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BRIEF REPORTS

Predictors of Patient Satisfaction With Inpatient Hospital Pain Management Across the United States: A National Study

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Satisfactory pain management of hospitalized patients remains a national unmet need for the United States. Although prior research indicates that inpatient pain management may be improving nationally, not all populations of patients rate pain management as equally satisfactory. County-level predictors, such as demographics and population density, and hospital-level predictors (eg, hospital-bed number), are understudied determinants of pain management patient satisfaction. We created a multivariate regression model of pain management patient satisfaction scores as indicated by Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results based on county and hospital level predictors. Number of hospital beds ($\beta = -0.16$), percent foreign-born ($\beta = -0.16$), and population density ($\beta = -0.08$) most strongly predicted unfavorable ratings, whereas African American ($\beta = 0.23$), white ($\beta = 0.23$), and younger population ($\beta = 0.08$) most strongly predicted favorable ratings. Greater attention should be placed on pain management in larger hospitals that serve foreign-born patients in population-dense areas. *Journal of Hospital Medicine* 2016;11:498–501. © 2016 Society of Hospital Medicine

Pain management is an integral component of patient-centered medical care and is a major concern for patients who are hospitalized.[1] Patient-reported ratings of pain management are highly correlated with overall satisfaction with healthcare delivery.[2] Current research indicates that patient satisfaction with pain management may be improving[3]; however, there may be structural and county-level disparities in these improvements in satisfaction. Although patient satisfaction with pain management increased from 2008 to 2012, a discrepancy in patient satisfaction with pain management has emerged between 3 different hospital systems (safety net, acute care, critical access hospitals)[3] Specifically, acute care hospitals provide less satisfactory pain management as compared to critical access hospitals.[3] Although patients' perception of pain management is an integral part of delivering patient-centered care, prior research indicates that there may not be a simple inverse association between pain intensity score and patient satisfaction.[4] The management of pain in hospitals continues to be problematic, perhaps, for instance, due to discrepancies in understanding the relationship between patient satisfaction and pain management. Certainly for this reason and many others, satisfaction with pain management is now one of the dimensions assessed by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, which is a global measure of patient satisfaction.

The HCAHPS survey is utilized by 85% of all US-based hospitals and gathers patient satisfaction information pertaining to 10 dimensions, including pain management. Patient satisfaction scores (via HCAHPS) now constitute 30% of Hospital Value-Based Purchasing (HVBP), which makes up 2% of at-risk reimbursements by the Centers for Medicare and Medicaid Services (CMS) as put forth by the Affordable Care Act (ACA) of 2010.[5] The ACA mandates that payments to hospitals must partly depend on metrics that assess patient satisfaction, as broadly measured by the HCAHPS, which are completed by patients upon hospital discharge.[5,6] Therefore, patient satisfaction, as measured by patients, now directly affects CMS payments for over 3000 hospitals across the United States. This constitutes a large amount of money for most hospitals that operate on high revenue but have low profit margins. As such, the 2% at-risk reimbursement may place many hospitals at financial risk that could be ameliorated with effective inpatient pain management.

In addition to its critical role in reimbursement to hospitals, patient satisfaction with pain management is also integrally related to providing patient-centered care. As such, patient satisfaction with pain management is considered a critical element of various models of the patient-centered approach to providing medical care. Although a medical inpatient team can assess objective signs of pain, patient-centric pain measurements are paramount in understanding the pain experience of patients and providing adequate pain management care. Moreover, patients, doctors, payers of medical services, and now CMS increasingly

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TABLE 1. Bivariate Linear Regression of Pain Management Patient Satisfaction With 20 Explanatory Variables (County-Level Demographics and Hospital Bed Numbers)

Variable	Median Value (SD)	Range	Regression Coefficient (SE)	*t* Value
African American alone, %	5.6% (13.8%)	0%–85.4%	0.02 (00)	−3.609*
White alone, %	86.2% (15.8%)	5.3%–99.0%	0.06 (0.01)	6.661*
Per capita income	$24,499 ($6,419)	$7,887–$61,290	0.00 (0.00)	−7.561*
With bachelor's degree, %	22.0% (10.1%)	6.3%–70.7%	0.06 (0.01)	−7.348*
Population <18 years of age, %	23.2% (3.1%)	8.3%–40.6%	0.18 (0.05)	3.498*
With a high school degree, %	86.0% (6.4%)	46.3%–98.6%	0.02 (0.01)	1.424
Population change over 1 year, %	0.7% (2.2%)	−18.1%–25.6%	−0.25 (0.04)	−5.645*
Same house over 1 year, %	85.4% (4.2%)	57.1%–98.0%	−0.01 (0.02)	−0.493
White alone (not Hispanic), %	75.2% (21.8%)	3.2%–98.4%	0.05(0.00)	12.077*
Household size	2.52 (0.3)	1.92–4.77	−2.266 (0.36)	−6.283*
Population county	105,937 (1,524,223)	1,160–9,818,605	0.00 (0.00)	−13.117*
Average travel time to work, min	23 (5.0)	6–42.5	−0.21 (0.02)	−11.071*
Non–English speaking, %	8.6% (15.1%)	0.2%–95.9%	−0.08 (0.01)	−13.843*
Total female, %	50.7% (1.6%)	34.4%–57.0%	−0.44 (0.06)	−7.489*
Population ≥65 years old, %	14.7% (4.1%)	5.8%–49.3%	−0.06 (0.02)	2.697...
Population in poverty, %	14.7% (5.6%)	5.8%–49.3%	−0.02 (0.02)	−1.01
Population density	138.7 (4,534)	0.3–69,467	−0.73 (0.05)	−15.734*
Foreign born, %	4.9% (9.3%)	0%–51.2%	−0.15 (0.01)	−16.775*
Median household income	$46,880 ($12,868)	$20,206–$120,096	−0.00 (0.00)	−6.052*
No. of hospital beds	103 (193)	2–2,259	−0.01 (0.00)	−15.403*

