

# At the Intersection of Patient Experience Data, Outcomes Research, and Practice: Analysis of HCAHPS Scores in Neurology Patients

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## Abstract


**Objective:** To assess variation in patient-reported experience in inpatient neurology patients.

**Patients and Methods:** We retrospectively identified 1045 patients 18 years and older admitted to a neurology service and discharged from January 1, 2013, through September 30, 2016, who completed Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys. Multivariable logistic regression evaluated the associations of patient factors with HCAHPS measures. Key driver analysis identified associations between HCAHPS measures and the Global score (combination of 0-10 hospital rating and likelihood to recommend). Multivariable logistic regression compared HCAHPS scores between neurology patients and those admitted to a neurosurgery (n=2190) or internal medicine (n=3401) service during the same period.

**Results:** Among patients admitted to a neurology service, overall (summary) scores did not vary significantly by diagnosis after adjustment for age, education, and overall health, but patients with neurologic diagnoses other than stroke, epilepsy, and neurodegenerative disease were more likely to report lower Pain Management scores compared with patients with cancer. Key driver analysis showed Care Transition scores as drivers of the Global score. After adjustment, general internal medicine service patients were more likely to report low Summary scores and neurosurgery service patients were significantly less likely to report low Summary scores compared with neurology service patients.

**Conclusion:** Efforts to improve how neurology patients experience their care should be aimed at targeting patients' perceptions of pain management, and improving care transitions is an important first-priority target for improvement. This analysis may help other institutions improve hospital rating, value-based payments, and patient-centered outcomes.

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 Optimizing clinical outcomes is no longer sufficient in the delivery of health care in the 21st century; physicians must also aim to provide the best possible patient experience, a concept central to patient-centered care.<sup>1-3</sup> A commonly used instrument for assessing patient experience is the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS), a national, standardized survey of inpatients' hospital care.<sup>4</sup>

The Centers for Medicare & Medicaid Services (CMS) require the use of HCAHPS

for most hospitals that treat Medicare patients.<sup>5</sup> The results of HCAHPS surveys are publicly reported on the CMS Hospital Compare website<sup>4,6,7</sup> and are directly tied to its value-based payment system.<sup>8</sup> Because the collection and analysis of external quality measures is costly,<sup>9</sup> it is important that hospitals fully use measures they are already required to collect. Although HCAHPS scores have been extensively used for quality improvement<sup>10</sup> and recently for surgical outcomes research,<sup>11,12</sup> few data exist on the use of HCAHPS scores for improving patient experience in medical patients,<sup>13-16</sup>



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and no published studies describe HCAHPS scores in patients with neurologic disorders.

In this study, we aimed to assess how patient experience varies by patient demographic characteristics and diagnoses in inpatient neurology patients. We identified key drivers of patients' overall rating of the hospital and likelihood to recommend the hospital with the aims of identifying how patients experience the hospitalization and guiding efforts to improve patient experience in this population. In addition, we aimed to research how patient-reported experience varies by admission service using institutional HCAHPS data.

## PATIENTS AND METHODS

Patients 18 years and older who were admitted to a neurology service and discharged from January 1, 2013, through September 30, 2016, from Mayo Clinic, Rochester, Minnesota, were identified via retrospective review.

### HCAHPS Surveys

The HCAHPS survey comprises 21 questions relating to patient experience, 7 questions capturing demographic characteristics (educational level, race, ethnicity, primary language spoken at home, admission through the emergency department, and overall and mental health), and 4 screening questions. The 21 patient experience questions were combined into 9 composite measures: Communication With Nurses, Communication With Doctors, Responsiveness of Hospital Staff, Pain Management, Communication About Medicines, Discharge Information, Care Transition, Environment, and Global scores (Supplemental Appendix 1, available online at <http://www.mcpiqjournal.org>).<sup>17</sup> The Global score was composed of 2 global perception rating measures (patient's overall hospital rating and likelihood that the patient would recommend the hospital to friends and family).<sup>17</sup> Composite measures were calculated using CMS-supported top-box methods, where each composite score was dichotomized as top-box vs non-top-box.<sup>17</sup> A top-box score on a composite measure indicates that the patient gave the most favorable response on all individual questions in the composite measure (eg, response of "always" on questions with possible responses of "never," "sometimes," "usually," and "always"; response of 9 or 10 on

an overall hospital rating from 0 to 10; and response of "definitely yes" on likelihood to recommend the hospital with possible responses of "definitely no," "probably no," "probably yes," and "definitely yes"). If more than 50% of questions that compose a composite measure were not answered, the patient was excluded from any analysis of that composite measure. To create a single summary score measure encompassing all composite measures, composite measures were recalculated after rescaling individual patient experience survey questions to a linear scale and were combined using published methods.<sup>18</sup> The Summary score was dichotomized as "high" (top quartile) and "low" (lower 3 quartiles).

