Dig Dis Sci (2014) 59:126–134
DOI 10.1007/s10620-013-2603-3

ORIGINAL ARTICLE

The Impact of Hispanic Ethnicity and Race on Post-Surgical Complications in Patients with Inflammatory Bowel Disease

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Received: 14 December 2012 / Accepted: 7 February 2013 / Published online: 13 March 2013

Abstract
Background Surgery for inflammatory bowel disease (IBD) is common and represents a large portion of the cost of IBD treatment. There are multiple risk factors for post-operative complications after IBD surgery, but the role of ethnicity remains unclear. The aim of our study was to compare the rate of post-operative complications in Hispanic and non-Hispanic patients with equal access to health care.
Methods We designed a case–control study including patients enrolled in a health plan available to uninsured patients at Jackson Memorial Hospital (Miami, FL, USA) who had access to health care for at least 24 consecutive months prior to surgery. Sixty-seven Hispanic patients (cases) and 75 non-Hispanic patients (controls) met criteria and were compared with respect to demographics, type of surgery, disease phenotype, and laboratory markers. Primary outcome was the development of a medical or surgical complication.
Results A slight numerical increase in post-operative complications was seen in Hispanic patients; this did not reach statistical significance [1.06 (95 % CI 0.48–2.36; $p = 0.88$)]. Factors independently associated with post-operative complications included diagnosis of ulcerative colitis [OR 5.4 (95 % CI 1.67–20.58; $p = 0.004$)], pre-operative albumin levels <3 mg/dL [OR: 8.2 (95 % CI 2.3–35.5; $p < 0.001$)], smoking [OR 15.7 (95 % CI 4.2–72.35; $p < 0.001$)], and use of ≥20 mg of prednisone [OR 6.7 (95 % CI 2.15–24.62; $p < 0.001$)].
Conclusions In a group of patients with equal access to medical care and follow-up, Hispanics and non-Hispanics with IBD that underwent surgery had no significant differences in types of IBD surgeries or post-surgical outcomes.

Keywords Ethnicity · Crohn's disease · Ulcerative colitis · Intraoperative complications · Hispanic Americans

Introduction

Over the past several years, gastroenterologists have witnessed substantial advancements in the medical treatment of inflammatory bowel disease (IBD), with some studies showing a decreased need for surgery with newer medical therapies [1–3]. However, surgical intervention is still an essential treatment option for both intractable disease and IBD-related complications. In patients with Crohn's disease (CD), surgery is usually performed to treat medically refractory disease and complications such as strictures and fistulas. Between 38 and 55 % of patients with CD will require surgery [4]. In ulcerative colitis (UC), colectomy not only represents a definitive therapeutic option but it also virtually eliminates the risk of malignancy associated with UC. The reported 5-year colectomy rate in patients with chronic UC ranges between 12 and 20 % [5–7].

The high frequency of abdominal surgeries and difficult resections in the face of active inflammation combined

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with sub-optimal nutritional status translates into high perioperative complication rates, ranging between 26 and 62 % in UC [8–11] and 18–23 % in CD [12–15]. The variability in complication rates has been attributed to physiologic and serologic variables, co-morbidities, and medical therapies for IBD [16–19].

Racial and ethnic differences have been explored to address the observed differences in complication rates after a variety of surgical procedures [20–23]. These studies are of immediate importance to the health care system given the observation that 16.3 % of the US population is of Hispanic background and continues to rise. Several studies have described the rate of post-operative complications in Hispanics; in most of them, Hispanics have worse outcomes than non-Hispanics. This disparity is uniformly attributed to more limited access to care [23–26]. Factors limiting health care utilization by Hispanics include poor English proficiency, cultural barriers, and lower socioeconomic status [27, 28]. Most importantly, one-third of Hispanic patients lack health insurance [29].

Studies have shown that race and ethnicity influence outcomes in patients with IBD, even though there is likely a significant influence of socio-economical status contributing to this difference [30]. Despite these reports, no studies have evaluated the relative surgical risk after an IBD-related surgery in Hispanic and black patients when accounting for the availability of health care resources. In this study, we aim to assess the rate of complications after IBD-related surgery in Hispanic patients when compared to non-Hispanics, controlling for access to medical care. We also sought to compare the rate of post-surgical complications among racial groups within the same health care system.

Materials and Methods

We performed a case–control study approved by the University of Miami Miller School of Medicine and Jackson Memorial Hospital Institutional Review Boards. Patients with CD and UC undergoing open or laparoscopic abdomino-pelvic IBD-related surgery at Jackson Memorial Hospital (Miami, FL, USA) between January 1998 and March 2011 were included.

The diagnosis of IBD was established using International Classification of Diseases, Clinical Modification (ICD-9-CM) codes 555.x and 556.x and confirmed by review of the medical chart using clinical, endoscopic, histologic, and radiologic criteria. IBD-related surgery was defined as any intra-abdominal or intra-pelvic procedure performed with a therapeutic indication for IBD or a known complication of IBD. For those procedures done in a 2- or 3-stage progression (e.g., ileal pouch–anal anastomosis, IPAA), the cumulative complication incidence of all stages was considered. Surgeries solely to address perianal disease were not considered in the analysis.

We included patients 18 years or older who were Miami-Dade County residents and had received regular medical care through the Jackson Health System for 2 or more years consecutively prior to surgery. All patients had been seen at least every 6 months in the gastroenterology outpatient clinic of Jackson Memorial Hospital, a non-profit, tertiary care academic hospital for the University of Miami and the safety-net hospital for Miami-Dade County residents (Miami, FL). In order to receive medical benefits through the Jackson Health System, uninsured patients must meet defined criteria for financial need based on economic and residency status as determined by the local health department and county government.

