

Patient Survey

Demographic Factors Associated with Patient-Reported Outcome Measures in Pain Management

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Background: Pain control is strongly correlated with the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) quality-of-care domains and overall hospital experience. Prior research implicates several factors in the variability of patients' pain management satisfaction scores, including but not limited to racial diversity, ethnic diversity, gender, socioeconomic status, and other cultural factors.

Objective: In this study, we examined responses to the HCAHPS survey in order to assess factors associated with patient-reported experiences of pain management.

Study Design: The study design involved a retrospective analysis of patient survey responses.

Setting: The research took place at a university-affiliated tertiary hospital.

Methods: The study was conducted in a university-affiliated tertiary hospital. Records for adult patients discharged between October 2015 and June 2017 were included. We obtained all patient responses to the HCAHPS pain management questions. We then performed a systematic statistical analysis to evaluate interactions between demographic factor variables and responses to the HCAHPS pain management questions.

Results: Between October 2015 and June 2017, 107,287 patients were discharged from the hospital. Of these, 13,026 of the respondents answered at least one of the HCAHPS pain management questions.

Among HCAHPS pain-domain respondents, "Hispanic" and "Black or African American" respondents are more likely to report successful Pain Control when compared to "Not Hispanic" and "Caucasian/White," respectively (odds ratios [ORs] 1.60, 1.22). Additionally, among women, "Black or African American" respondents are more likely to report positive Staff Helpfulness than "Caucasian/White" respondents (OR 1.38).

However, we also identified corresponding associations among HCAHPS pain-question responding and patient race/ethnicity: "Hispanic" and "Black/African American" patients were each less likely to respond to the HCAHPS pain questions (ORs 2.03, 2.74).

Limitations: The primary limitation to this study was nonresponse bias; nevertheless, this is likely to be similar to bias experienced at other institutions. Additionally, this is a single institution study; however, given that the institution has a very large catchment area, we believe the results could be generalized to other settings.

Conclusion: Response rates and responses to HCAHPS pain questions vary by race/ethnicity and sex. It appears likely that Hispanic and Black/African American patients underreport negative experiences. As HCAHPS surveys are used to inform decision-making within the US health care system, demographic biases in the survey data could lead to biases in care and resource allocation.

Key words: Pain, HCAHPS, patient reported outcome measures, patient satisfaction, ethnicity, race

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Patient-reported outcome measures and patient satisfaction are strongly correlated with better clinical outcomes and improved quality of care (1-3). The Centers for Medicare and Medicaid Services (CMS) uses satisfaction reports as a metric to assess the quality of care delivered and the performance of individual hospitals (4-6). The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey serves as the primary national tool to measure patients' perception of their hospital experience. HCAHPS assesses 8 main domains of hospital care quality including communication with nurses and doctors, responsiveness of hospital staff, pain management, cleanliness and quietness, communication about medication, discharge information, and overall hospital score (7). In the hospital value-based purchasing program (6), the scores obtained from HCAHPS account for 30% of the total performance score used for an individual hospital's Medicare and Medicaid reimbursement.

Pain has played a critical role in overall patient satisfaction since the 1990s, after the American Pain Society initiated the "Pain, the fifth vital sign" campaign, raising awareness among health care professionals of pain assessment and management (8). As a result of this campaign, large regulatory bodies including the Veterans Health Administration (VHA) and Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) mandated pain assessment and treatment of all patients (9,10).

Question 14 in the HCAHPS survey is intended to evaluate patients' experience of their pain management (6). Pain control is strongly correlated with other HCAHPS quality-of-care domains and overall hospital experience (3,11). Prior research implicates several factors in the variability of patients' pain management satisfaction scores, including, but not limited to, racial/ethnic diversity, gender, socioeconomic status, and other cultural factors (12,13). Multiple studies demonstrate that racial and ethnic differences influence health outcomes, access to care, health care utilization, and the perception of hospital experience (14-18). Here, we examine demographic associations with patient-reported outcomes of pain management.

