The limited influence of neurosurgeons' behavior on inpatient satisfaction: a retrospective multihospital analysis

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OBJECTIVE The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) is a survey that assesses patient satisfaction, which is an important measure of the quality of hospital care and ultimately the overall hospital rating (OHR). However, the survey covers several elements of patient satisfaction beyond the patient-surgeon interaction. In this study, authors investigated which admission and experience factors had the highest impact on the OHR.

METHODS This was a retrospective cohort analysis of HCAHPS surveys from patients who, in the period between August 1, 2016, and January 31, 2018, had been discharged from the neurosurgical or orthopedic service at three hospitals serving a single metropolitan area. The top-box score was defined as the highest rating obtainable for each survey question. Baseline admission attributes were obtained, and multivariate logistic regression was used to determine predictors of the top-box OHR.

RESULTS After application of the inclusion and exclusion criteria, 1470 patients remained in the analysis. Categories on the HCAHPS included OHR, communication, education, environment, pain management, and responsiveness. After excluding identifying questions from the survey and adjusting for subspecialty and hospital, 7 of 17 HCAHPS survey items were significant predictors of OHR. Only 2 of these were related to the surgeon: 1) discharge, "Did you get information in writing about what symptoms or health problems to look out for after you left the hospital?" (OR 5.93, 95% CI 2.52–13.94); and 2) doctor, "Did doctors explain things in a way you could understand?" (OR 2.78, 95% CI 1.73–4.46). The top three strongest correlating items were 1) discharge; 2) nursing, "Did nurses treat you with courtesy and respect?" (OR 3.86, 95% CI 2.28–6.52); and 3) hospital environment, "Were your room and bathroom kept clean?" (OR 2.86, 95% CI 1.96–4.17).

CONCLUSIONS The study findings demonstrated that there are several nonmodifiable factors (i.e., specialty, experience) and items that are not under the direct purview of the neurosurgeon (e.g., nursing communication, hospital environment) that are significant influences on overall inpatient satisfaction on the HCAHPS survey. Furthermore, components of the survey that ultimately influence the OHR vary across different hospitals. Hence, HCAHPS survey results should be broadly interpreted as a way to make health systems more aware of the overall hospital factors that can improve quality of care and patient experience.

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KEYWORDS patient satisfaction; patient-reported outcomes; communication; HCAHPS; behavior

IN 2013, the assessment of hospital quality for all specialties, including neurosurgery, transitioned from the Press Ganey survey to the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS).¹ The HCAHPS survey is now the most widespread measure of inpatient satisfaction in the United States. It is a 31-item survey that is mailed, emailed, or called in to pa-

tients soon after they are discharged from the hospital and evaluates their experiences, including an overall hospital rating (OHR). Considering that patient satisfaction is an important indicator of hospital care quality, collecting this measure can raise potential solutions and opportunities to improve hospital care.^{2,3} A previous systematic review investigating instruments to measure patient satisfaction

ABBREVIATIONS HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems; OHR = overall hospital rating.

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with healthcare quality in hospitals has highlighted the HCAHPS as a reliable and valid measure strongly recommended for use for high-stakes purposes (e.g., financial incentives or an outcome measure in a research study).³

The Centers for Medicare & Medicaid Services (CMS) requires all hospitals in the United States to report HCAHPS findings, which are used as a proxy for the quality of hospitals to calculate Medicare reimbursements and compensations.^{4,5} Although there are financial incentives that directly affect the neurosurgeon, the 31 survey items cover a broad range of domains including OHR, communication with doctors (“Doctor”) and nurses (“Nursing”), medications (“Medication”), discharge education (“Discharge”), hospital environment (“Environment”), pain management (“Pain”), and responsiveness to needs (“Responsiveness”).⁶

Because there are many other components to the questionnaire, we sought to clarify the drivers of the overall rating using de-identified patient responses to the HCAHPS in conjunction with hospital admissions data. Using the OHR as the outcome measure in this study, we attempted to determine 1) the baseline admission-specific predictors of the OHR, 2) the HCAHPS items most strongly associated with a good OHR, and 3) methods to improve the assessment of neurosurgeons based on these findings.

Methods

Study Design and Setting

This IRB-exempt study was a retrospective cohort analysis of returned HCAHPS surveys from patients who had been discharged from our health system between August 1, 2016, and January 31, 2018. Study results were reported using the STROBE statement.⁷

Participants

Included for analysis were all patients who 1) had been admitted under a neurosurgeon or an orthopedic spine surgeon; 2) had been hospitalized in one of the three main hospitals within the health system: university hospital (hospital 1) = large (957 beds) academic hospital, regional hospital (hospital 2) = medium (369 beds) community hospital, city hospital (hospital 3) = small (186 beds) community hospital; and 3) had been eligible for and returned the HCAHPS survey. Patients eligible for the survey were those over the age of 18 years who were admitted for at least 1 complete night, did not have a primary psychiatric diagnosis, and were not discharged to a nursing home or hospice.⁸ Excluded patients were those who did not answer the OHR item.