NOTE: Pain management patient satisfaction was determined by the percentage of patients who stated that their pain was "always" well controlled (median 71%, SD 5.5, range 33%–100%). **Abbreviations:** SD, standard deviation; SE, standard error. *$P < 0.001$. ...$P < 0.01$.

regard a patient-centered approach to medical care as crucial for the delivery of high-quality care.

HCAHPS survey sampling represents an excellent opportunity to help assess current gaps in patient-centered clinical care. However, "ecological" factors, such as county-level demographics and hospital size (eg, bed number), are known to influence health outcomes but have not been adequately studied in pain management patient satisfaction.[7] Hospital and county-level factors may influence the degree to which patients experience patient-centered pain management care. For instance, most patient satisfaction scores are worse in urban areas.[8,9] These disparities in patient satisfaction scores could be associated with population density, greater ethnic diversity or non–English-speaking individuals, or number of hospital beds.

The US Census demographics and hospital-bed number provide a concurrent measure that can be used across the country to estimate hospital ecology. This study evaluated the influence of county-level demographic and structural factors (ie, hospital beds) on patient satisfaction with hospital pain management in all HCAHPS-participating hospitals across the United States. We hypothesized that demographic diversity, higher population density, and higher numbers of hospital beds would predict lower levels of patient satisfaction with inpatient pain management.

METHODS

Data Collection: County-Level Predictors

Publically available data were obtained from the American Hospital Directory[10] and United States Census Bureau[11] websites. Twenty US Census data categories were selected a priori by their clinical relevance to influence pain management perception out of the 50 publically reported US Census categories. Final variables utilized in regression modeling are listed under the Variable column in Table 1. Covariate correlation coefficients were all under 0.7, indicating a lack of significant colinearity.

Data Collection: Patient Satisfaction With Pain Management

Pain management was measured using the HCAHPS survey pain management dimension by calculating the percentage of patient responders who said their pain was "always" controlled. HCAHPS data are publically available on the CMS Hospital Compare website.[6] It contains 32 questions that comprise 10 evaluative measures. It is provided to a random sample of patients across the United States throughout the year at 48 hours to 6 weeks after discharge from the hospital.

Analytic Plan

HCAHPS and US Census datasets were analyzed to assess their distribution curves. The population density variable was converted to a logarithmic scale to account for its skewed distribution and long tail in the area of low population density. Data were subsequently merged into an Excel (Microsoft Corp., Redmond, WA) spreadsheet using the VLOOKUP function such that relevant 2010 census county data were added to each hospital's HCAHPS data.

TABLE 2. Multivariate Regression Predicting Patient Satisfaction With Pain Management From HCAHPS Scores According to County Demographics and Hospital Size

Variable	Median Value (SD)	Range	Regression Coefficient (SE)	β	*t* Value
African American alone, %	5.6% (13.8%)	0%–85.4%	0.07 (0.01)	0.23	7.104*
White alone, %	86.2% (15.8%)	5.3%–99.0%	0.08 (0.01)	0.23	6.953*
Per capita income	$24,499 ($6,419)	$7,887–$61,290	0.00 (0.00)	0.22	2.885
With bachelor's degree, %	22.0% (10.1%)	6.3%–70.7%	0.03 (0.02)	0.10	1.401
Population <18 years old, %	23.2% (3.1%)	8.3%–40.6%	0.18 (0.05)	0.08	3.498*
With a high school degree, %	86.0% (6.4%)	46.3%–98.6%	0.02 (0.01)	0.02	1.424
Population change over 1 year, %	0.7% (2.2%)	−18.1%–25.6%	−0.11 (0.06)	−0.01	−1.986
Same house over 1 year, %	85.4% (4.2%)	57.1%–98.0%	−0.01 (0.02)	−0.01	−0.493
White alone (not Hispanic), %	75.2% (21.8%)	3.2%–98.4%	−0.02(0.00)	−0.01	−0.740
Household size	2.52 (0.3)	1.92–4.77	−0.92 (0.80)	−0.03	−1.145
Population county	105,937 (1,524,223)	1,160–9,818,605	0.00 (0.00)	−0.03	−1.495
Average travel time to work, min	23 (5.0)	6–42.5	−0.06 (0.02)	−0.06	−3.054...
Non–English speaking, %	8.6% (15.1%)	0.2%–95.9%	−0.00 (0.03)	−0.06	−0.028
Total female, %	50.7% (1.6%)	34.4%–57.0%	−0.23 (0.07)	−0.06	−3.158...
Population ≥65 years old, %	14.7% (4.1%)	5.8%–49.3%	−0.10 (0.04)	−0.07	−2.411
Population in poverty, %	14.7% (5.6%)	5.8%–49.3%	−0.02 (0.02)	−0.08	−1.01
Population density	138.7 (4,534)	0.3–69,467	−0.24 (0.09)	−0.08	−2.823...
Foreign born, %	4.9% (9.3%)	0%–51.2%	−0.07 (0.02)	−0.12	−4.906*
Median household income	$46,880 ($12,868)	$20,206-$120,096	−0.00 (0.00)	−0.16	−2.599
No. of hospital beds	103 (193)	2–2,259	−0.00 (0.00)	−0.16	−9.167*
Model statistics			$F(1, 9) = 62.222$, $P < 0.001$		
Adjusted R^2			0.124		