METHODS

Sample

The sample was obtained from a large (957-bed) tertiary care center affiliated with a large academic

institution. This care center is located in an urban area, receiving patients from a wide radius and caring for a diverse population of patients from various ethnic and racial backgrounds. Records for all adult patients discharged from the University Hospital between October 2015 and June 2017, inclusive, were included in this study. Records included patient responses (if any) to the 2 pain-domain HCAHPS questions and patient-reported demographic factors (sex, race, and ethnicity).

HCAHPS Surveys

The University Hospital attempts to collect HCAHPS survey responses from all eligible adult patients. Inclusion criteria are: discharged nonpsychiatric patients age 18 years or older who had at least one overnight stay in the hospital. Exclusion criteria are: patients discharged to hospice care, nursing home, or skilled nursing facility; court/law enforcement patients; and no-publicity patients (19).

HCAHPS-eligible patients are sampled by one of 2 methods. First, a random sample of eligible discharges is drawn on a monthly basis for inclusion in the officially-reported HCAHPS sample. CMS services mandates that hospitals must obtain at least 300 completed HCAHPS surveys over the 12-month reporting period (19). Per CMS, patients included in this sample are mailed paper copies of the HCAHPS survey to complete. These patients are contacted at the mailing address they provided upon admission. Second, after the officially-reported HCAHPS sample is chosen randomly from among eligible discharges, all remaining eligible patients are solicited to complete an internet-based HCAHPS survey. These patients are contacted at the email address they provided upon admission.

The responses to the HCAHPS pain-domain questions were extracted for this study. The HCAHPS instruments in use during this time period included 2 questions on pain management: (a) "During this hospital stay, how often was your pain well controlled?" (hereafter "Pain Control") and (b) "During this hospital stay, how often did the hospital staff do everything they could to help you with your pain?" (hereafter "Staff Helpfulness"). The available answer choices for these questions were: "Never," "Sometimes," "Usually," or "Always." Customary interpretation of these questions collapses responses to a binary. Only responses with "Always" are considered positive (success); all other answer choices are considered negative (failure). The study was approved by the Institutional Review Board.

Statistical Analysis

Descriptive statistics for patient demographics were calculated at baseline and presented as mean (standard deviation [SD]) for continuous variables and frequency (percentage) for categorical variables (Table 1). The outcome variables for this study are HCAHPS pain management and staff satisfaction. To identify predictors for these outcomes, we first used a log-linear model to determine the relationships among the 5 categorical variables (gender, race, ethnicity, pain control, and staff helpfulness) and all of their interaction terms. A saturated model was built with all 5 variables and all interaction terms. The most nonsignificant term was removed at each iteration in hierarchical manner. We used likelihood ratio (LR) tests to compare the 2 models before and after each term removal. The final log-linear model was determined based on a significant LR test comparing the new and previous model ($P < .05$). We also tested the goodness of fit of the final model by comparing it to the saturated model using the LR test.

For each outcome of interest, we performed univariate logistic regression by including the terms that interact with the outcome variable in the final log-linear model. Multiple-level categorical variables (e.g., race) were tested for their global effects as well as individual-level comparisons to the reference group. In the case of a 3- or more-way interaction with the outcome variable in the final log-linear model, a multivariable logistic model was built to determine global effects and was followed by stratified univariable logistic regression models. As a supplemental analysis, all baseline demographic variables and outcome variables (pain control and staff helpfulness) were compared between participants who responded to any part of the survey versus those who did not. Statistical significance was determined based on $P < .05$. All analyses were performed by SAS Version 9.4 (SAS Institute, Inc., Cary, NC), and R Version 3.4.3.

RESULTS

There were a total of 107,287 adult patients discharged from the university hospital between October 2015 and June 2017, inclusive. Of these, 13,026 survey respondents answered at least one of the pain management questions during the study period.