Ethnic groups were divided into Hispanic and non-Hispanic cohorts. Patient ethnicity was determined by self-report on entry into the health system. Hispanic ethnicity was defined as a person of Latin American descent (including the Caribbean) with some degree of Spanish or Portuguese ancestral origins, irrespective of other racial considerations [31]. Ethnic groups were segregated into Hispanic and non-Hispanic; racial groups were stratified as white (people with Caucasian ancestral origins including Spain and Portugal) and black (defined as a person with African ancestral origins, including Afro-Caribbean) [31]. While we intended to include other races, no other individuals met inclusion criteria. White and black Hispanic patients served as cases, with white and black non-Hispanics serving as controls. In parallel, we compared outcomes in black and white patients.

Patients in each group were considered to have equal access to health care as they met minimum financial need criteria and received clinical care in accordance with the defined pre-operative time intervals. Even though socioeconomic status was not considered in the study, in order to be enrolled in the health system, patients undergo a financial evaluation, including patients with only limited resources. No patients had insurance. In an attempt to standardize the pre-surgical risk of all subjects, we excluded patients that were categorized as American Society of Anesthesiologists (ASA) physical status classification system of 3 or greater [32], as well as those who required an urgent procedure (unplanned hospitalization and surgery within 48 h of admission). We also excluded those subjects with <30 days of post-procedure follow-up or incomplete medical records.

In patients with CD, surgery was classified as small bowel resection (SBR), partial colectomy, ileo-colonic/rectal anastomosis (involving resection of part of the ileum and colon), or total proctocolectomy (TPC) with permanent

ileostomy. In patients with UC, surgery was classified as TPC with IPAA or TPC with permanent ileostomy. Multi-stage procedures (e.g., TPC with IPAA) were considered as a single surgery.

Data were retrospectively collected from inpatient and outpatient medical records by two investigators. One researcher recorded the predictive pre-operative variables while the other recorded post-operative outcomes. Each was masked to the other's data to avoid any bias in data collection and interpretation. Data collection sheets were audited at random to prevent deficiencies and ensure accurate data extraction.

Predictive Variables

Independent variables considered were demographics, IBD phenotype, pre-operative laboratories, comorbidities, use of total parenteral nutrition (TPN) prior to surgery, transfusion of packed red blood cells in the 30 days prior to the procedure, smoking status, body mass index (BMI), and IBD-related medications.

Disease phenotype was classified according to the Montreal classification [33]. CD was categorized as ileal, colonic, or ileo-colonic, with or without upper gastrointestinal tract involvement and stricturing or fistulizing disease. UC was classified as proctitis, left-sided disease, or extensive involvement (pan-colitis). Extra-intestinal manifestations (EIM) were also considered for each patient. The most recent pre-operative laboratory tests performed within 30 days of the surgery were considered for analysis. Among the included studies were: complete blood count, creatinine, blood urea nitrogen (BUN), serum protein, albumin, C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR).

Corticosteroid (CS) use was recorded if taken for 30 or more consecutive days prior to the surgery and classified according to the dose of prednisone or its steroid equivalent ($<$20 or $\geq$20 mg daily). No patient was on budesonide. Rectally administered topical steroids (e.g., enemas or suppositories) were not considered in the analysis. Immunomodulators (azathioprine, 6-mercaptopurine, and methotrexate) and biologic agents (infliximab, adalimumab, and certolizumab pegol) were considered if taken for $\geq$60 days at any dose prior to the surgery. Antibiotics were included in the analysis if taken for at least 1 week and within 30 days prior to the surgery.

Outcomes

The primary outcome was the development of a post-operative medical or surgical complication within 30 days of the procedure. Surgical complications were defined as wound infection or dehiscence, intra-abdominal abscess (with or without sepsis), and anastomotic leak. Medical complications included urinary tract infection (UTI), pneumonia, respiratory insufficiency requiring non-invasive or invasive ventilator support, and deep venous thrombosis (DVT). Secondary outcomes were length of post-operative inpatient stay (LPOS), post-operative need for TPN, need for admission to an intensive care unit (ICU), and death.

Wound infection was defined as an infection occurring at the site of the surgical incision. Intra-abdominal sepsis was defined as the presence of an abdominal fluid collection with new-onset fever (body temperature $>$38.0 °C) in the absence of another identifiable infectious source. Anastomotic leaks were defined as postoperative fistulas communicating with the surgical anastomosis, abscesses associated with extravasation of enteric contrast on an imaging study, presence of significant peri-anastomotic air, or a communication noted after a fluid collection drainage [34].

Sepsis was defined using accepted criteria and included those patients with wound sepsis and abscesses that required a surgical intervention [35]. UTI was diagnosed using clinical and laboratory criteria (urine analysis and culture). Pneumonia was confirmed with radiological/microbiological criteria as per current standards [36]. Suspected DVT of upper or lower extremities was confirmed with compression ultrasonography. All outcomes were considered to be post-surgical if they occurred within 30 days of the surgery except for pneumonia, which was included if symptoms developed within 14 days, as per published criteria [37].

Statistical Analysis

Descriptive statistics were used to examine the baseline characteristics of the cohorts. Continuous variables were compared using Student's t test or the Mann–Whitney U test (for nonparametric variables). The χ^2 test was used to evaluate distributions of categorical variables. Multiple logistic regression models were used to identify individual variables and their coefficients associated with surgical morbidity. Multivariate models were then constructed in order to control for confounding variables between Hispanics and non-Hispanics, using those variables found to be significant in the univariate analysis.

