Socioeconomic Status Negatively Affects HCAHPS Scores in Orthopedic Patients
The Results of 15,789 Patients at a Single Institution

Brandon S. Shulman, MD, Brooks Crowe, MD, Lorraine Hutzler, MPA, Raj Karia, MPH, and Joseph Bosco, MD

Abstract

Background: The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) is a nationally reported survey of patients’ perspectives of hospital care that is used for hospital comparison and reimbursement. Although the survey attempts to correct for many factors that may affect scoring, socioeconomic factors are not considered in score weighting. The purpose of this study was to analyze the effect of socioeconomic status on HCAHPS scores.

Patients and Methods: HCAHPS scores from 15,789 patients were collected. All patients were seen at a single academic medical center from 2010 to 2014, thus controlling for quality of care. HCAHPS Top Box scores were then compared to patient socioeconomic status based on the median income of the ZIP Code for each patient.

Results: Median income was negatively associated with patients’ overall hospital rating (p < 0.001) and willingness to recommend hospital (p < 0.001). When controlling for the current adjustment factors (age, education, primary language, health status, and emergency admission), living in a ZIP Code with a median household income above $100,000 per year was independently associated with worse Top Box Scores for the categories of “Overall Hospital Rating” (p = 0.042), “Recommend Hospital” (p = 0.007), “Pain Management” (0.048), “Communication about Medicine” (p = 0.007), “Cleanliness of Hospital Environment” (p = 0.002), and “Quietness of Hospital Environment” (p < 0.001).

Conclusion: Socioeconomic status independently affects HCAHPS scores. Patients living in ZIP Codes with lower median incomes generally rated hospitals better than patients with higher incomes. Therefore, treatment of a disproportionate number of low income patients cannot be cited as a pretext for poor HCAHPS scores.

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) is a nationally reported survey of patients’ perspectives of hospital care that is used for hospital comparison and reimbursement. Jointly developed for public use by the Centers for Medicare and Medicaid Services (CMS) and the Agency for Healthcare Research and Quality (AHRQ), it consists of 27 questions arranged in 10 categories intended to measure patients’ perceptions of their hospital experience. Each category is then stratified into three “boxes,” with the Top Box Score denoting the highest possible score of each category. HCAHPS scores provide metrics that allow hospitals to assess themselves against their peers in a standardized fashion, thus incentivizing hospitals to make quality improvements. The Affordable Care Act of 2010 also uses HCAHPS scores to adjust hospital reimbursement through its Value Based Purchasing (VBP) program. In this program, HCAHPS scores form the basis for 30% of the “Total Performance Score” that ties hospital revenue to quality measures. Additionally, CMS’s mandatory total joint bundle, Comprehensive Care for Joint Replacements (CJR), uses HCAHPS as 40% of their quality scores.

In order to improve standardization between hospitals, HCAHPS takes into account several demographic patient-mix factors known to influence scores. Age, education, primary language, health status, and emergency admission are all incorporated into the final HCAHPS score calculation for each of the 10 HCAHPS categories. However, several demographic factors such as gender, surgical volume, geo-
graphic region, race, nationality, and insurance have all been shown to influence HCAHPS scores, despite their exclusion from the official scoring algorithm.1,5,7-11 The exclusion of potentially score-impacting demographic factors from the scoring algorithm raises the concern that HCAHPS scores may not reflect the quality of all hospitals equally or that untested demographic factors could be blamed for poor HCAHPS scores.

One largely unstudied but highly pertinent demographic factor that has potential to influence HCAHPS scores is socioeconomic status. Poorer patients have worse outcomes with a variety of orthopedic interventions including total joint arthroplasty.12 The purpose of this study was to analyze the effects of socioeconomic status on HCAHPS scores while controlling for demographic variance that is currently incorporated into HCAHPS scoring. Our null hypothesis is that socioeconomic status has no discernable effect on HCAHPS scores.

