

Ethnic Variation Trends in the Use of Ileal Pouch–Anal Anastomosis in Patients With Ulcerative Colitis

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Background: Approximately 15%–20% of patients with ulcerative colitis (UC) will require surgery during their lifetime. Ileal pouch–anal anastomosis (IPAA) is the preferred surgical option, which typically requires access to a specialist experienced in surgery for inflammatory bowel diseases (IBD).

Methods: The aims of this study are the assessment of the comparative use of IPAA for UC among different racial/ethnic groups and observe trends over the past decade in the United States as well as the comparative assessment of their respective postoperative outcomes. This was an observational retrospective study using the National Inpatient Sample (NIS) 2009–2018 dataset. All patients with ICD-9/10CM codes for UC were included. The primary outcome was comparative trends in IPAA construction across races/ethnicities in the past decade, which was compared to White patients as reference. Multivariate regression analyses were used to adjust for age, gender, Charlson comorbidity index, income in patient zip code, insurance status, hospital region, location, size, and teaching status.

Results: The number of patients discharged from US hospitals with an associated diagnosis of UC increased between 2009 and 2018, but the number of patients undergoing an IPAA decreased during that time period. Of 1 153 363 admissions related to UC, 60 688 required surgery for UC, of whom 16 601 underwent IPAA in the study period. Of all the patients undergoing surgery for UC, 2862 (4.7%) were Black, while 44 351 were White. This analysis indicated that Black patients were less likely to undergo IPAA both in 2009 and in 2018 compared to Whites. Hispanic patients were significantly less likely to receive IPAA in 2009 but were no longer less likely to receive IPAA in 2018 when compared to Whites.

Conclusions: The use of IPAA among Black patients requiring surgery for UC remains less common than amongst their White counterparts. Further research is needed to determine if racial disparity is a factor in decreased access to specialized care.

Lay Summary

We aimed to assess the comparative use of ileal pouch–anal anastomosis (IPAA) for ulcerative colitis (UC) among different ethnic groups and observe trends over the past decade in the United States using the National Inpatient Sample. The use of IPAA among African American patients requiring surgery for UC remains less common than among their Caucasian counterparts.

Key Words: ulcerative colitis, ileal pouch–anal anastomosis, racial disparities

Introduction

Multiple studies have identified differences in treatments and outcomes for a variety of conditions among different racial and ethnic groups. Studies have demonstrated that racial minority groups, especially African American (AA) and Hispanics, undergoing colorectal surgery have worse mortality, morbidity, prolonged length of hospital stay, and increased readmission rates.^{1–3} Racial disparity has also been well investigated in oncologic surgical outcomes with an effect found on overall survival and disease recurrence rates.^{4,5} Similarly, among patients with inflammatory bowel diseases (IBD), AA, Hispanic, and Asian patients with Crohn's disease (CD) were found to be less likely than White patients to receive treatment with biologic agents and immunomodulators even after adjusting for disease severity.^{6–9} AA patients with ulcerative colitis (UC) were also less likely to receive immunomodulators or steroids compared to White patients.^{9,10}

Approximately 15%–20% of patients with UC will require surgery during their disease course^{11,12} and proctocolectomy with ileal pouch–anal anastomosis (IPAA) is the preferred surgical approach.¹³ Several studies reported considerable racial variation in the proportion of individuals who undergo surgery for UC.^{14–17} Previous studies have also indicated that the use of surgery for UC is decreasing as the available medical treatment options are more numerous, available, and increasingly effective. In addition, the number of patients treated with initial total abdominal colectomy rather than total proctocolectomy has become the most common operation among individuals requiring surgery for UC.¹⁸ This change in surgical practice has resulted in a substantial increase in the number of patients who undergo IPAA in a completely elective fashion. There is scant data on possible racial/ethnic differences in the use of IPAA as the accepted preferred standard of care among UC patients. The aims of

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this study are the assessment of the comparative use of IPAA for UC among different racial/ethnic groups and observing trends over the past decade in the USA as well as the comparative assessment of their respective postoperative outcomes.