Results

Patient Characteristics and Type of Surgery

Two-hundred and fifteen patients with CD and UC who underwent surgery between January 1998 and March 2011

Table 1 Baseline characteristics by ethnicity

Variables	Hispanic	Non-hispanic	*p* value
Diagnosis of Crohn's disease (*n*, %)	40 (59.7)	39 (52)	0.36
Female gender (*n*, %)	**24 (35.8)**	**43 (64.2)**	**0.01**
Black race (*n*, %)	**2 (3)**	**17 (22.7)**	**<0.001**
Smoking (*n*, %)	13 (48.2)	14 (52)	0.91
Age at surgery (mean in years, SD)	42 (18)	41 (13)	0.6
Time with IBD diagnosis (mean in years, SD)	15.3 (10.7)	12.9 (7.4)	0.14
Body mass index (mean in kg/m^2, SD)	24.5 (5)	24.4 (4.7)	0.94
Serum albumin (mean in mg/dL, SD)	3.5 (0.97)	3.5 (0.98)	1
CRP (mean in mg/dL, SD)	2.7 (1.5)	3.2 (2.5)	0.18
ESR (mean in mg/dL, SD)	34.3 (15)	32.7 (16.9)	0.55
BUN (mean in mg/dL, SD)	14.9 (8)	17.9 (22)	0.27
Creatinine (mean in mg/dL, SD)	0.9 (0.23)	0.93 (0.9)	0.75
WBC (mean in mean in 10^3 μL, SD)	10.4 (3.3)	10.7 (4.3)	0.64
Absolute neutrophil count (mean in 10^3 μL, SD)	8.4 (3.3)	8.2 (3.9)	0.67
Absolute lymphocyte ratio (mean in 10^3 μL, SD)	1.2 (0.75)	1.5 (0.8)	0.06
Pre-operative RBC transfusions (*n*, %)	13 (19.4)	18 (24)	0.5
Hemoglobin (mean in g/dL, SD)	11.8 (2.4)	12 (1.9)	0.59
Medications			
Prednisone (*n*, %)	29 (43.3)	30 (40)	0.69
6-MP/AZA (*n*, %)	12 (17.9)	16 (21.3)	0.6
Anti-TNF agents (*n*, %)	12 (17.9)	17 (22.7)	0.48
Aminosalicylates (*n*, %)	27 (40.3)	32 (42.7)	0.78
Antibiotics (*n*, %)	13 (19.4)	16 (21.3)	0.78

Values in bold are statistically significant

SD standard deviation, *CRP* C-reactive protein, *ESR* erythrocyte sedimentation rate, *BUN* blood urea nitrogen, *WBC* white blood cell, *RBC* red blood cell, *6MP* 6-mercaptopurine, *AZA* azathioprine, *TNF* tumor necrosis factor

were identified; 142 patients met our strict inclusion criteria. The study group included 74 men (52.8 %). Sixty-seven were self-reported Hispanics (47.2 %), and 63 had a diagnosis of UC (44.4 %). When compared to non-Hispanics, Hispanics had a higher proportion of whites (93 vs. 77 %, $p = <0.001$) and males (64 vs. 43 %, $p = 0.01$). Surgeries were performed via a laparoscopic approach in 38.7 % of cases, and there was no difference in the rate of laparoscopic procedures between ethnic groups ($p = 0.72$). All procedures were done by a colorectal or laparoscopic surgeon with experience in the treatment of patients with IBD. The baseline characteristics of the population stratified by ethnicity and race are shown in Tables 1 and 2, respectively. Non-Hispanic patients were more likely to be female and black than Hispanics. Aminosalicylates were more commonly prescribed for black patients (Table 1). There was no difference in serum albumin levels BMI between groups. Figure 1 shows the distribution of surgical procedures done in the total study population stratified by disease type (CD and UC). The operative interventions, in order of decreasing frequency, were ileo-colonic resection with primary anastomosis, TPC with permanent ileostomy, TPC with IPAA, SBR, and partial colectomy (Table 3). The distribution of procedures was similar among ethnic groups (Table 3). The topography of GI tract involvement and IBD medications used were not different between Hispanics and non-Hispanics (Table 4).

Outcomes

The total rate of complications was 21.8 %. Of those, 35.4 % were managed medically; the remainder required an invasive intervention (surgical or percutaneous). When comparing ethnic groups, there was no difference in medical (26.7 % in Hispanics vs. 37.5 % in non-Hispanics, $p = 0.6$), or surgical (73.3 % in Hispanics vs. 62.5 % in non-Hispanics, $p = 0.5$) complications (Fig. 2).