The 5-way log-linear analysis produced a final model that retained all effects:

Ethnicity + Race + Gender + Pain Control + Staff helpfulness + (Ethnicity:Race) + (Pain Control:Staff Helpfulness) + (Ethnicity:Pain Control) + (Race:Pain Control) + (Race:Staff Helpfulness)

Table 1. Survey responding patient demographics.

Demographic Table among Responders	
	Total (n = 13026)
Ethnicity	
Not Hispanic/Latino	12416 (95.32%)
Hispanic	255 (1.96%)
Not Reported	355 (2.73%)
Race	
Caucasian/White	10103 (77.56%)
Black or African American	2206 (16.94%)
Asian	176 (1.35%)
American Indian or Alaskan Native	57 (0.44%)
Native Hawaiian or Other Pacific Islander	7 (0.05%)
Other	153 (1.17%)
Unknown	149 (1.14%)
2 or more races	175 (1.34%)
Gender	
Female	7465 (57.31%)
Male	5561 (42.69%)
Pain Control	
Pain Always Controlled	8261 (63.69%)
Pain Not Controlled	4710 (36.31%)
Missing	55 (.%)
Staff Helpfulness Level	
Staff Always Helpful	10515 (81.33%)
Staff Not Always Helpful	2414 (18.67%)
Missing	97 (.%)

Of interest, 3 of the demographic-response interactions were statistically significant: Race:Gender:Staff Helpfulness ($P = .014$), Race:Pain Control ($P = .001$), and Ethnicity:Pain Control ($P = .004$). To break down the Race:Gender:Staff Helpfulness interaction, chi-square tests on Race and Staff Helpfulness variables were performed separately by gender. For women, there was a significant association between Race and Staff Helpfulness ($P < .001$); this was not the case for men ($P = .10$).

For the Race:Gender:Staff Helpfulness interaction among women, staff helpfulness was examined in each group of Race in reference to "Caucasian/White." Odds ratios indicated that the odds of reporting positive Staff Helpfulness were 1.38 times higher for "Black or African American" respondents (95% confidence interval [CI], 1.18-1.62) than for "Caucasian/White" respondents (Table 3).

Table 2. Investigation into demographic associations with Pain Control.

Investigated Associations with Pain Control					
	Total (n = 12971)	Pain Not Always Controlled (n = 4710)	Pain Always Controlled (n = 8261)	OR (95% CI)	P value
Ethnicity					0.004
Not Hispanic/Latino	12366 (95.34%)	4519 (95.94%)	7847 (94.99%)	Reference	--
Hispanic	253 (1.95%)	67 (1.42%)	186 (2.25%)	1.60 (1.21, 2.12)	0.001
Not Reported	352 (2.71%)	124 (2.63%)	228 (2.76%)	1.06 (0.85, 1.32)	0.61
Race					0.001
Caucasian/White	10068 (77.62%)	3748 (79.58%)	6320 (76.50%)	Reference	
Black or African American	2192 (16.90%)	716 (15.20%)	1476 (17.87%)	1.22 (1.11, 1.35)	<0.001
2 or more races	172 (1.33%)	61 (1.30%)	111 (1.34%)	1.08 (0.79, 1.48)	0.64
American Indian or Alaskan Native	57 (0.44%)	14 (0.30%)	43 (0.52%)	1.82 (1.00, 3.33)	0.052
Asian	175 (1.35%)	71 (1.51%)	104 (1.26%)	0.87 (0.64, 1.18)	0.36
Native Hawaiian or Other Pacific Islander	7 (0.05%)	2 (0.04%)	5 (0.06%)	1.48 (0.29, 7.65)	0.64
Other	152 (1.17%)	46 (0.98%)	106 (1.28%)	1.37 (0.97, 1.94)	0.08
Unknown	148 (1.14%)	52 (1.10%)	96 (1.16%)	1.10 (0.78, 1.54)	0.60

For the Race:Pain Control interaction, pain control was examined in each group of Race in reference to "Caucasian/White." Odds ratios indicated that the odds of reporting positive Pain Control were 1.22 times higher for "Black or African American" respondents (95% CI, 1.11-1.35) than for "Caucasian/White" respondents (Table 2).