Methods

In order to assess the changes throughout 10 years, the National Inpatient Sample (NIS) datasets for the years 2009 and 2018 were selected to perform a retrospective observational study. The NIS is the largest publicly available, inpatient, all-payer dataset in the USA. This dataset is overseen and maintained by the Healthcare Cost and Utilization Project (HCUP), which in itself is a sub-branch of the U.S. Department of Health and Human Services through the Agency for Healthcare Research and Quality (AHRQ). Each year, the HCUP publishes a dataset compiling all data for the calendar year, accounting for over seven million hospital admissions. This represents a 20% stratified sample of over 4000 nonfederal acute care hospitals across up to 44 US states. The HCUP provides discharge weights which, when applied, make the sample representative of 95% of hospitalizations in the USA.¹⁹ The NIS's unit of observation is the inpatient stay record and contains a principal diagnosis code (reason for hospitalization at discharge) and secondary diagnoses, as well as procedural codes for procedures performed during the admission.²⁰

Study Population

All adult patients with International Classification of Diseases, Ninth and Tenth Revisions, Clinical Modification (ICD-9 and ICD-10 CM) diagnostic codes for UC were included. Data on patient ethnicity are included in NIS and were abstracted from the dataset as such. Patients with missing data on ethnicity were excluded from the analysis. Patients undergoing IPAA were then identified using the procedural ICD-9 and ICD-10 codes (45.95, 0D1B0ZQ, 0D1B8ZQ, 0D1B4ZQ).^{21,22} The comparison between the total number of performed procedures in patients with UC was assessed by comparing the years 2009 and 2018. In order to account for the 2012 NIS framework and design shift, discharge "Trend Weights" provided by the HCUP were applied to all years prior to 2012 at the time of constructing the database for analysis. This has allowed us to make estimates of these years comparable to 2012 and beyond, making data from both time periods analyzable, per HCUP standards.

Variable Definition

Patient characteristics that were evaluated were age, gender, race/ethnicity, median income in patient zip code, insurance coverage, and Charlson comorbidity index. Hospital characteristics that were evaluated included the hospital's geographic region, teaching status, urban versus rural location, and hospital bed size.²⁰ Other variables extracted from the dataset were length of hospitalization, total hospitalization charges, and hospital costs. In order to account for comorbidities, the Deyo adaptation of the Charlson comorbidity index was utilized, which has been validated for large dataset analysis.²³ Of note, NIS provides the variable "RACE," which is described on the data elements as "Race/Ethnicity."

Outcomes

The primary outcome was determining the number and odds of IPAA in patients with UC across races/ethnicities, comparing 2018–2009. Secondary outcomes were determining the postoperative morbidity and mortality between the different groups.

Statistical Analysis

Discharge-level weights were applied in order to estimate the total number of patients with UC and the total number of patients who underwent IPAA in the 2 examined years. General descriptive statistics were used to describe and compare patient characteristics between the 2 analyzed years. A hybrid multivariate logistic regression model was constructed by initially performing univariate analysis on variables that have been identified on prior studies to correlate with outcomes in patients with UC. If these variables had an association with outcomes ($P < .1$), these were included in the subsequent multivariate model. On multivariate analysis, odds ratios (ORs) and means were adjusted for age, gender, median income in the patient's zip code, Charlson comorbidity index, hospital region, urban location, bed size, and teaching status, yielding adjusted OR. In order to account for multiple calculations, a P -value of $<.0125$ was considered significant after Bonferroni correction. All statistical calculations were conducted using STATA, Version 14 (StataCorp LP, College Station, TX).

Results

The yearly number of patients discharged from US hospitals with an associated diagnosis of UC during the study period ranged from 107 649 in 2009 to 127 665 in 2018. The respective numbers of patients undergoing IPAA were 2225 in 2009 compared to 1285 in 2018 (2.07% vs 1.01%, $P = .0099$). The use of IPAA was noted to decrease from 2067 per 100 000 patient admissions with UC in 2009, to 1007 IPAA per 100 000 patient admissions with UC in 2018. When considering patients undergoing IPAA, the mean age, gender, median income, comorbidities, insurance coverage, distribution across the USA, and the race/ethnicities of patients were statistically similar between 2009 and 2018. IPAA as a surgical procedure was more frequently performed in smaller rather than large hospitals in 2018 compared with 2009 (Table 1). When considering all patients combined during the study period, our numbers remained small to accurately analyze differences among race/ethnicities with respect to postoperative mortality or severe postoperative complication rates. A logistic regression was performed comparing odds of IPAA in all race/ethnicities to White after adjustment for age, gender, Charlson comorbidity score, median income in patient zip code, insurance, hospital bed size, region, urban location, and hospital teaching status. This analysis indicated that Black patients were less likely than White patients to undergo IPAA both in 2009 and in 2018 (OR 0.38 [95% CI, 0.20–0.74], $P < .01$ and 0.50 (0.29–0.85), $P = .01$, respectively). Hispanic patients were significantly less likely to receive IPAA in 2009 but were no longer less likely to receive IPAA in 2018 when compared to Whites (Table 2).

