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Race and socioeconomic disparities in national stoma reversal rates

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Abstract

BACKGROUND: Many temporary stomas are never reversed leading to significantly worse quality of life. Recent evidence suggests a lower rate of reversal among minority patients. Our study aimed to elucidate disparities in national stoma closure rates by race, medical insurance status, and household income.

METHODS: Five years of data from the Nationwide Inpatient Sample (2008 to 2012) was used to identify the annual rates of stoma formation and annual rates of stoma closure. Stomas labeled as "permanent" or those created secondary to colorectal cancers were excluded. Temporary stoma closure rates were calculated, and differences were tested with the chi-square test. Separate analyses were performed by race/ethnicity, insurance status, and household income. Nationally representative estimates were calculated using discharge-level weights.

RESULTS: The 5-year average annual rate of temporary stoma creation was 76,551 per year (46% colostomies and 54% ileostomies). The annual rate of stoma reversal was 50,155 per year that equated to an annual reversal rate of 65.5%. Reversal rates were higher among white patients compared with black patients (67% vs 56%, $P < .001$) and among privately insured patients compared with uninsured patients (88% vs 63%, $P < .001$). Reversal rates increased as the household income increased from 61% in the lowest income quartile to 72% in the highest quartile ($P < .001$).

CONCLUSIONS: Stark disparities exist in national rates of stoma closure. Stoma closure is associated with race, insurance, and income status. This study highlights the lack of access to surgical health care among patients of minority race and low-income status.

The fashioning of an ileostomy or colostomy is a relatively common surgical procedure performed for a myriad of indications spanning trauma, diverticulitis, malignancy, inflammatory bowel disease, and ischemia. These stomas can be permanent or temporary, with the latter being reversed within a very variable time frame.

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An estimated 450,000 patients in the United States have an ostomy.[1] An unknown proportion of these await reversal. From clinical experience and previous reports, not all stomas are reversed.[2,3] There is a paucity of data regarding the national rates of stoma formation and reversal. In a retrospective analysis of 3,899 trauma patients in the state of California who underwent stoma creation, 28% were not reversed within 5 years.[2] In a similar study of 1,176 patients in California with stomas created for diverticulitis, an estimated 35% of patients did not have their stomas reversed.[4] Living with an ostomy has been associated with a lower quality of life, worse illness perceptions, and higher health care consumption compared with a similar patient population without an ostomy.[5,6]

Recent studies have shown insurance status, race, age, and income level to be associated with stoma reversal.[2,3,7,8] African Americans have been found to be 4 times less likely to undergo reversal than Caucasians.[3] Lack of adequate health insurance has been identified as a predictor of greater disease severity, suboptimal surgical treatment, and mortality.[9] Older patients and those of lower socioeconomic status were also less likely to have their stomas reversed in a timely fashion.[7] Most of these studies are, however, single-institution retrospective reviews. It is, therefore, difficult to extrapolate these results at a national level. The aim of this study was to assess race, insurance, and income-related disparities in the rates of stoma reversal on a national scale in the United States.

Methods

We used 5 years of data from the Nationwide Inpatient Sample (NIS; admission years 2008 to 2012). The NIS is the largest all-payer inpatient database available.[10] It is a 20% probability sample of all community hospitals and is derived from state inpatient databases. It represents 95% of the US population and includes demographic, clinical, and outcomes information. Discharge-level weights provided for each patient allow for the calculation of nationally representative estimates.

The NIS does not have longitudinal data on patients beyond hospital discharge; therefore, follow-up information, such as whether an individual patient's stoma was reversed after a few months, is unavailable. However, because the NIS is a representative sample, it does provide us with national estimates. In an ideal situation where all temporary stomas are reversed, the national 5-year average number of stomas created should equal the national 5-year average number of stomas reversed. Using discharge-level weights and survey estimation commands, we are able to determine these numbers. Therefore, we are able to calculate national stoma reversal rates by dividing the national 5-year average number of stomas reversed by the national 5-year average number of stomas created.

From the NIS 2008 to 2012, we created 2 separate data sets: one with all patients who had a temporary stoma created and the second with all patients who had a stoma reversal. For both data sets, we calculate 5-year national average rates. For the first data set, we used *International Classification of Diseases, Ninth Revision* (*ICD 9*), procedure codes and the NIS-provided Clinical Classification Software to select all patients who had a procedure code for "colostomy" (*ICD 9* codes 46.10, 46.11, 46.12, 46.13, and 46.14) and "ileostomy" (*ICD 9* codes 46.20, 46.21, 46.22, 46.23, 46.24, 46.31, 46.32, and 46.39) creation. We then excluded patients if they satisfied either one of the following exclusion criteria: (a) procedure labeled as "permanent" stoma, (b) stoma created because of a diagnosis of malignancy of the colon, rectum, or anus, (c) the patient died during the same hospitalization, or (d) the stoma was reversed during the same admission. In particular, malignancy of colon, rectum, and anus were excluded because of the lack of staging information that made it impossible to determine which patients had permanent ostomies because of advanced-stage cancers. We, therefore, arrived at a cohort of patients with "temporary" stomas.

From the database, it is impossible to determine with 100% accuracy whether a stoma created was intended to be temporary or permanent. The earlier mentioned exclusion criteria offer us the closest and most reasonable estimate of "temporary" stomas; however, it is not an entirely accurate estimate. For example, many stomas for cancers of the colon, rectum, and anus may have been intended to be temporary, which we exclude, and conversely many trauma stomas, eg, in paraplegic patients, may have been intended to be permanent, which we include. These inaccuracies in identification are, however, thought to be unrelated to demographic and socioeconomic categories. Because the objective of our analysis is to study disparities in stoma reversal rates, it is reasonable to accept this marginal inaccuracy in identification of "temporary" stomas as it is unlikely to affect the disparity.

Other demographic and clinical variables included in the data set were age (in years), gender, race, number of chronic conditions, admission type (elective vs emergent), insurance (Medicare, Medicaid, private insurance, uninsured or self pay, and other insurance), income quartile of patients, Zip code, primary diagnosis, length of hospital stay, and mortality. Using NIS-provided discharge-level weights, we were able to estimate the 5-year average annual rate of "temporary" stoma creation. We calculated this rate for different demographic categories.

For the second data set, we used *ICD 9* procedure codes to identify patients who underwent an "ileostomy closure" (*ICD 9* code 46.51), "colostomy closure" (46.52), or "unspecified stoma closure" (46.50). A similar set of demographic and clinical variables were abstracted and tabulated. Using discharge-level weights, we calculated 5-year average annual rates of stoma reversal for different demographic categories as mentioned earlier. We then calculated stoma reversal rates by dividing the annual average number of stomas reversed by the annual average number of stomas created. Ideally, these 2 numbers should