For the Ethnicity:Pain Control interaction, "Hispanic" and "Not Hispanic" levels of Ethnicity were compared with "Not Hispanic" as the reference. Odds ratios indicated that the odds of reporting positive Pain Control were 1.60 times higher for "Hispanic" respondents (95% CI, 1.20-2.15) than for "Not Hispanic" respondents (Table 2).

These analyses suggest that, among HCAHPS pain-domain respondents, "Hispanic" and "Black or African American" respondents are more likely to report successful Pain Control when compared to "Not Hispanic" and "Caucasian/White," respectively. Additionally, among women, "Black or African American" respondents are more likely to report positive Staff Helpfulness than "Caucasian/White" respondents.

Demographic distributions across HCAHPS pain-domain respondents and nonrespondents were analyzed. All discharged patients were categorized (Response) as either having responded to at least one pain-domain question (Respondents, n = 13,026) or not having responded to either pain-domain question (Nonrespondents, n = 94,261). Data are reported in

Table 4. There were significant associations between both Race and Response ($P < .001$) and between Ethnicity and Response ($P < .001$). Follow-up analyses were performed corresponding to those completed above. "Black or African American" patients were 2.74 times less likely to respond to HCAHPS pain questions than "Caucasian/White" patients (95% CI, 2.61-2.88). "Hispanic" patients were 2.03 times less likely to respond to HCAHPS pain questions than "Not Hispanic" patients (95% CI, 1.78-2.31).

DISCUSSION

Here, we report 2 principal, high-level findings: (a) among respondents to HCAHPS pain questions, rates of patient-reported successful pain control and positive staff helpfulness varied by patient race/ethnicity; and (b) response rates to those HCAHPS pain questions also varied by the same patient race/ethnicity factors.

Specifically, among respondents to HCAHPS pain questions: Hispanic and Black/African American patients were each more likely to report successful pain control; and female Black/African American patients were more likely to report positive staff helpfulness.

Patient-reported outcome measures, such as those in the HCAHPS survey, are shown to be strongly correlated with clinical outcomes and quality of care (1-3). Furthermore, the pain control domain is shown to be strongly correlated with other HCAHPS quality-of-care domains and overall hospital experience.

Demographic Factors and Pain Management

Table 3. Investigation into three-way interaction term, Sex*Race*Staff Helpfulness.

Investigation into Staff Helpfulness by Race, among Females					
	Total (n = 7416)	Staff Not Always Helpful (n = 1454)	Staff Always Helpful (n = 5962)	OR (95% CI)	P-value
Race					0.004
Caucasian/White	5544 (74.76%)	1132 (77.85%)	4412 (74.00%)	Reference	--
Black or African American	1393 (18.78%)	218 (14.99%)	1175 (19.71%)	1.38 (1.18, 1.62)	<0.001
2 or more races	122 (1.65%)	30 (2.06%)	92 (1.54%)	0.79 (0.52, 1.19)	0.26
American Indian or Alaskan Native	26 (0.35%)	3 (0.21%)	23 (0.39%)	1.97 (0.59, 6.56)	0.27
Asian	124 (1.67%)	30 (2.06%)	94 (1.58%)	0.80 (0.53, 1.22)	0.30
Native Hawaiian or Other Pacific Islander	4 (0.05%)	0 (0.00%)	4 (0.07%)	NA	NA
Other	98 (1.32%)	18 (1.24%)	80 (1.34%)	1.14 (0.68, 1.91)	0.62
Unknown	105 (1.42%)	23 (1.58%)	82 (1.38%)	0.92 (0.57, 1.46)	0.71