In the univariate analysis, the odds ratio (OR) for Hispanics to develop any post-surgical complication was 1.06 (95 % CI 0.48–2.36; $p = 0.88$). The remaining comparator variables are shown in Table 5. After adjusting for the confounding variables found to be statically significant in the univariate analysis, Hispanics had a numerically higher but not statistically significant risk of complications, with an OR of 1.64 (95 % CI 0.49–5.85; $p = 0.43$) Of the variables found to have statistical significance in the univariate analysis (Table 5), diagnosis of UC [OR 5.4 (95 % CI 1.67–20.58; $p = 0.004$)], pre-operative albumin levels <3 mg/dL [OR: 8.2 (95 % CI 2.3–35.5; $p < 0.001$)], smoking [OR 15.7 (95 % CI 4.2–72.35; $p < 0.001$)] and use of ≥20 mg of prednisone or its equivalent [OR 6.7

Table 2 Baseline characteristics by race (including Hispanics and non-Hispanics)

Variables	Black	White	*p* value
Diagnosis of Crohn's disease (*n*, %)	7 (36.8)	72 (58.4)	0.08
Female gender (*n*, %)	**12 (63.2)**	**55 (44.7)**	**0.13**
Smoking (*n*, %)	4 (21.1)	23 (18.7)	0.8
Age at surgery (mean in years, SD)	45 (13)	41 (16)	0.14
Time with IBD diagnosis (mean in years, SD)	19 (7.8)	13.7 (9.4)	0.27
Body mass index (mean in kg/m^2, SD)	24.4 (4.7)	24.5 (5)	0.94
Serum albumin (mean in mg/dL, SD)	3.6 (0.9)	3.1 (0.95)	0.1
CRP (mean in mg/dL, SD)	3.3 (2)	2.9 (2.1)	0.41
ESR (mean in mg/dL, SD)	32.7 (16.9)	34.3 (15)	0.55
BUN (mean in mg/dL, SD)	17.0 (14)	16.4 (17)	0.88
Creatinine (mean in mg/dL, SD)	0.8 (0.4)	0.9 (0.7)	0.3
WBC (mean in mean in 10^3 μL, SD)	11.8 (6.6)	10.4 (3.3)	0.4
Absolute neutrophil count (mean in 10^3 μL, SD)	9.4 (5.9)	8.2 (3.2)	0.4
Absolute lymphocyte ratio (mean in 10^3 μL, SD)	1.4 (1)	1.3 (0.7)	0.7
Hemoglobin (mean in g/dL, SD)	11.3 (2.2)	12.0 (2.1)	0.9
Pre-operative RBC transfusions (%)	7 (36.8)	24 (19.5)	0.08
Medication use			
Prednisone (*n*, %)	8 (42)	51 (41.5)	0.95
6-MP/AZA (*n*, %)	5 (26.3)	23 (18.7)	0.4
Anti-TNF (*n*, %)	6 (31.6)	23 (18.7)	0.2
Aminosalicylates (*n*, %)	**14 (73.7)**	**45 (36.6)**	**0.002**
Antibiotics (*n*, %)	4 (21.1)	25 (20.3)	0.94

Values in bold are statistically significant

SD standard deviation, *CRP* C-reactive protein, *ESR* erythrocyte sedimentation rate, *BUN* blood urea nitrogen, *WBC* white blood cell, *RBC* red blood cell, *6MP* 6-mercaptopurine, *AZA* azathioprine, *TNF* tumor necrosis factor

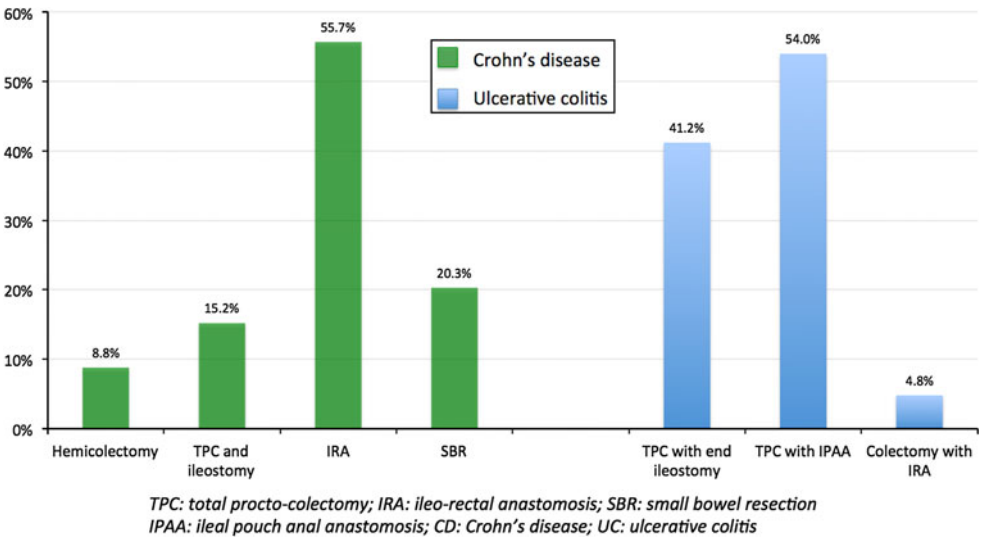

Fig. 1 Type of surgical procedure in the study population with Crohn's disease

(95 % CI 2.15–24.62; $p < 0.001$)] remained significant in the multivariate analysis.

Hispanics were not prescribed post-operative TPN more frequently than non-Hispanics [OR 1.4 (95 % CI 0.58–3.38; $p = 0.4$)] and did not need more post-operative ICU admissions [OR 0.36 (95 % CI 0.1–1.17; $p = 0.09$)]. There was no difference in the LPOS between groups [mean of 12.3 (SD: 13) days in Hispanics vs. 18.2 (SD: 34) days in non-Hispanics, $p = 0.17$]. No patients died. When comparing outcomes by race, black patients did not have an increased rate of complications compared to whites [OR 2.4 (95 % CI 0.86–6.76; $p = 0.08$)].