Materials and Methods
From 2010 to 2014, we collected 15,789 of our patient’s HCAHPS scores. HCAHPS surveys were administered, collected, and scored by quality control officers at our institution prior to the initiation of this study. All scores came from a single hospital system. All patients were treated in facilities located within a 2 mile radius, essentially nullifying variance between treatment locations in travel time from home to medical facility. HCAHPS surveys were not sent to patients below the age of 18 at time of treatment. No exclusion criteria existed for this study and all HCAHPS scores received during the allotted time were included. Patient response rates to the HCAHPS survey were calculated by quartile; in our study quarterly HCAHPS survey response rates ranged from 31% to 34%.

Socioeconomic status was determined based on the median income of the ZIP Code reported for each patient. This information was obtained from the United States Census.13 The use of ZIP Code median income as a proxy for determining socioeconomic status is well established in the literature.14-18 Median income was analyzed as both a linear variable as well as an ordinal value—median household income above and below $100,000 per year. The $100,000 per year income was chosen since it was approximately the 75th percentile for median income in our dataset (Fig. 1). Regression analyses were conducted to compare patient socioeconomic status based on the median income of the ZIP Code for each patient while controlling for the demographic factors already including in the HCAHPS scoring algorithm.

Top box scores were calculated per CMS.4 The “top-box” response is “Always” for five HCAHPS composites (Communication with Nurses, Communication with Doctors, Responsiveness of Hospital Staff, Pain Management, and Communication about Medicines) and two individual items (Cleanliness of Hospital Environment and Quietness of Hospital Environment), “Yes” for the Discharge Information composite, “‘9’ or ‘10’ (high)” for the Overall Hospital Rating item, “Definitely yes” for the Recommend the Hospital item, and “Strongly agree” for the Care Transition composite.

Descriptive statistics were used to characterize the patient cohort. Backward stepwise binary logistic regression analyses were performed to evaluate the relationship between socioeconomic status and top-box scored domains of “Overall Hospital Rating,” “Willingness to Recommend Hospital,” “Cleanliness of Hospital Environment,” and “Quietness of Hospital Environment” while controlling for age, education, primary language, health status, and emergency admission. Linear regression analyses were conducted for the remainder of the HCAHPS categories, as they are composite categories comprised of multiple answers. All statistical analyses were performed with IBM SPSS Statistics software version 21 (IBM, Armonk, New York), and the significance level was set at p < 0.05.

Results
There were 11,821 patients who lived in ZIP Codes with a median income less than $100,000/year and 3,852 patients who lived in ZIP Codes with a median income greater than $100,000 per year (Table 1). Median income was negatively associated with patients’ overall hospital rating (p < 0.001). Median income was also negatively associated with patients’ willingness to recommend the hospital (p < 0.001). When

![Distribution of Incomes](image_url)

**Figure 1** Distribution of Income; $100,000 represents approximately the 75th percentile.
controlling for the current adjustment factors (age, education, primary language, health status, and emergency admission), living in a ZIP Code with a median household income above $100,000 per year was independently associated with: Overall Hospital Rating, Hospital Recommendation, Pain Management, Communication About Medicine, Communication with Nurses, Discharge Information, Cleanliness of Hospital Environment, and Quietness of Hospital Environment (Table 2). Communication with Doctors showed no association with economic status and was eliminated in our backward stepwise model.

