Racial Disparities in Readmissions and Site of Care for Major Surgery

Micah E Girotti, MD, MS, Terry Shih, MD, Sha'Shonda Revels, MD, MA, MS, Justin B Dimick, MD, MPH, FACS

BACKGROUND: Racial disparities have been described in many surgical outcomes. We sought to examine whether these disparities extend to postoperative readmission rates and whether the disparities are associated with differences in patient mix and/or hospital-level differences.

STUDY DESIGN: National Medicare beneficiaries undergoing operations in 3 different specialties from 2006 to 2008 were examined: colectomy, hip replacement, and coronary artery bypass grafting (CABG) (n = 798,279). Our outcome measure was risk-adjusted 30-day readmission. We first used logistic regression to adjust for patient factors. We then stratified hospitals into quintiles according to the proportion of black patients treated and examined the differences in readmission rates between blacks and whites. Finally, we used fixed effects regression models that further adjust for the hospital to explore whether the disparity was attenuated after accounting for hospital differences.

RESULTS: Black patients were readmitted more often after all 3 operations compared with white patients. The unadjusted odds ratio (OR) for readmission for all 3 operations combined was 1.25 (95% CI 1.22 to 1.28) (colectomy OR 1.17, 95% CI 1.13 to 1.22; hip replacement OR 1.20, 95% CI 1.14 to 1.27; CABG OR 1.25, 95% CI 1.19 to 1.30). Adjusting for patient factors explained 36% of the disparity for all 3 operations (35% for colectomy, 0% for hip replacement, and 32% for CABG), but in analysis that adjusts for hospital differences, we found that the hospitals where care was received also explained 28% of the disparity (35% for colectomy, 70% for hip replacement and 20% for CABG).

CONCLUSIONS: Black patients are significantly more likely to be readmitted to the hospital after major surgery compared with white patients. This disparity was attenuated after adjusting for patient factors as well as hospital differences. (J Am Coll Surg 2014;218:423–430. © 2014 by the American College of Surgeons)

Racial disparities have been widely described in morbidity and mortality after major surgery.[1-7] Although focusing on these outcomes is clearly important, there is an increased emphasis on readmissions as a quality measure.[8] Recent policy enacted by the Hospital Readmission Reduction Program aims to improve fragmentation and poor care coordination, especially among vulnerable populations, by incentivizing improvement efforts around readmission to the hospital.[9]

However, although racial disparities for morbidity and mortality have previously been described, it is unknown whether these disparities extend to readmissions after major surgery. It is quite possible that racial disparities extend to other domains of care, given that patients who lack sufficient resources may be even more vulnerable to lapses in care coordination. Such disparities take on increasing importance given the current policy focus on reducing hospital payments for readmissions. This could result in the so-called "reverse Robin Hood effect," in which hospitals with the least resources are financially penalized, leaving them with even fewer resources to invest in effective care coordination and quality improvement.[10]

In this context, we used national Medicare claims data to examine readmissions in patients undergoing 3 major

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From the Center for Healthcare Outcomes and Policy, University of Michigan, Ann Arbor, MI.

Correspondence address: Micah E Girotti, MD, MS, University of Michigan Department of Surgery, The Center for Healthcare Outcomes and Policy (CHOP), 2800 Plymouth Rd, Building 16, Room 136E, Ann Arbor, MI 48109. email: micahg@med.umich.edu

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Abbreviations and Acronyms

CABG = coronary artery bypass graft
CMS = Centers for Medicare and Medicaid Services
ICD-9-CM = International Classification of Diseases, 9th edition, Clinical Modification
OR = odds ratio

operations. After first testing for the presence of differences in readmission rates between black and white patients, we determined whether these disparities were attenuated after accounting for patient factors as well as between-hospital differences where black patients obtained surgical care.

METHODS

Data source and study population

The Centers for Medicare and Medicaid Services (CMS) maintains a database of perioperative patient variables obtained from a file entitled Medicare Provider and Analysis Review, which contains claims submitted for inpatient hospital stays. Using appropriate International Classification of Diseases, 9th edition, Clinical Modification (ICD-9-CM) codes, we identified patients who underwent colectomy (45.73–45.76), hip replacement (81.51–52), and coronary artery bypass grafting (CABG) (36.10–19) during 2006 to 2008. We excluded CABG patients with concomitant valve replacements (35.10–29). In regard to race, patients were categorized as black, non-Hispanic white, or "other." Each other minority group consisted of 1% or less of our patient sample (3.5% for all other minority groups). Due to limited sample size, we selected non-Hispanic white patients for our comparison group and excluded the other patients in our overall models.

Outcomes

The primary outcome measure was 30-day hospital readmission. Because 100% of Medicare claims were used for this study, we were able to capture readmission to any facility. So we defined our primary outcome measure as readmission to either the index hospital or any other hospital for any reason within 30 days of discharge after the original operation. Readmission within 30 days of discharge was considered a dichotomous outcome. Patients with multiple readmissions were treated similarly to patients with a single readmission. This is consistent with the definition of readmission within the CMS Hospital Readmissions Reduction Program policy.

Analysis

In initial demographic and comorbidity analyses comparing the black and white populations, chi-squared tests were used to compare black vs white patients for categorical variables and Student's *t*-test for continuous variables. Statistical significance was set at $p < 0.05$. After calculating an unadjusted readmission rate, we elected to adjust for any patient-level differences in the 2 populations. This was performed by creating a logistic regression model incorporating multiple clinical variables, including the type of operation, demographics such as age (continuous variable), sex, admission acuity, and comorbidities. Patient comorbidities were adjusted using the Elixhauser method, a validated tool developed by the Agency for Healthcare Research and Quality to be used for administrative data.[11,12] Additionally, socioeconomic status was added to the model, using a composite measure described by Birkmeyer and colleagues,[13] based on the 2000 United States Census data. This incorporates such factors as neighborhood income, education, and occupation level based on patient ZIP code data. We anticipated that this regression analysis model would define the presence of a racial disparity by isolating the effect of black race on 30-day readmission after adjusting for all measurable clinical factors.

To specifically examine the effect of site of care on this disparity, we first organized all patient-level data by hospital. In order to identify hospitals that serve a high proportion of black patients, we ranked hospitals based on the proportion of black patients among all patients for the 3 procedures. We then created 5 equal-sized patient groups (quintiles) stratified by these hospital ranks. These were termed quintiles 1 to 5, with quintile 1 defined as "nonminority-serving hospitals" and quintile 5 designated as "minority-serving hospitals." Therefore, 10 dichotomous groups of patients were delineated: black and white patients at each of the 5 quintiles of hospitals. We then used a logistic regression model identical to our first analytic step to obtain the risk-adjusted odds of readmission, and then compared the readmission rates of blacks and whites and the variation between hospital quintile. For purposes of the model, all odds ratios are in reference to white patients at the nonminority-serving hospitals. This approach allowed us to draw conclusions about the effect of race on readmission among hospitals with varying degrees of racial mix.

Finally, we applied a fixed-effects hierarchical regression model to the dataset using hospital identifier numbers contained within the Medicare claims database. In this model, we used hospital fixed effects to account for within-hospital variation in addition to adjusting for patient factors. This type of modeling essentially adjusts for hospital-level factors that affect all patients, isolating the racial differences. Comparing this with the previously performed logistic regression adjusting for patient factors