Similar to most hospitals in the United States, the Mayo Clinic HCAHPS surveys are administered by a third-party vendor (Press Ganey). This vendor selects the random sample of inpatients to whom HCAHPS surveys are sent using published HCAHPS sampling methods.<sup>19</sup> Data on which patients were sampled and which patients did not return surveys were unavailable for research.

### Cohort

We identified 7036 neurology inpatients. Patients who refused Minnesota research authorization (n=411, 5.8%) and those for whom HCAHPS survey data were unavailable because they were either not sampled to receive a survey or were sampled but did not return a survey (n=5580, 79.3%) were excluded. Data on which patients were surveyed were not available. A subanalysis of patient factors compared those with HCAHPS survey data with those without survey data to assess the representativeness of the respondents to the larger population of inpatients admitted to a neurology service.

Administrative data records were reviewed for patient demographic characteristics, hospital length of stay (LOS), procedures, and diagnoses. Prolonged LOS was defined as greater than or equal to 5 days from admission to discharge (top quartile). Procedures were identified using *Current Procedural Terminology* codes, which were reviewed to identify admissions with any surgical procedure. *International Classification of Diseases, Ninth Revision* and *Tenth Revision* diagnosis codes were grouped as (1) cancer, (2) neurodegenerative disease, (3) stroke, (4) epilepsy,

(5) other neurologic diagnoses, and (6) other non-neurologic diagnoses. Patients with more than one diagnosis type during their admission were assigned to groups 1 to 5 in a hierarchical manner, first based on the primary diagnosis assigned to the admission and then on secondary diagnoses.

A secondary analysis identified an additional 37,101 adult inpatients who were admitted to a neurosurgery service (n=9163) or general internal medicine service (n=27,938) during the study period. Of these patients, 2168 (5.8%) refused Minnesota research authorization and 29,342 (79.1%) were either not sampled to receive a survey or were sampled but did not return a survey and were excluded.

### Analysis of Neurology Inpatients

Univariate analysis comparing neurology inpatient patient factors by presence of HCAHPS survey data and comparing low HCAHPS scores by patient factors used  $\chi^2$  tests for comparisons of categorical variables, Wilcoxon rank sum tests for comparisons of continuous variables, and Cochran-Armitage trend tests for assessing trends in low HCAHPS scores by year of discharge. Multivariable logistic regression models assessed variation in patient experience scores by diagnosis after controlling for HCAHPS case-mix adjusters. Analysis of each composite score and the Summary score included patients for whom that score was available.

Key driver analysis identified composite scores that were most low scoring and most highly correlated with the Global score as important drivers of the Global score by plotting the mean of each linear-scaled composite measure against the Spearman correlation coefficient of that composite measure with the linear-scaled Global score.<sup>12</sup> Key driver analysis was performed overall and separately within each diagnosis group.

### Analysis Comparing With Other Services

On secondary analysis, patient factors of patients admitted to a neurology service were compared with those of patients admitted to a neurosurgical or general internal medicine service using  $\chi^2$  tests and Kruskal-Wallis tests. Multivariable logistic regression assessed the variation in patient experience scores by admission service after controlling for HCAHPS

case-mix adjusters (patient-reported overall health rating, educational level, and age).

The Mayo Clinic Institutional Review Board approved this study and waived the need for informed consent.  $P < .05$  was considered significant, and analyses were performed using SAS software, version 9.4 (SAS Institute Inc).

## RESULTS

### Neurology Admission Service Patients

Among 1045 adult inpatients with a returned HCAHPS survey after an admission to a neurology service, median age at discharge was 64 years (interquartile range [IQR], 50-75 years), and 50.0% (n=522) were male. One-fifth of the patients (n=227, 21.7%) underwent a surgical procedure during the admission. Almost half of the patients (n=471, 45.1%) had a diagnosis of stroke, followed by 27.4% (n=286) with epilepsy, 8.4% (n=88) with cancer, and 2.7% (n=28) with neurodegenerative disease. An additional 14.8% of patients (n=155) had another neurologic diagnosis, and 1.6% (n=17) had another nonneurologic diagnosis. Median LOS was 3 days (IQR, 2-5 days), and 50.8% of patients (n=531) were admitted through the emergency department. Almost all the patients (n=1002/1009, 99.3%) were English-language speakers, and 94.6% (n=625/661) were non-Hispanic white.

Patients who responded to the HCAHPS survey were older (median age, 64 vs 59 years;  $P < .001$ ) and less likely to have a prolonged LOS (27.9% [n=292/1045] vs 35.9% [n=2006/5580];  $P < .001$ ) compared with those who either were not sampled or received a survey but did not complete it.