Discussion

Surgery for IBD can be challenging and carry a high risk of complications. In this study, we address whether Hispanic

Table 3 Distribution of procedure types by ethnicity

Procedure	Hispanic	Non-hispanic	*p* value
TPC and ileostomy (*n*, %)	14 (21)	22 (29.3)	0.25
Partial colectomy (*n*, %)	3 (4.5)	6 (8)	0.4
TPC with IPAA[a] (*n*, %)	19 (28.4)	15 (20)	0.24
Ileo-colonic anastomosis (*n*, %)	26 (38.8)	21 (28)	0.17
Small bowel resection (*n*, %)	5 (7.5)	11 (14.7)	0.16
Intrabdominal fistula repair[b] (*n*, %)	10 (14.9)	13 (17.3)	0.69

[a] *TPC* total proctocolectomy, *IPAA* ileal pouch-anal anastomosis

[b] In combination with another procedure

Table 4 Comparison of Crohn's disease and ulcerative colitis phenotypes by ethnicity

Crohn's disease phenotype	Hispanics	Non-hispanics	*p* value
Ileal disease (*n*, %)	13 (32.5)	14 (35.9)	0.75
Ileo-colonic (*n*, %)	16 (40)	20 (51.3)	0.31
Colonic disease (*n*, %)	11 (27.5)	5 (12.8)	0.1
Upper GI tract (*n*, %)	0 (0)	1 (2.6)	0.23
Perforating disease (*n*, %)	8 (20)	10 (25.6)	0.55
Strictures (*n*, %)	4 (10)	9 (23)	0.11
Ulcerative colitis phenotype			
Proctitis (*n*, %)	1 (3.7)	0	0.19
Left-sided colitis (*n*, %)	8 (29.6)	6 (16.7)	0.22
Pancolitis (*n*, %)	17 (63)	21 (58.3)	0.71

patients have a higher risk of post-operative complications when accounting for differences in health care resources. We found no difference in the rate of post-operative complications between Hispanic and non-Hispanic IBD patients with equal access to health care and similar pre-operative health care utilization. Outcomes were also similar when comparing black and white patients. These results suggest that the disparity in complication rate after surgery described in prior studies may be a product of unequal access to care and not to an intrinsic difference in disease phenotype or behavior among ethnic and racial minorities [23, 38–40].

To the authors' knowledge, this report is the first comparison of IBD-related surgical outcomes among ethnicities. Previous studies on surgical outcomes not restricted to IBD patients have shown that Hispanic and black patients have worse post-surgical outcomes [23–26, 41–43]. Analogous to what we have shown here for IBD patients, this disparity is attenuated among general surgical patients when accounting for access to care [21, 40]. Our study population demonstrated no difference in outcomes; equal access to care was mandated by the entry criteria into our hospital system. The closed nature of the hospital system and its broad catchment area increased the likelihood that all elective medical and surgical encounters occurred within our medical center. The homogeneity of care in our hospital system is relevant, as complication rates and mortality from surgeries differ among hospitals [44]. Furthermore, the catchment area of our hospital system dictated that the surgeons in our medical center perform a high volume of procedures. Kaplan et al. [45] found that mortality after a total abdominal colectomy was lower in those centers that performed a higher volume of surgeries. This could explain the low mortality rate observed in our series.

Several studies have shown that racial and ethnic minorities do not have equivalent access to care when compared to non-Hispanic Whites [46]. This disparity is observed among uninsured patients without ready availability of universally accessible health systems (including public/charity hospitals among others) [24]. In addition to the financial restrictions preventing health care uptake among underserved individuals, other social and cultural variables stand as barriers to health care utilization. Language proficiency, immigration status, geographic isolation, and cultural beliefs are important determinants of health care for racial and ethnic minorities [26]. Furthermore, provider-based partiality or "unconscious bias" may contribute to differences in care, especially in relation to socio-economic status [47, 48]. Our study should have been relatively immune to these financial, access-oriented, utilization, and treatment concerns given the universally indigent nature of our study population and the prevalence of ethnic and racial minorities in Miami-Dade County. Sixty-three percent of the county's population is Hispanic according to the 2008 US Census, actually making this group an ethnic majority [49]. Fewer barriers to medical access are reported by individuals living among ethnically and racially similar people [50].

The similarity of study results between our ethnic groups prompted us to compare the complication rate in our system to previous reports and to identify the variables associated with worse surgical outcomes. Our population of uninsured patients had similar total, surgical, and medical complication rates to that observed in other series [8, 9, 12, 15, 51–53]. In the present study, the degree of systemic inflammation and suboptimal nutritional status in the pre-operative period were linked with complications. These observations corroborate the findings of prior studies [11, 14, 16–18, 54]. These pre-operative factors may suggest sub-optimal medical therapy or poor disease management across all ethnic groups. Indeed, <25 % of patients in our study were exposed to anti-TNFs prior to surgery; this rate of anti-TNF exposure is lower than would be expected from other published series. A German study reported that 52 % of CD and 58 % of UC patients undergoing surgery