Table 1. Patients with ulcerative colitis who underwent IPAA in 2009 versus 2018.

Variable	2009 (N = 2225)	2018 (N = 1285)	P-value
Age (years)	36.7	37.6	.52
Females	41.8%	39.7%	.62
Race/ethnicity			
White	83.24% (1852)	79.35% (1019)	
Black	3.62% (81)	5.26% (68)	
Hispanic	5.45% (121)	8.10% (104)	.40
Asian	1.34% (30)	3.24% (42)	
Other	6.35% (141)	4.05% (52)	
Median income in zip code			
\$1–\$37 999	15.65%	13.10%	
\$38K–47 999	20.64%	26.19%	.35
\$48K–63 999	31.17%	25.79%	
>\$64 000	32.54%	34.92%	
Charlson score			
0	85.29%	80.93%	
1	10.52%	14.01%	.45
2	2.83%	2.72%	
>3	1.36%	2.33%	
Insurance			
Medicare	7.27%	8.56%	
Medicaid	8.07%	12.84%	.46
Private	77.85%	73.15%	
Self	3.07%	2.72%	
Other	3.74%	2.73%	
Region			
Northeast	18.69%	28.02%	
Midwest	51.18%	26.85%	.15
South	14.81%	25.29%	
West	15.31%	19.84%	
Urban location	98.28%	99.22%	.52
Teaching hospital	90.66%	95.72%	.12
Bedsizes			
Small	1.78%	11.67%	
Medium	16.51%	16.73%	.03
Large	81.71%	71.60%	

Discussion

Our study assesses the number and odds of patients with UC to undergo IPAA among different races/ethnicities in the years 2009 and 2018 using the NIS dataset. The results highlight racial/ethnic disparities in getting IPAA among patients with UC. In our study, there were more patients discharged from US hospitals with an associated diagnosis of UC in 2018 compared to 2009. This could be explained by the increasing incidence of IBD in recent years and more IBD awareness among general physicians.²⁴ However, our study shows that the total percentage of patients with UC undergoing IPAA in 2018 was significantly less compared to 2009 and this is likely because of the more available and widespread use of advanced therapies in recent years as shown by studies by Wewer et al. and Yu et al.^{25,26}

Table 2. Adjusted odds of IPAA

	Overall	2009	2018
Black	0.43 (0.29–0.67), <0.01	0.38 (0.20–0.74), <0.01	0.50 (0.29–0.85), 0.01
Hispanic	0.57 (0.41–0.80), <0.01	0.56 (0.36–0.87), 0.01	0.63 (0.39–1.04), 0.07
Asian	0.96 (0.54–1.71), 0.90	0.69 (0.24–2.02), 0.50	1.29 (0.69–2.41), 0.43
Other	0.83 (0.50–1.41), 0.50	1.06 (0.59–1.90), 0.85	0.54 (0.23–1.23), 0.14

Abbreviation: IPAA, ileal pouch–anal anastomosis. Multivariate logistic regression yielding adjusted odds (95% confidence interval) of IPAA in all races/ethnicities compared to Whites. Variables that were adjusted for include: age, sex, median income in the patient's zip code, Charlson comorbidity index, hospital region, urban location, bed size, and teaching status.

Two studies demonstrated that most patients undergoing colectomy for UC had private insurance.^{14,27} In our study, most patients undergoing IPAA also had private insurance rather than Medicaid, Medicare, or self-pay in both 2009 and 2018. Previous work by Kayal et al. reached the same conclusion that Black, Hispanic, or public insurance patients were less likely to undergo IPAA. IPAA rates were highest in White patients and those with private insurance consistently over time. The observed disparity in IPAA rates among minorities with public insurance may be a result of differential access to health services and specialists, specifically gastroenterologists and colorectal surgeons. In addition, individual and cultural preferences among minorities may lead to less utilization of elective surgery such as IPAA in this case.²⁸

More than 90% of patients had their IPAA surgery performed in a teaching hospital in an urban location in both 2009 and 2018. Additionally, more than 70% of patients had their IPAA surgery in large hospitals which could be due to the availability of more experienced colorectal surgeons there. However, our study notes that in 2018, the number of patients undergoing IPAA in large hospitals decreased, with an increase noted in small hospitals compared to 2009. That could indicate that more surgeons are becoming comfortable doing IPAA in smaller hospitals, but it also could reflect the positive effect of new IBD medications in avoiding surgery in large hospitals that usually have more IBD-specialized gastroenterologists.