Variables

Patient HCAHPS responses as well as their discharge month, hospital, surgeon, and discharging service were obtained from Performance Services—a department responsible for collecting routine business performance metrics such as feedback and demographic data at the individual patient, provider, and hospital level. For each attending, their sex and years of experience were collected from their online institutional profiles. National averages

for the HCAHPS scores were also available from Medicare and HCAHPS online reports for comparison.^{6,9}

For each patient, de-identified responses to 17 of the 31 survey items (Table 1) were made available from our Performance Services database, as were their discharge month, hospital, attending, and discharging service. The 14 HCAHPS items excluded from our analysis were identifying data or did not materially add to the analyses (e.g., “Would you recommend this hospital to your friends and family?”). The attending physician of each patient was linked to their sex and years of experience, and these variables were added to the analysis.

The HCAHPS is a multiple-choice survey, but providers and hospitals only receive credit for the best responses, called “top-box” responses; therefore, each of the responses to each question was recoded as a binary, with top-box answers (score of 10 or 9 for numeric questions, “always” for Likert questions, or “yes” for yes/no questions) assigned a score of 1 and all other answers assigned a score of 0. The percentage of top-box answers for each question item was recorded as the variable “top box.” Questions within the domain of communication with doctors (Doctor) or discharge communication (Discharge) were considered to be under the direct purview of the surgeon or surgical team, and all other questions were considered not to be.

Statistical Considerations

Descriptive statistics (frequencies, means, and percentages) were used to summarize the surgeon characteristics at baseline. For the outcome measure, OHR, the degree of influence of a variable or survey item on the OHR was calculated as the odds ratio of receiving a top-box OHR given a specific value for that variable or a top-box score for that item. The odds ratios were derived from multivariate logistic regressions with OHR as the outcome. The first regression looked at the hospital admission variables (i.e., admitting hospital, department, subspecialty, patient sex, and month) as predictors of OHR in order to determine baseline differences in OHR between hospitals, specialties, and subspecialties. The second regression looked at the HCAHPS questions as predictors, adjusting for hospital admission variables based on the first analysis, and backward elimination was used to arrive at the final model for the questions that were the greatest determinants of the OHR with a minimum $p_{\text{out}} = 0.05$. To investigate confounding, additional post hoc tests were run, including a beta regression to determine if the response rate to an item was influenced by the score. We also separated our cohort by hospital to determine if patients within the different hospitals assigned differing weights to specific HCAHPS items as related to the OHR.

The major source of bias in the study was nonresponse bias from incomplete surveys, so the questions that had nonresponse rates greater than 15%—two medication communication questions and one responsiveness question—were eliminated from consideration in the model (Table 1). There has been no documented need to add nonresponse weights to individual items.¹⁰ The nonresponse bias related to the relatively low rates of response to the survey at all is well documented in the literature; therefore,

TABLE 1. Summary of HCAHPS responses

Code	Question Item	No. of Responses	Top-Box Responses	National Average
OHR	Rate this hospital from 0 to 10	1470	78%	73%
	Communication w/ doctors			82% overall
Doctor-1	Did doctors explain things in a way you could understand?	1464	85%	
Doctor-2	Did doctors listen carefully to you?	1464	87%	
Doctor-3	Did doctors treat you with courtesy and respect?	1467	92%	
	Communication about medicines			65% overall
Medication-1	Did hospital staff describe possible side effects in a way you could understand?	970	51%	
Medication-2	Did hospital staff tell you what the medicine was for?	982	80%	
	Communication w/ nurses			80% overall
Nursing-1	Did nurses explain things in a way you could understand?	1473	80%	
Nursing-2	Did nurses listen carefully to you?	1468	78%	
Nursing-3	Did nurses treat you with courtesy and respect?	1471	86%	
	Discharge communication			
Discharge-1	Did you get information in writing about what symptoms or health problems to look out for after you left the hospital?	1372	96%	87%
Discharge-2	Did doctors, nurses, or other hospital staff talk with you about whether you would have the help you needed when you left the hospital?	1373	92%	52%
	Hospital environment			
Environment-1	Were your room and bathroom kept clean?	1462	71%	75%
Environment-2	Was the area around your room quiet at night?	1463	63%	62%
	Pain management			
Pain-1	Was your pain well controlled?	1323	63%	71%
Pain-2	Did the hospital staff do everything they could to help you with your pain?	1321	81%	NA
	Responsiveness			69% overall
Responsiveness-1	After you pressed the call button, did you get help as soon as you wanted it?	1285	63%	
Responsiveness-2	Did you get help in getting to the bathroom or in using a bedpan as soon as you wanted?	1093	69%	

NA = not applicable.

this analysis is limited to those patients who responded.^{11,12} The data were compiled and unified in Microsoft Excel, and all analyses were performed using RStudio software. A $p < 0.05$ was considered statistically significant.