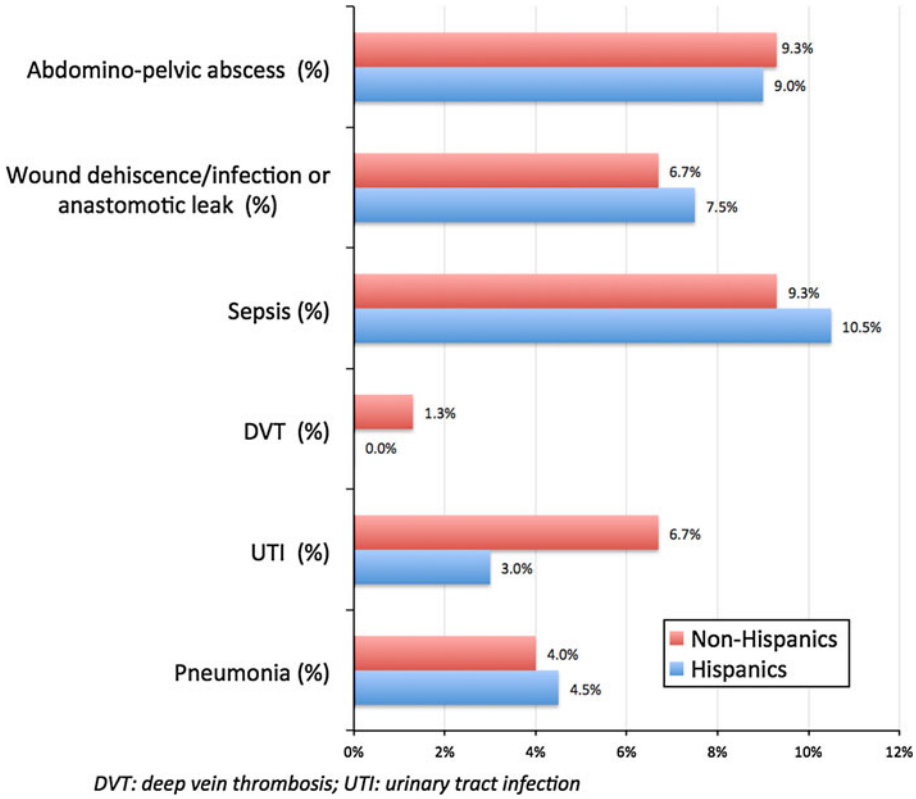

Fig. 2 Distribution of complications by ethnicity

Table 5 Univariate analysis predictive of surgical complication

Variables	Odds ratio	*p* value	95 % CI
Hispanic ethnicity	1.06	0.88	0.48–2.36
Gender (male)	1.11	0.8	0.5–2.5
Race (White)	0.42	0.11	0.15–1.17
More than 5 years with IBD	1.12	0.8	0.34–3.7
C-reactive protein level ≥1.5 mg/dL	**9.2**	**0.01**	**1.2–70.5**
Diagnosis of UC	**5.1**	**<0.001**	**2.09–12.46**
Smoking	**6.21**	**<0.0001**	**2.49–15.48**
Laparoscopic	1	0.99	0.44–2.26
Diabetes	3.96	0.07	0.88–17.75
White blood cell count >12,000 μL	**2.6**	**0.02**	**1.12–5.9**
Pre-op hemoglobin level <10 mg/dL	1.4	0.5	0.5–4.1
Albumin level <3 mg/dL	**5.2**	**<0.001**	**2.2–12.2**
BMI ≥30 kg/m^2	**4.2**	**0.002**	**1.63–10.6**
Prednisone ≥20 mg	**5.18**	**<0.0001**	**2.22–12**
6MP/AZA	1.8	0.74	0.45–3.09
5-aminosalicylates	1.02	0.96	0.46–2.29
Age at surgery ≥40 years	1.1	0.04	0.5–2.4

Values in bold are statistically significant

UC ulcerative colitis, *BMI* body mass index, *6MP* 6-mercaptopurine, *AZA* azathioprine

were previously anti-TNF exposed [17]. On the contrary, use of anti-TNF agents has been implicated as a source of increased post-operative complications, especially in UC [10, 12, 16]. Our results would point to aggressive, debilitating, and undertreated disease as an important determinant of post-operative complications.

Our study has several limitations. First, the number of patients that met inclusion criteria was not high enough to detect subtle differences between groups or to reliably address complications with a low incidence (e.g., death, myocardial infarctions, and cerebrovascular events). The exclusion of patients with an ASA classification of 3 or more may also skew results when discussing health outcomes where racial and ethnic minorities may be sicker than non-Hispanic whites; however, this exclusion was unlikely to affect our outcomes, as only 7 of the 215 screened patients were excluded due to their increased ASA status. Also, we included a wide range of medical and surgical complications with different degrees of severity as a composite outcome. For example, an uncomplicated UTI represents a minor complication when compared to the development of a nosocomial pneumonia requiring mechanical ventilation, yet each is weighted equally in our study. Nevertheless, the distribution of complications was equivalent in both groups (Fig. 2). Another issue with our study design is that we were unable to account for differences in the utilization of resources. In order to overcome

this issue, we only included patients that had been followed on a regular basis, even though this does not guarantee treatment adherence or equality with respect to utilization of other hospital resources.

The present study was able to account for the important patient factors of health care access, limited patient financial resources, and health care utilization. Unfortunately, patients continue to face other cultural, social, and educational barriers that are difficult to address with a retrospective study design. Patient advocacy for these underserved groups, regardless of race and ethnicity, may be limited, leading to sub-optimal pre-operative management and subsequent outcomes. Future health care reform needs to address these barriers to improve early access and utilization of health care for those with suspected or diagnosed CD or UC. Concomitantly, efforts to improve IBD-oriented patient education and the importance of treatment compliance are warranted.

Conflict of interest None.

