Age	54.1 $\pm$ 13.0	50.5 $\pm$ 13.8	52.4 $\pm$ 13.2	54.8 $\pm$ 13.2	52.2 $\pm$ 13.5	<0.001
Lifestyle						
Aspirin use	148 (24)	121 (14)	100 (16)	16 (23)	385 (18)	<0.001
NSAID use	119 (19)	125 (14)	126 (20)	9 (13)	379 (17)	0.01
Smoking	383 (62)	376 (43)	394 (63)	33 (14)	1186 (54)	<0.001
Alcohol use	330 (53)	552 (63)	391 (63)	30 (43)	1303 (59)	<0.001
Drug use	166 (27)	170 (19)	193 (31)	9 (13)	538 (25)	<0.001

* Includes American Indian/Alaska Native/Asian/Pacific Islander/East Indian

Table 2

Clinical features

	Black (N=620) n(%) / Mean $\pm$ SD	Hispanic (N=881) n(%) / Mean $\pm$ SD	White (N=625) n(%) / Mean $\pm$ SD	other* (N=70) n(%) / Mean $\pm$ SD	All (N=2196) n(%) / Mean $\pm$ SD	p-value
Pulse	92 $\pm$ 21	93 $\pm$ 21	95 $\pm$ 20	93 $\pm$ 20	93 $\pm$ 21	0.23
Systolic pressure	129 $\pm$ 27	124 $\pm$ 25	122 $\pm$ 24	123 $\pm$ 23	124 $\pm$ 25	<0.001
Diastolic pressure	74 $\pm$ 18	70 $\pm$ 16	69 $\pm$ 16	69 $\pm$ 17	71 $\pm$ 17	<0.001
Rockall (pre-endoscopy)	2.1 $\pm$ 1.4	2.0 $\pm$ 1.3	2.0 $\pm$ 1.4	2.1 $\pm$ 1.5	2.0 $\pm$ 1.4	0.29
ASA score	2.5 $\pm$ 0.7	2.5 $\pm$ 0.7	2.5 $\pm$ 0.7	2.5 $\pm$ 0.6	2.5 $\pm$ 0.7	0.96
Bleeding						
Hematemesis	339 (55)	549 (62)	384 (61)	35 (50)	1307 (60)	0.01
Melena	389 (63)	535 (61)	407 (65)	55 (79)	1386 (63)	0.01
Hematochezia	51 (8)	77 (9)	45 (7)	11 (16)	184 (8)	0.10
Lab values						
HGB	9.1 $\pm$ 3.6	9.4 $\pm$ 3.8	9.5 $\pm$ 2.7	9.0 $\pm$ 2.2	9.3 $\pm$ 3.4	0.21
HCT	27.5 $\pm$ 7.7	27.8 $\pm$ 7.4	28.5 $\pm$ 7.7	26.8 $\pm$ 6.5	27.9 $\pm$ 7.6	0.07
PLT	216 $\pm$ 116	166 $\pm$ 124	191 $\pm$ 128	167 $\pm$ 96	187 $\pm$ 124	<0.001
MCV	87 $\pm$ 27	89 $\pm$ 27	90 $\pm$ 33	85 $\pm$ 8	89 $\pm$ 28	0.10
BUN	31 $\pm$ 28	28 $\pm$ 27	31 $\pm$ 29	33 $\pm$ 24	30 $\pm$ 28	0.07
INR	1.4 $\pm$ 1.0	1.4 $\pm$ 0.8	1.4 $\pm$ 0.7	1.4 $\pm$ 0.8	1.4 $\pm$ 0.9	0.97
PTT	28 $\pm$ 11	29 $\pm$ 13	29 $\pm$ 10	28 $\pm$ 8	29 $\pm$ 12	0.36