Results

Participants

The inclusion criteria generated 1478 patients distributed among the three hospitals and attended by 30 surgeons. After 8 patients were eliminated for not responding to the OHR item, 1470 patients remained in the analysis (Fig. 1). The overall quantity of responses and the percent of top-box responses are reported in Table 1. Among the attendings were 22 neurosurgeons and 8 orthopedic spine surgeons (Table 2). Most of the surgeons were men, and the overall mean experience was 27 years. Compared to the national average top-box scores, our institution outperformed the nation in OHR scores as well as on the Doctor and Discharge questions.

Main Results

The first analysis was performed to determine baseline

differences in OHR based on hospital admission variables. In a multivariate logistic regression controlling for subspecialty and hospital type, every year of additional surgeon experience was associated with a significantly increased likelihood of patients reporting a top-box OHR (OR 1.02, 95% CI 1.00–1.03; Table 3). Also, patients admitted to an orthopedic surgeon (OR 0.56, 95% CI 0.40–0.77) were less likely to give a top-box OHR.

The second analysis was performed to create a model, adjusted for the significant baseline variables in the first analysis and using backward elimination, that described which HCAHPS items had the strongest influence on the OHR. Among the 17 items tested, a total of 7 (Discharge-1, Nursing-3, Environment-1, Doctor-1, Responsiveness-1, Pain-2, Nursing-2) remained in the adjusted model (Table 4). Only two of those were related to the surgeon/surgical team: Discharge-1, “Did you get information in writing about what symptoms or health problems to look out for after you left the hospital?” (OR 5.93, 95% CI 2.52–13.94); and Doctor-1, “Did doctors explain things in a way you could understand?” (OR 2.78, 95% CI 1.73–4.46). The top three strongest correlating items were as follows: Discharge-1; Nursing-3, “Did nurses treat you with courtesy

FIG. 1. Flow diagram of the study cohort.

and respect?” (OR 3.86, 95% CI 2.28–6.52); and Environment-1, “Were your room and bathroom kept clean?” (OR 2.86, 95% CI 1.96–4.17).

Subgroup Analyses

To investigate confounding, additional post hoc tests were run. Beta regression revealed that after controlling for hospital, the response rate to an item was significantly influenced by the score, indicating that HCAHPS items with higher overall scores were more likely to have had a response ($p < 0.001$, pseudo R^2 0.15).

Discussion

Key Results

This retrospective exploratory analysis of neurosurgical patient satisfaction data revealed that within our health system, surgical service and surgeon years of experience were significant factors affecting the OHR for HCAHPS.

Once the HCAHPS factors affecting OHR were adjusted for, the HCAHPS items with the most influence on OHR were Discharge-1 (“Did you get information in writing about what symptoms or health problems to look out for after you left the hospital?”), Nursing-3 (“Did nurses treat you with courtesy and respect?”), and Environment-1 (“Were your room and bathroom kept clean?”).

Interpretation

Our results indicate that out of the 7 items on the HCAHPS that predict OHR, only one of the top three questions that most significantly contributed to the OHR was related to the actions of the surgeons/surgical team. Hence, the HCAHPS’s OHR minimally captures the patient assessment of communication with doctors and discharge communication, and there are significant competing contributions from communication with nurses and pain management as well.

Primarily, the fact that all the doctor or discharge communication items drop out as significant predictors in different subpopulations is important because it means that the HCAHPS OHR is not a specifically useful measure of neurosurgeon performance, but rather a reflection of whatever is left as a significant predictor. This does not mean that neurosurgeons should completely dissociate themselves from the OHR—instead, we should consider improving patient satisfaction with the quality of care as a group effort and encourage initiatives for change in domains that prove to be both significant drivers of OHR and weak performance areas.^{13–16}

We should also consider measures other than HCAHPS to be tied to reimbursement. The relationship between patient satisfaction and what physicians consider to be measures of quality has always been controversial.^{17–22} In addition to the adjustment for nonresponse bias, HCAHPS scores must also be adjusted for the environment; it has been demonstrated that there are several hospital- and

TABLE 2. Characteristics among 30 surgeons

Variable	Value
Specialty	
Neurosurgery	22 (73.3)
Cranial	4
Pediatric	3
Spine	12
Vascular	3
Orthopedics spine	8 (26.7)
Male sex	27 (90)
Experience in yrs	13.0 (11.3)

Continuous variables are expressed as the mean (SD). Categorical variables are expressed as the number (%).