NOTE: This model demonstrates the multivariate association of 20 predictor variables with pain management patient satisfaction as determined by hospital percentage of patients who stated that their pain was "always" well controlled (median 71%, SD 5.5, range 33%–100%). **Abbreviations:** HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems; SD, standard deviation; SE, standard error. *$P < 0.001$. ...$P < 0.01$.

Bivariate analyses were conducted to determine which US Census categories were significant predictors for patient satisfaction with pain management. All significant predictors were then included in a multivariate model, which predicted for patient satisfaction with pain management. All analyses were 2-tailed, and statistical significance was set at $\alpha = 0.05$.

RESULTS

Complete HCAHPS scores were obtained from 3907 hospitals out of a total of 4621 US hospitals (85%). The majority of hospitals (73.8%, n = 2884) collected over 300 surveys, fewer (n = 696) collected 100 to 299 surveys, and a small number of hospitals (n = 327) collected less than 100 surveys. Based on the most conservative estimate, results were available from at least 934,800 individual surveys. Missing HCAHPS hospital data averaged 13.4 (standard deviation [SD] = 12.2) hospitals per state. County-level data were obtained from all 3144 county or county equivalents across the United States (100%).

Bivariate Analyses

Univariate regression indicated a significant association between pain management patient satisfaction and most county-level demographic variables and number of hospital beds.

Multivariate Analyses

A multivariate linear regression model was run in which 20 county-level demographic and hospital factors were examined as predictors of patient satisfaction with pain management. The model, which examined county-level predictors of pain management, explained 12% of the variability in patients' ratings of pain management ($R^2 = 0.124$, $P < 0.0001$). A total of 8 out of the 20 US Census variables were statistically significant predictors of pain management (Table 2). African American and white race were most strongly associated with higher ratings of patient satisfaction with pain management (ie, by partial coefficient and statistical significance). Number of hospital beds, percent foreign born, population density, and female gender were most strongly related to lower ratings of patient satisfaction with pain management.

DISCUSSION

By utilizing county-level demographic data and the HCAHPS survey measures from across the United States, this study provides a representative sample of US hospitals that can be used to define ecological trends in patient satisfaction with pain management. This statistical model demonstrates the nonrandom variability of pain management satisfaction across the United States, even after CMS patient-mix adjustment. Although the quality of pain management may be increasing by some reports, our present results indicate that pain management satisfaction is not equitable with the rest of the country among select groups of patients (eg, foreign born, female gender, areas of long travel times to work) or in certain care settings (eg, larger

hospitals, population dense areas). These data suggest that areas of pain management may lack in quality compared to pain management across the entire US as a whole. This is consistent with the increasingly recognized contribution of multiple nonmedical determinates to health outcomes.[12] These results demonstrate the overall magnitude of healthcare disparity in the United States, and are particularly concerning because African Americans and Hispanics tend to rate overall satisfaction higher than Caucasians in other studies.[13,14] The same minority reporting bias may be reflected in HCAHPS results. These patients may be reporting higher pain management satisfaction that is not consistent with the level of care they received, as studies have consistently indicated worse pain management delivery for racial and ethnic minorities.[15]

The present findings reveal structural (eg, hospital beds) and demographic (eg, population density, foreign born) gaps in satisfaction with pain management. An effort to improve pain management for all people in the heterogeneous makeup of the United States is an enormous challenge. However, change may be forthcoming, as Hospital Value-Based Purchasing draws attention pain practice inequities in real time. Although several of the significant explanatory variables cannot be modified (eg, size of hospital, urban setting, patients served), pain management delivery should receive extra attention in hospitals with those characteristics. Pain management delivery in large, urban hospitals that serve foreign-born patients may be improved with focused multilevel interventions. Future research should examine these inequities further and develop multilevel interventions that target hospitals in at-risk areas with the aim of lessening disparities in hospital-based pain management.

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