References

1. Nguyen GC, Nugent Z, Shaw S, Bernstein CN. Outcomes of patients with Crohn's disease improved from 1988 to 2008 and were associated with increased specialist care. *Gastroenterology*. 2011;141:90–97.
2. Herrinton LJ, Liu L, Fireman B, et al. Time trends in therapies and outcomes for adult inflammatory bowel disease, Northern California, 1998–2005. *Gastroenterology*. 2009;137:502–511.
3. Lakatos PL, Golovics PA, David G, et al. Has there been a change in the natural history of Crohn's disease? Surgical rates and medical management in a population-based inception cohort from Western Hungary between 1977–2009. *Am J Gastroenterol*. 2012;107:579–588.
4. Peyrin-Biroulet L, Loftus EV, Colombel J-F, Sandborn WJ. The natural history of adult Crohn's disease in population-based cohorts. *Am J Gastroenterol*. 2010;105:289–297.
5. Burger DC, Travis S. Colon salvage therapy for acute severe colitis: cyclosporine or infliximab? *Curr Opin Gastroenterol*. 2011. doi:10.1097/MOG.0b013e32834586e3.
6. Leijonmarck CE, Persson PG, Hellers G. Factors affecting colectomy rate in ulcerative colitis: an epidemiologic study. *Gut*. 1990;31:329–333.
7. Gower-Rousseau C, Dauchet L, Vernier-Massouille G, et al. The natural history of pediatric ulcerative colitis: a population-based cohort study. *Am J Gastroenterol*. 2009;104:2080–2088.
8. Ferrante M, D'hoore A, Vermeire S, et al. Corticosteroids but not infliximab increase short-term postoperative infectious complications in patients with ulcerative colitis. *Inflamm Bowel Dis*. 2009;15:1062–1070.
9. Schluender SJ, Ippoliti A, Dubinsky M, et al. Does infliximab influence surgical morbidity of ileal pouch–anal anastomosis in patients with ulcerative colitis? *Dis Colon Rectum*. 2007;50:1747–1753.
10. Selvasekar CR, Cima RR, Larson DW, et al. Effect of infliximab on short-term complications in patients undergoing operation for chronic ulcerative colitis. *J Am Coll Surg*. 2007;204:956–962; discussion 962–963.
11. Mahadevan U, Loftus EV, Tremaine WJ, et al. Azathioprine or 6-mercaptopurine before colectomy for ulcerative colitis is not associated with increased postoperative complications. *Inflamm Bowel Dis*. 2002;8:311–316.
12. Colombel J-F, Loftus EV, Tremaine WJ, et al. Early postoperative complications are not increased in patients with Crohn's disease treated perioperatively with infliximab or immunosuppressive therapy. *Am J Gastroenterol*. 2004;99:878–883.
13. Utech M, Rijcken EJM, Laukoetter MG, et al. Preoperative steroid administration: effect on morbidity among patients undergoing intestinal bowel resection for Crohn's disease. *World J Surg*. 2003;27:1306–1310.
14. Yamamoto T, Allan RN, Keighley MR. Risk factors for intra-abdominal sepsis after surgery in Crohn's disease. *Dis Colon Rectum*. 2000;43:1141–1145.
15. Appau KA, Fazio VW, Shen B, et al. Use of infliximab within 3 months of ileocolonic resection is associated with adverse postoperative outcomes in Crohn's patients. *J Gastrointest Surg*. 2008;12:1738–1744.
16. Kumar A, Auron M, Aneja A, Mohr F, Jain A, Shen B. Inflammatory bowel disease: perioperative pharmacological considerations. *Mayo Clin Proc*. 2011;86:748–757.
17. Egberts J-H, Stroeh A, Alkatout I, et al. Preoperative risk evaluation of postoperative morbidity in IBD patients—impact of the POSSUM score. *Int J Colorectal Dis*. 2011;26:1–10.
18. Page MJ, Poritz LS, Kunselman SJ, Koltun WA. Factors affecting surgical risk in elderly patients with inflammatory bowel disease. *J Gastrointest Surg*. 2002;6:606–613.
19. Kaplan GG, Hubbard J, Panaccione R, et al. Risk of comorbidities on postoperative outcomes in patients with inflammatory bowel disease. *Arch Surg*. 2011;146:959–964.
20. Rumsfeld JS, Plomondon ME, Peterson ED, et al. The impact of ethnicity on outcomes following coronary artery bypass graft surgery in the Veterans Health Administration. *JAC*. 2002;40:1786–1793.
21. Parsons HM, Habermann EB, Stain SC, Vickers SM, Al-Refaie WB. What happens to racial and ethnic minorities after cancer surgery at American College of Surgeons national surgical quality improvement program hospitals? *J Am Coll Surg*. 2012. doi:10.1016/j.jamcollsurg.2011.12.024.
22. LaPar DJ, Bhamidipati CM, Harris DA, et al. Gender, race, and socioeconomic status affects outcomes after lung cancer resections in the United States. *Ann Thorac Surg*. 2011;92:434–439.
23. Curry WT Jr, Carter BS, Barker FG II. Racial, ethnic, and socioeconomic disparities in patient outcomes after craniotomy for tumor in adult patients in the United States, 1988–2004. *Neurosurgery*. 2010;66:427–438.
24. Mayberry RM, Mili F, Ofili E. Racial and ethnic differences in access to medical care. *Med Care Res Rev*. 2000;57:108–145.
25. Oh-Park M, McGinn A, Lipsitz E, Thomas M, Zonszein J. Racial disparity in amputation-free survival after infrainguinal bypass procedure: contribution of socioeconomic status. *Am J Phys Med Rehabil*. 2009;88:986–994.
26. Kirby JB, Taliaferro G, Zuvekas SH. Explaining racial and ethnic disparities in health care. *Med Care*. 2006;44:I64–I72.
27. Fiscella K, Franks P, Doescher MP, Saver BG. Disparities in health care by race, ethnicity, and language among the insured: findings from a national sample. *Med Care*. 2002;40:52–59.
28. Derose KP, Baker DW. Limited English proficiency and Latinos' use of physician services. *Med Care Res Rev*. 2000;57:76–91.
29. Albert NG. *The Hispanic Population: 2010*. USA: US Department of Commerce; 2011:1–16.
30. Sewell JL, Velayos FS. Systematic review: the role of race and socioeconomic factors on IBD health care delivery and effectiveness. *Inflamm Bowel Dis*. 2012. doi:10.1002/ibd.22986.
31. Bhopal R. Glossary of terms relating to ethnicity and race: for reflection and debate. *J Epidemiol Community Health*. 2004;58:441–445.