Investigation into Staff Helpfulness by Race, among Males					
	Total (n = 5513)	Staff Not Always Helpful (n = 960)	Staff Always Helpful (n = 4553)	OR (95% CI)	P-value
Race					0.25
Caucasian/White	4484 (81.34%)	762 (79.38%)	3722 (81.75%)	Reference	--
Black or African American	794 (14.40%)	154 (16.04%)	640 (14.06%)	0.85 (0.70, 1.03)	0.10
2 or more races	53 (0.96%)	8 (0.83%)	45 (0.99%)	1.15 (0.54, 2.45)	0.71
American Indian or Alaskan Native	30 (0.54%)	2 (0.21%)	28 (0.61%)	2.87 (0.68, 12.06)	0.15
Asian	50 (0.91%)	13 (1.35%)	37 (0.81%)	0.58 (0.31, 1.10)	0.10
Native Hawaiian or Other Pacific Islander	3 (0.05%)	0 (0.00%)	3 (0.07%)	NA	NA
Other	55 (1.00%)	13 (1.35%)	42 (0.92%)	0.66 (0.35, 1.24)	0.20
Unknown	44 (0.80%)	8 (0.83%)	36 (0.79%)	0.92 (0.43, 1.99)	0.83

These results are consistent with results reported by Goldstein et al, where Black/African American patients, in general, reported better experiences on the overall HCAHPS survey in comparison to Caucasian/White patients (18,20-22). Nonetheless, these results represent a departure from the current literature on racial disparities in pain management in the United States. Research shows that physicians usually underestimate the severity of pain if the patient is from a minority group (23,24). Minorities are generally less likely to receive adequate care for pain management (25). The discrepancy can potentially be explained by the different expectations between different racial and ethnic groups in terms of pain management. Although most clinical quality and access indicators show superior health care for non-Hispanic Caucasian/White patients, Black/African American and Hispanic patients assess their interactions with providers more positively than

non-Hispanic Caucasian/White patients (26). Another study found that, generally, Black/African American patients give physicians higher ratings than do Caucasian/White patients (27).

However, we also identified corresponding associations between response to HCAHPS pain questions and patient race/ethnicity: Hispanic and Black/African American patients were each less likely to respond to the HCAHPS pain questions. There are 2 possible explanations for this response variance: (a) Hispanic and Black/African American patients were less likely to be treated for pain; or (b) Hispanic and Black/African American patients with negative experiences were less likely to respond to HCAHPS (at either the full-survey or pain-question levels).

The HCAHPS instruments used with the study population include a pain screening question: "During this hospital stay, did you need medicine for pain?" Patients

Table 4. Demographics of Survey responder's vs Non-responders

Demographics of Pain Question Survey Responders vs Non-Responders					
	Total (n = 107,287)	Responders (n = 13026)	Non-responders (n = 94261)	OR (95% CI)	P-value
Ethnicity					< 0.001
Not Hispanic/Latino	101009 (94.15%)	12416 (95.32%)	88593 (93.99%)	Reference	--
Hispanic	3941 (3.67%)	255 (1.96%)	3686 (3.91%)	2.03 (1.78, 2.30)	< 0.001
Not Reported	2337 (2.18%)	355 (2.73%)	1982 (2.10%)	0.78 (0.70, 0.88)	< 0.001
Race					< 0.001
Caucasian/White	64320 (59.95%)	10103 (77.56%)	54217 (57.52%)	Reference	--
Black or African American	34635 (32.28%)	2206 (16.94%)	32429 (34.40%)	2.74 (2.61, 2.87)	< 0.001
2 or more races	1928 (1.80%)	175 (1.34%)	1753 (1.86%)	1.87 (1.60, 2.18)	< 0.001
American Indian or Alaskan Native	585 (0.55%)	57 (0.44%)	528 (0.56%)	1.73 (1.31, 2.70)	< 0.001
Asian	1569 (1.46%)	176 (1.35%)	1393 (1.48%)	1.48 (1.26, 1.73)	< 0.001
Native Hawaiian or Other Pacific Islander	98 (0.09%)	7 (0.05%)	91 (0.10%)	2.42 (1.12, 5.23)	0.02
Other	2794 (2.60%)	153 (1.17%)	2641 (2.80%)	3.22 (2.73, 3.79)	< 0.001
Unknown	1358 (1.27%)	149 (1.14%)	1209 (1.28%)	1.51 (1.27, 1.80)	< 0.001
Sex					--
Female	60015 (55.94%)	7465 (57.31%)	52550 (55.75%)	Reference	--
Male	47207 (44.00%)	5561 (42.69%)	41646 (44.18%)	1.06 (1.03, 1.10)	0.001
Unknown	65 (0.06%)	0 (0.00%)	65 (0.07%)	NA	NA