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Table 3

Main diagnoses

	Black (N=620) n(%)	Hispanic (N=881) n(%)	White (N=625) n(%)	other* (N=70) n(%)	All (N=2196) n(%)	p-value
Gastroduodenal ulcers	199 (32)	176 (20)	155 (25)	28 (40)	559 (26)	<0.001
Esophageal varices	75 (12)	297 (34)	155 (25)	13 (19)	540 (25)	<0.001
Esophagitis	69 (11)	95 (11)	87 (14)	4 (6)	255 (12)	0.83
No lesion	67 (11)	58 (7)	48 (8)	8 (11)	181 (8)	0.24
Mallory-Weiss tear	19 (3)	35 (4)	23 (4)	3 (4)	80 (4)	0.81
Gastritis	22 (4)	22 (3)	25 (4)	1 (1)	70 (3)	0.28
PHG	11 (2)	36 (4)	19 (3)	3 (4)	69 (3)	0.07
Gastric erosions	23 (2)	21 (2)	15 (3)	0 (0)	59 (3)	0.09
Dieulafoy	21 (3)	17 (2)	15 (2)	3 (4)	56 (3)	0.28
Other [†]	114 (18)	124 (14)	83 (13)	7 (10)	328 (15)	0.03

* Includes Native American/Alaska Native/Asian/Pacific Islander/East Indian

[†] Includes anastomotic ulcer, AVM, Cameron's ulcer, diverticular bleed, duodenitis, esophageal erosions, esophageal fistula, esophageal ulcer, foreign body, gastric varices, GAVE, ischemia, NG trauma, polyp, post-sphincterotomy, radiation injury, and tumor

Table 4

Outcomes

	Black (N=620) n(%) / Mean $\pm$ SD	Hispanic (N=881) n(%) / Mean $\pm$ SD	White (N=625) n(%) / Mean $\pm$ SD	other* (N=70) n(%) / Mean $\pm$ SD	All (N=2196) n(%) / Mean $\pm$ SD	p-value
Transfusions						
Blood transfusions	371 (60) 4.3 $\pm$ 4.1	505 (58) 3.9 $\pm$ 3.8	350 (56) 4.6 $\pm$ 5.7	49 (70) 3.1 $\pm$ 2.3	1275 (58) 4.2 $\pm$ 4.5	0.08
Units of blood						0.44
Platelet transfusions	21 (3) 4.1 $\pm$ 4.6	56 (6) 3.2 $\pm$ 3.0	32 (5) 4.2 $\pm$ 5.0	5 (7) 2.0 $\pm$ 1.0	114 (5) 3.6 $\pm$ 3.9	0.07
Units of platelets						0.63
FFP transfusions	49 (8) 3.7 $\pm$ 2.4	98 (11) 3.5 $\pm$ 3.4	59 (9) 3.1 $\pm$ 2.3	9 (13) 2.7 $\pm$ 1.3	215 (10) 3.4 $\pm$ 2.9	0.18
Units of FFP						0.29
Complications						
Post Rockall score	4.2 $\pm$ 1.8	4.2 $\pm$ 1.8	4.2 $\pm$ 1.7	4.8 $\pm$ 2.2	4.2 $\pm$ 1.8	0.06
Surgery	12 (2) 38 (6)	26 (3) 83 (9)	18 (3) 31 (5)	2 (3) 4 (6)	58 (3) 156 (7)	0.66
ICU transfer						0.01
Mechanical ventilation	31 (5) 5 (1)	44 (5) 13 (2)	35 (6) 12 (2)	6 (9) 0 (0)	116 (5) 30 (1)	0.79
Infections						
Death/Rebleeding						
Rebled	54 (9)	87 (10)	36 (6)	8 (11)	185 (8)	0.02
Died	43 (7)	49 (6)	42 (7)	4 (6)	138 (6)	0.68
Cause of death						
GI bleed	9 (2)	7 (1)	3 (1)	0 (0)	19 (1)	
Respiratory/Cardiac failure	7 (1)	9 (1)	8 (1)	1 (1)	25 (1)	
Renal failure	1 (0.2)	2 (0.2)	2 (0.3)	0 (0)	5 (0.2)	
Hepatic failure/Cirrhosis	4 (1)	4 (1)	3 (1)	0 (0)	11 (1)	
Sepsis/Infection	2 (0.3)	4 (1)	2 (0.3)	0 (0)	8 (0.4)	
MODS	8 (1)	17 (2)	16 (3)	2 (3)	43 (2)	
Terminal malignancy	9 (2)	6 (1)	5 (1)	0 (0)	20 (1)	
Other	3 (0.5)	0 (0)	3 (1)	1 (1)	7 (0.3)	

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