32. ASA Relative Value Guide 2002, American Society of Anesthesiologists. Code 99140. 2012.
33. Silverberg MS, Satsangi J, Ahmad T, et al. Toward an integrated clinical, molecular and serological classification of inflammatory bowel disease: report of a working party of the 2005 Montreal world congress of gastroenterology. *Can J Gastroenterol*. 2005;19:5–36.
34. Hyman N, Manchester TL, Osler T, Burns B, Cataldo PA. Anastomotic leaks after intestinal anastomosis. *Ann Surg*. 2007; 245:254–258.
35. Bone RC, Balk RA, Cerra FB, Dellinger RP, Fein AM. American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference: definitions for sepsis and organ failure and guidelines for the use of innovative therapies in sepsis. *Crit Care Med*. 1992;20:864–874.
36. American Thoracic Society, Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and health care-associated pneumonia. *Am J Respir Crit Care Med*. 2005;171:388–416.
37. Montravers P, Veber B, Auboyer C, et al. Diagnostic and therapeutic management of nosocomial pneumonia in surgical patients: results of the Eole study. *Crit Care Med*. 2002;30:368–375.
38. Bridges CR, Edwards FH, Peterson ED, Coombs LP. The effect of race on coronary bypass operative mortality. *JAC*. 2000;36: 1870–1876.
39. Ibrahim SA, Stone RA, Han X, et al. Racial/ethnic differences in surgical outcomes in veterans following knee or hip arthroplasty. *Arthritis Rheum*. 2005;52:3143–3151.
40. Kim J, Artinyan A, Mailey B, et al. An interaction of race and ethnicity with socioeconomic status in rectal cancer outcomes. *Ann Surg*. 2011;253:647–654.
41. Turner PL, Oyetunji TA, Gantt G, Chang DC, Cornwell EE, Fullum TM. Demographically associated variations in outcomes after bariatric surgery. *Am J Surg*. 2011;201:475–480.
42. Straus WL, Eisen GM, Sandler RS, Murray SC, Sessions JT. Crohn's disease: does race matter? The mid-Atlantic Crohn's Disease Study Group. *Am J Gastroenterol*. 2000;95:479–483.
43. Lemaire A, Cook C, Tackett S, Mendes DM, Shortell CK. The impact of race and insurance type on the outcome of endovascular abdominal aortic aneurysm (AAA) repair. *J Vasc Surg*. 2008;47:1172–1180.
44. Birkmeyer JD, Siewers AE, Finlayson EVA, et al. Hospital volume and surgical mortality in the United States. *N Engl J Med*. 2002;346:1128–1137.
45. Kaplan GG, McCarthy EP, Ayanian JZ, Korzenik J, Hodin R, Sands BE. Impact of hospital volume on postoperative morbidity and mortality following a colectomy for ulcerative colitis. *Gastroenterology*. 2008;134:e1.
46. Mahmoudi E, Jensen GA. Diverging racial and ethnic disparities in access to physician care: comparing 2000 and 2007. *Med Care*. 2012;50:327–334.
47. Burgess D, Ryn M, Dovidio J, Saha S. Reducing racial bias among health care providers: lessons from social-cognitive psychology. *J Gen Intern Med*. 2007;22:882–887.
48. Santry HP, Wren SM. The role of unconscious bias in surgical safety and outcomes. *Surg Clin N Am*. 2012;92:137–151.
49. Miami-Dade County QuickFacts from the US Census Bureau. 2012;609:1–2. Available at: http://quickfacts.census.gov/qfd/states/12/12086.html. Accessed 10 December 2012.
50. Haas JS, Phillips KA, Sonneborn D, et al. Variation in access to health care for different racial/ethnic groups by the racial/ethnic composition of an individual's county of residence. *Med Care*. 2004;42:707–714.
51. Kunitake H, Hodin R, Shellito PC, Sands BE, Korzenik J, Bordeianou L. Perioperative treatment with infliximab in patients with Crohn's disease and ulcerative colitis is not associated with an increased rate of postoperative complications. *J Gastrointest Surg*. 2008;12:1730–1737.
52. Farouk R, Dozois RR, Pemberton JH, Larson D. Incidence and subsequent impact of pelvic abscess after ileal pouch-anal anastomosis for chronic ulcerative colitis. *Dis Colon Rectum*. 1998;41:1239–1243.
53. Loftus EV Jr, Delgado DJ, Friedman HS, Sandborn WJ. Colectomy and the incidence of postsurgical complications among ulcerative colitis patients with private health insurance in the United States. *Am J Gastroenterol*. 2008;103:1737–1745.
54. Aberra FN, Lewis JD, Hass D, Rombeau JL, Osborne B, Lichtenstein GR. Corticosteroids and immunomodulators: postoperative infectious complication risk in inflammatory bowel disease patients. *Gastroenterology*. 2003;125:320–327.