Our study did not show a statistically significant difference in the rate of mortality and severe morbidity after IPAA for patients with UC among different racial/ethnic groups in both 2009 and 2018. This is reassuring and in agreement with other studies that showed no difference in complication rates and outcomes after IPAA between Blacks, Hispanics, and Whites.^{29,30} However, our data contrast with other studies that showed that composite postoperative morbidity after elective surgeries for IBD was highest for Black patients³¹ and that non-White patients had increased odds of individual complications after surgery for IBD.³² It is important to point out that those studies did not specifically evaluate IPAA surgery. Also, among patients with UC undergoing total proctocolectomy with IPAA, Hispanic and Black patients were significantly more likely to require readmission within 30 days of surgery than White patients.³³

Our study showed a significant disparity between the odds of Black and to a lesser extent Hispanic patients to undergo IPAA in comparison to White counterparts. Variations in rates of surgery among patients with UC from different races and ethnicities have been previously demonstrated but some of those studies focused on colectomy in general rather than IPAA as an individual procedure. In a study by Nguyen et al., Blacks were less likely than Whites to undergo colectomy for refractory UC (3.9% vs 40.7%, $P < .001$) while Hispanics had a higher prevalence of surgery (85.7% vs 40.7%, $P < .001$).^{14,17}

Between 1998 and 2003, there was a decreasing trend over time in colectomy rates among White patients ($P < .02$) but not among other racial/ethnic groups, which appeared to narrow the racial/ethnic gap in the colectomy rate.¹⁴ There was also a greater proportion of Black patients who underwent subtotal or total colectomy with retention of rectal stump and temporary ileostomy than Whites (35.3% vs 24.3%, $P < .05$)¹⁴ although a different study has shown no difference in the personal preference of pouch compared to ileostomy among different races.³⁴ Notably, our study showed that the percentage of Black, Hispanic, and Asian patients undergoing IPAA for UC have increased in 2018 compared to 2009 reflecting a decrease in disparity between different races/ethnicities.^{27,28}

We suspect the causes of the decreased probability of receiving IPAA among Blacks compared to White patients are multifactorial including unequal access to healthcare resources, access to IBD specialists, severity of disease, racial/ethnic discrimination, or patient preferences. However, in our study compared to 2009, the percentage of non-White patients undergoing IPAA increased in 2018 which could reflect improvement in access to healthcare resources or that more surgeons are performing IPAA, but it could also reflect that physicians are offering biologic therapy and/or immunomodulators more to White patients as reported in a study by Flasar et al.³⁵

The studies evaluating the rate of colectomy for Hispanic patients have been conflicting where some studies showed a higher rate of colectomy than White patients,^{16,17} while other studies showed a lower rate.²⁷ In our study, the overall odds of Hispanic patients with UC to undergo IPAA was less compared to White patients, but it was not statistically significant in 2018. Interestingly, our study and Bhurwal et al.'s study²⁷ had the data collected from the NIS database.^{16,17} The conflicting results could be due to different patient demographics in the different studies.

Meanwhile, Asian patients had lower odds of getting IPAA in 2009 in comparison to Whites but higher odds than White patients in 2018 but in both years, the results were not statistically significant.

One of the strengths of our study is that we used the NIS dataset, which is the largest publicly available, inpatient, all-payer dataset in the USA, so results are generalized to hospitalized patients in the USA. We also adjusted the results for age, gender, Charlson comorbidity score, median income in patient zip code, insurance, hospital bed size, region, urban location, and hospital teaching status to calculate the OR for patients with different races/ethnicities to undergo IPAA compared to White patients. Our study is also one of the first studies to specifically evaluate IPAA among different races/ethnicities. There are several limitations of this study, most importantly that the study did

not account for disease severity among different races/ethnicities, the ease of access to IBD specialists or the type of medications that were prescribed to patients prior to IPAA. It also did not account for patient preferences and specifically whether they would prefer pursuing IPAA compared to end ileostomy although a prior study did not find any underlying preferences for either surgery among Black or White patients.³⁴ Moreover, our study was retrospective in nature and therefore inherently more subject to confounding bias.

In conclusion, our study has important findings that illustrate the persistent racial/ethnic disparity, particularly between White and Black patients undergoing IPAA for UC in the USA. Further studies are needed to better understand the cause of these racial disparities and assess the specific role in rates of IPAA surgery among different races/ethnicities while considering disease severity, patient preferences, and type of medications used prior to undergoing IPAA.

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None declared.

Conflicts of Interest

J.G.H. holds the position of Associate Editor for *Crohn's & Colitis 360* and has been recused from reviewing or making decisions for the manuscript. No conflicts of interest exist for the remaining authors.

Data Availability

No new data were created or analyzed.

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