who respond "No" to this question are instructed to skip the 2 pain-domain questions. Therefore, if fewer Hispanic and Black/African American patients need pain treatment, they would be underrepresented among HCAHPS pain-domain respondents. The combination of Hispanic and Black/African American patients having less pain and being more responsive to pain treatment would suggest that pain is notably less problematic among these demographic groups. Such a conclusion defies reason and is not supported by the literature. Another possibility is that patients respond "No" when asked if they needed medicine for pain because they do not recall all of the events during their hospitalization. Since this survey is taken after discharge from the hospital, there may be a bias based on patient recall.

It is also possible that both principal associations (HCAHPS Responses – Demographics and Response Rate – Demographics) are related to an underreporting of negative experiences by Hispanic and Black/African American patients. That is, if Hispanic and Black/African American patients who would respond negatively to the HCAHPS pain questions choose to withhold their responses (either to the entire HCAHPS survey or to those specific questions), those demographic groups would be underrepresented among HCAHPS pain question re-

spondents. Further, responses from those demographic groups would be biased towards positive responses. Racial and ethnic differences in response rates to national adult surveys have been examined in prior research (28). The analysis by Sykes et al was complicated by a widespread lack of response-rate reporting and large variability in response rates across studies. The authors attribute variations in response rates to the design of surveys and the methods by which the surveys were introduced. They did not identify consistent trends in response by race/ethnicity across all surveys, but did note meaningful differences in response rates within many surveys.

However, racial and ethnic differences in response rates to the HCAHPS survey do not appear to have been previously reported, including by studies reporting racial/ethnic differences in HCAHPS-reported patient satisfaction (20-22). Discrepancies in the demographic makeup of HCAHPS respondents, HCAHPS samples, and overall hospital patient populations could lead to demographically-biased inaccuracies. HCAHPS patient satisfaction measures are important quality measures and have a critical role in US hospital reimbursement. Because of this, patient care and organizational decisions within hospitals and health systems are often

based upon HCAHPS data. Biases in the data can therefore lead to inadvertent biases in care and resource allocation, indicating the need for further research in this area.

Limitations and Future Directions

One of the limitations of this study is that it is a single institutional study. However, because the university hospital is large and located in an urban area and serves a diverse population, we believe the results may reflect the health care system as a whole. Another limitation of this study is that only 12% (13,026 responded out of 107,287 total discharges) of the discharged population responded to the pain questions on the survey during our timeframe. Further research is needed to determine whether nonrespondents differed in their interpretation of the survey or understanding of questions or had a systematically different health care experience. Additionally, of the 12% of respondents, fewer than 2% classified themselves as Hispanic. This population may be an underrepresentation, as the total Hispanic popu-

lation in America as of 2016 was 17.8% (29). However, it cannot be determined if this underrepresentation is due to a lower Hispanic population at the university hospital, or if the Hispanic population has a significantly lower response rate to the survey.

Continued demographic studies should also focus on education, employment status, and socioeconomic status. Of note, a new, current, HCAHPS survey has been published by CMS and will go into effect October 1, 2019 (30). The previous version of this new questionnaire reported communication of pain between providers and patients, however, these questions have been removed. This new survey will no longer include questions specific to pain management.

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