Discussion
Our study demonstrated that the socioeconomic status of our patients was correlated with HCAHPS scores. Specifically, those patients who lived in relatively less affluent ZIP Codes were more willing to recommend the hospital and gave the hospital an overall higher rating than their peers who lived in more affluent ZIP Codes. The HCAHPS survey is increasingly being used to compare hospitals and guide reimbursement. There are several factors that are known to affect HCAHPS scores, and currently CMS controls for age, education, primary language, health status, and emergency admission when calculating scores. However, there are clearly other factors that affect patient satisfaction reporting beyond these five factors. In our cohort, socioeconomic status effected HCAHPS scores to essentially the same degree as the five factors currently controlled for by CMS. This has important consequences when using HCAHPS scores for comparison or reimbursement. In part, the uncounted effect of socioeconomic status on HCAHPS scores devalues the HCAHPS scores in their current form, as two hospitals

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there are other factors beyond age, education, primary language, health status, and emergency admission that have been reported to affect HCAHPS scores. Elliott et al. found that women report less positive experiences than men, most notably in the Communication about Medicines, Discharge Information, and Cleanliness categories. Maher et al. reported that lower post-anesthesia care unit (PACU) pain scores were associated with better HCAHPS scores. Tevis and Kennedy reported that centers with higher surgical volume had improved HCAHPS scores for surgical patients. However, unlike socioeconomic data, which can differ drastically between hospitals, the majority of uncontrolled factors currently reported to influence HCAHPS are either relatively consistent between hospitals (gender) or indirectly reflected in current scores. It stands to reason that centers with more experience treating surgical patients or better postoperative pain control protocols would see appropriately improved scores in the existing HCAHPS categories.

In regard to socioeconomic factors, the effects of race on HCAHPS scores have been reported in the literature, but with contradictory results. McFarland et al. found that education and white ethnicity were most strongly associated with favorable HCAHPS scores. However, Goldstein et al. found that African Americans and Hispanics reported better experiences than non-Hispanic whites. Iannuzzi et al. found that African Americans reported higher HCAHPS scores than other non-white minorities. Elliott et al. found that Native Americans reported significantly higher scores than non-Hispanic whites, but acknowledged that only certain hospital systems had sizable Native American populations. Both in terms of medical outcomes and in quality reporting such as length of stay, income has been shown to be an independent modifier when controlling for race. Our income data may provide some explanation as to why the effects of race on HCAHPS scores have been so inconsistently reported in the existing literature. Furthermore, it helps advance the notion that socioeconomic factors do influence HCAHPS reporting in ways that are not currently accounted for when comparing hospitals.

Patients from lower-income households have previously been reported to have worse outcomes across a variety of conditions—from decreased reperfusion after ischemic stroke to increased risk of hypoglycemia in diabetics to longer length of stay after total hip arthroplasty. Given this knowledge, it might be easy for hospital administrators to develop a sense of complacency and infer that treating lower-income patients automatically portends to lower HCAHPS scores. However, our data shows that when controlling for quality of care and hospital setting, patients living in lower income ZIP Codes actually rate hospitals better than their higher income peers. This is extremely important when evaluating hospitals that treat primarily low-income populations, as economic factors should not be held as a cover for gaps in quality of care.

This study was limited by retrospective data. Although our response rates were similar to those reported in previous literature, all HCAHPS studies are subject to nonresponse bias. Nonresponse bias is defined as systematic error due to differences between the responses of those who do respond and the responses of nonrespondents had they responded. Our study was also conducted using data from a single academic medical center. While this allowed us to control for quality of care, our cohort had geographically specific social determinants of health that may not be universally applicable. Social services, housing, and health care access are not geographically consistent among people with similar incomes.

Conclusion

In conclusion, we found that socioeconomic factors do influence HCAHPS scores in a setting of equal quality of care. While socioeconomic factors are not currently weighted in HCAHPS score calculations, they independently influence HCAHPS scores when controlling for the five factors currently weighted in the scoring algorithm. As patients living in low income ZIP Codes tend to rate hospitals better than patients living in higher income ZIP Codes, low socioeconomic status should not be used as a justification for poor HCAHPS scores. Instead, the quality of care that these patient receive should be considered as a source of their low HCAHPS scores.

Disclosure Statement

None of the authors have a financial or proprietary interest in the subject matter or materials discussed, including, but not limited to, employment, consultancies, stock ownership, honoraria, and paid expert testimony.

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