TABLE 3. Admission-specific determinants of OHR

Variable	OR	95% CI	p Value
Orthopedics (ref = neurosurgery)	0.56	0.40–0.77	<0.01
Experience (for every yr of experience)	1.02	1.00–1.03	0.03
Female (ref = male)	1.38	0.70–2.75	0.36
Month	1.00	0.97–1.02	0.81

ref = reference.

Boldface type indicates statistical significance. The first set of regressions looked at hospital data as predictors after controlling for subspecialty and hospital size. Patients of more experienced surgeons gave higher ratings.

county-level factors that confound the HCAHPS score, including case mix, illness severity, hospital size, and local demographics.^{23–31} However, care should be taken to ensure that over-adjustment does not lead to ignoring real differences in experiences between groups.^{32–34}

Secondarily, it is important to note the variability in items that are the strongest drivers of OHR in different populations because it indicates that these same analyses must be done for any neurosurgical department that wishes to draw conclusions about the utility of the OHR.^{35,36} In this regard, our findings agree with the results in more limited neurosurgical populations such as adult spine patients and adult cranial patients.^{37,38} Each microenvironment is unique, and our findings demonstrate that while trends exist, there are no hard rules about the OHR even within a single health system. Our specific findings should not be generalized to other neurosurgical hospital services but instead serve as a template for exploratory analyses to drive quality improvement.

This study has several limitations inherent to any retrospective review of voluntary survey data. The accuracy of HCAHPS data is limited by the response rate, a phenomenon well documented in the literature.^{11,39–41} Our study was no exception with a response rate of 16.3%. There are also sources of bias in both incomplete HCAHPS surveys and unreturned surveys, as discussed above and as noted by our post hoc beta analysis. The variable return rates among the different hospitals can make it difficult to generalize the data. Limited access to patient data prevented the inclusion of other confounders noted in the literature, such as illness severity and race/ethnicity. Second, there may have been less variability among the 30 surgeons we followed, which could decrease variation in the factors that affect the resulting OHR. Third, HCAHPS requires at least 300 completed surveys per hospital to achieve a minimum of 0.8 reliability for the reported measures.⁴² Because our study had 1470 filled questionnaires for 30 surgeons, averaging about 49 surveys per surgeon, the reliability for surgeon assessment may be low.

Conclusions

Our findings demonstrate that there are several factors and items not under the direct purview of the neurosurgeon (e.g., nursing communication, hospital environment) that are significant influences on inpatient satisfaction on the HCAHPS survey. This indicates that the HCAHPS

TABLE 4. HCAHPS items that predict OHR

Variable	OR	95% CI	p Value
Discharge-1	5.93	2.52–13.94	<0.01
Nursing-3	3.86	2.28–6.52	<0.01
Environment-1	2.86	1.96–4.17	<0.01
Doctor-1	2.78	1.73–4.46	<0.01
Responsiveness-1	2.48	1.67–3.67	<0.01
Pain-2	1.87	1.20–2.93	0.01
Nursing-2	1.69	1.05–2.74	0.03

Corrected for admission-specific variables after controlling for subspecialty and hospital size. Of the 7 independently significant questions contributing to the overall rating, only 2 (Discharge-1 and Doctor-1) were directly related to the surgical team. Boldface type indicates items related to the surgeon/surgical team.

OHR is not a reliable measure of neurosurgical quality. Although the HCAHPS will continue to have value to the various dimensions of care represented in the survey, neurosurgeons and hospitals should consider alternative measures of performance, including both postoperative outcomes and patient satisfaction, and should work with other teams like nursing to improve overall patient satisfaction, even where the surgical team measures are not significant.

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Author Contributions

Conception and design: Gottfried, Zakare-Fagbamila. Acquisition of data: Gottfried, Zakare-Fagbamila, Dickson, Garcia. Analysis and interpretation of data: Gottfried, Park, Zakare-Fagbamila. Drafting the article: Gottfried, Park, Zakare-Fagbamila. Critically revising the article: Park. Reviewed submitted version of manuscript: Gottfried, Park. Statistical analysis: Zakare-Fagbamila. Administrative/technical/material support: Park. Study supervision: Gottfried.

Supplemental Information

Previous Presentations

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