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Racial disparities in length-of-stay persist even with no postoperative complications

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ABSTRACT

Background: To determine the contribution of race to postoperative length-of-stay in elective colorectal surgery without complications.

Methods: The 2012-2013 National Surgical Quality Improvement Program Colectomy-Targeted Database was queried for patients undergoing elective colorectal surgery without complications. After stratifying by race, univariate/bivariate comparisons were made. On adjusted comparison, predictors of postoperative length-of-stay were identified along with incident rate ratios and Least Squares Means for predicted length-of-stays.

Results: Of 28,480 elective colorectal surgeries, 19,898 patients had no postoperative complications. Patients stratified to white (84%), black (8%), Hispanic (3%), and Asian (3%). Overall mean postoperative length-of-stay was 4.8 d, with black patients having the longest at 5.3 d ($P < 0.05$). After covariate adjustment, black race increased postoperative length-of-stay by 9%, 7%, and 6% compared to white, Hispanic, and Asian patients, respectively ($P < 0.05$). No statistical difference existed in postoperative length-of-stay for Hispanic and Asian patients versus white patients. Adjusted postoperative length-of-stay was 5.1 d for black patients compared to 4.7, 4.8, and 4.8 d for white, Hispanic, and Asian patients, respectively ($P < 0.05$).

Conclusions: Black patients have significantly longer postoperative length-of-stay after elective colorectal surgery even if no postoperative complications occur. Further studies are needed to understand the mechanism(s) for these disparities.

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Introduction

Racial disparities in health outcomes have been demonstrated across many surgical disciplines, including colorectal

surgery.^{1,2} With in-hospital lengths-of-stay spanning 8-12 days,³ postoperative complication rates approaching 30%,⁴ and 30-day readmission rates of 15%, colorectal operations account for nearly 25% of all complications in general

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surgery.⁵ Minority patients have even worse outcomes with longer lengths-of-stay (LOS),⁶ higher mortality² and more readmissions⁷ after colorectal operations. The underlying mechanism(s) are poorly understood, but surgical factors such as postoperative complications have been implicated.^{8–10} Although most studies have focused on postoperative complications, it remains unknown if minority patients with an uneventful in-hospital recovery (i.e., no in-hospital, postoperative complications) still experience disparities in postoperative length-of-stay (poLOS). The sustained presence of disparities under these circumstances would signify alternative and potentially novel mechanisms of health inequities.

The development of effective strategies to reduce disparities in outcomes such as poLOS relies on a critical understanding of the problem. Sukumar *et al.*¹¹ recently demonstrated that black patients have an increased overall LOS when undergoing major cancer operations compared to white patients. This study, however, included a heterogeneous group of surgical patients and included those with postoperative complications, which is a significant confounder for poLOS. In addition, no comparisons were made in growing minority groups such as Asian and Hispanic patients. We therefore aimed to investigate the effect of race on poLOS for patients undergoing elective colorectal operations with no in-hospital, postoperative complications and included non-black minority groups. We hypothesized that racial disparities would still persist in poLOS for minority patients even if no complications occur.

Materials and methods

The 2012-2013 American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) Colectomy-Targeted Database was queried for all patients undergoing elective colorectal surgery. Patients with ACS-NSQIP who measured predischarge, in-hospital postoperative complications were excluded. Postoperative complications included prolonged ileus, wound complications, sepsis, venous thromboembolism, respiratory complications, neurologic complications, cardiac complications, urinary tract infections, postoperative bleeding, renal complications, and organ space infections as defined by ACS-NSQIP. The cohort was represented by white, black, Hispanic, and Asian patients with the exposure of interest identified as black. Patients not identified as white, black, Hispanic, or Asian were excluded. Patient and procedure-specific variables were included.

Patient-specific comorbidities included diabetes mellitus, body mass index (BMI), smoking, 10% weight loss 6 mo preoperatively, history of chronic obstructive pulmonary disease (COPD), hypertension, steroid use, surgical indication, American Society of Anesthesiologists (ASA) class, and preoperative albumin. Procedure-specific factors included procedure type, stoma construction, type of bowel preparation, laparoscopic *versus* open approach, work relative value unit (RVU), and wound classification. The CPT codes used for procedure-specific classification included: partial colectomy (CPT44140-44141,44204), low anterior

resection/abdominoperineal resection/Hartmann's procedure (CPT44143-44147,44206-44208), ileocolic resection (CPT44160), and total colectomy (CPT44150-44151,44210).

The primary outcome was in-hospital, postoperative LOS (poLOS). Univariate and bivariate comparisons were used to examine the patient- and procedure-specific differences between white, black, Hispanic, and Asian patients undergoing elective colorectal operations without postoperative complications. Chi-squared and Wilcoxon rank sum tests were used to determine differences among categorical and continuous variables, respectively.

Predictors of poLOS were identified with multivariate regression using a negative binomial model. All variables that were significant in bivariate comparisons were included in the negative binomial regression model. From this saturated model, incident rate ratios (IRR) and LSMeans were obtained. Statistical significance was assigned for P value less than 0.05. All analyses were completed using SAS, v9.2.

Results

From the 2012-2013 ACS-NSQIP Colectomy-Targeted Database, 28,480 patients were identified who underwent elective colorectal surgery. Of these, 19,898 patients (69.8%) had no NSQIP measured in-hospital, postoperative complications (Table 1). Overall, most patients were female (53%) with a median age of 61 y (interquartile range: 51-71). Patients were stratified by race to white (84%), black (8%), Hispanic (3%), and Asian (3%). Hypertension was the most common comorbidity found (47%), followed by smoking (17%), diabetes (11%), steroid use (7%), preoperative weight loss (3%), and COPD (3%). Partial colectomy (42%) was the most frequent procedure performed, followed by LAR/APR/Hartmann procedure (31%), ileocolic resection (22%), and total colectomy (3%). Colorectal cancer (45%) was the most common indication for operative intervention, followed by diverticulitis (26%), other benign (non-inflammatory bowel disease [IBD] or diverticulitis) disease (19%), and IBD (8%). 14% of patients had a stoma constructed, and 32% received an open approach. 24% of patients had no preoperative bowel preparation compared to 34% with mechanical bowel preparation only, 24% with combined mechanical and oral antibiotic bowel preparation, and 3% with oral antibiotic bowel preparation alone. The overall median poLOS was 4.0 d (interquartile range: 3-6), and the mean poLOS was 4.8 days with a 30-d readmission rate of 5% (Table 1).

On patient-specific comparison between black and white patients, similarities existed in age, BMI, history of COPD, and steroid use. Black patients, however, were significantly more comorbid with higher rates of diabetes (20% *versus* 11%), smoking (20% *versus* 16%), 10% weight loss (4% *versus* 3%), hypertension (60% *versus* 44%), low albumin levels (6% *versus* 4%), and ASA scores 3-5 (54% *versus* 42%) compared to white patients ($P < 0.05$). On procedure-specific comparison, black patients were more likely to lack preoperative bowel preparation (26% *versus* 24%), have a lower rate of a bowel prep containing oral antibiotics (24% *versus* 28%), and have a higher rate of open approaches to the operation (37% *versus* 32%) when compared to white patients ($P < 0.05$). On unadjusted

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