Among responders, on univariate analysis diagnosis was not significantly associated with a low Summary score. However, Pain Management scores varied by diagnosis, where low scores were more common among epilepsy patients (n=44/93, 47.3%) and other neurologic patients (n=53/96, 55.2%) compared with patients with diagnoses of any cancer (n=19/57, 33.3%), neurodegenerative diseases (n=5/13, 38.5%), stroke (n=68/194, 35.1%), and other diagnoses (n=3/7, 42.9%) ( $P = .02$ ). Women were more likely to give low scores in Communication About Medicines (54.1% [n=160/296] vs 44.8%

**TABLE 1. Univariate Associations Between Patient Factors and Low Satisfaction With Selected Composite Measures and Summary Scores in Patients Admitted to a Neurology Service**

Factor	Total cohort (n=1045) (No. [%])	Pain management (n=460)		Communication about medicines (n=631)		Discharge information (n=863)		Care transition (n=1020)		Summary score (n=1040)	
		Low score (%)	P value	Low score (%)	P value	Low score (%)	P value	Low score (%)	P value	Low score (%)	P value
Missing HCAHPS measure (No. [%])		585/1045 (66.0)		414/1045 (39.6)		182/1045 (17.4)		25/1045 (2.4)		5/1045 (0.5)	
Diagnosis type (n=1045)			.02		.19		.16		.41		.23
Cancer	88 (8.4)	19/57 (33.3)		32/67 (47.8)		15/70 (21.4)		44/86 (51.2)		63/88 (71.6)	
Neurodegenerative	28 (2.7)	5/13 (38.5)		11/18 (61.1)		3/22 (13.6)		20/28 (71.4)		25/28 (89.3)	
Stroke	471 (45.1)	68/194 (35.1)		175/337 (51.9)		65/377 (17.2)		258/458 (56.3)		368/467 (78.8)	
Epilepsy	286 (27.4)	44/93 (47.3)		39/103 (37.9)		59/255 (23.1)		149/277 (53.8)		214/285 (75.1)	
Other neurologic	155 (14.8)	53/96 (55.2)		50/100 (50.0)		18/124 (14.5)		80/154 (51.9)		117/155 (75.5)	
Other nonneurologic	17 (1.6)	3/7 (42.9)		3/6 (50.0)		5/15 (33.3)		8/17 (47.1)		11/17 (64.7)	
Sex (n=1045)			.24		.02		.01		.16		.77
Female	523 (50.0)	113/256 (44.1)		160/296 (54.1)		97/432 (22.5)		288/505 (57.0)		401/520 (77.1)	
Male	522 (50.0)	79/204 (38.7)		150/335 (44.8)		68/431 (15.8)		271/515 (52.6)		397/520 (76.3)	
Age (n=1045)			.44		.92		.12		.06		.23
18-49 y	249 (23.8)	51/110 (46.4)		52/105 (49.5)		46/216 (21.3)		124/244 (50.8)		185/247 (74.9)	
50-59 y	167 (16.0)	41/92 (44.6)		50/110 (45.5)		36/149 (24.2)		105/165 (63.6)		137/167 (82.0)	
60-69 y	223 (21.3)	48/112 (42.9)		76/151 (50.3)		28/181 (15.5)		110/218 (50.5)		165/222 (74.3)	
70-79 y	251 (24.0)	34/92 (37.0)		84/172 (48.8)		32/212 (15.1)		133/244 (54.5)		187/250 (74.8)	
≥80 y	155 (14.8)	18/54 (33.3)		48/93 (51.6)		23/105 (21.9)		87/149 (58.4)		124/154 (80.5)	
Length of stay (n=1045)			.10		.32		.60		.62		.29
<5 d	753 (72.1)	105/272 (38.6)		199/417 (47.7)		128/656 (19.5)		408/738 (55.3)		569/750 (75.9)	
≥5 d	292 (27.9)	87/188 (46.3)		111/214 (51.9)		37/207 (17.9)		151/282 (53.5)		229/290 (79.0)	
Emergency department admission (n=1045)			.64		.19		.04		.09		.30
No	514 (49.2)	96/224 (42.9)		124/269 (46.1)		94/428 (22.0)		260/499 (52.1)		385/511 (75.3)	
Yes	531 (50.8)	96/236 (40.7)		186/362 (51.4)		71/435 (16.3)		299/521 (57.4)		413/529 (78.1)	
Surgery (n=1045)			.22		.47		.09		.51		.75
No	818 (78.3)	129/294 (43.9)		214/444 (48.2)		138/680 (20.3)		433/798 (54.3)		622/813 (76.5)	
Yes	227 (21.7)	63/166 (38.0)		96/187 (51.3)		27/183 (14.8)		126/222 (56.8)		176/227 (77.5)	
Year of discharge (n=1045)			.36		.17		.56		.04		.31
2013	272 (26.0)	42/124 (33.9)		71/163 (43.6)		42/219 (19.2)		130/265 (49.1)		201/270 (74.4)	
2014	271 (25.9)	58/119 (48.7)		87/175 (49.7)		49/239 (20.5)		147/267 (55.1)		208/271 (76.8)	
2015	256 (24.5)	53/122 (43.4)		83/156 (53.2)		41/212 (19.3)		143/247 (57.9)		198/254 (78.0)	
2016	246 (23.5)	39/95 (41.1)		69/137 (50.4)		33/193 (17.1)		139/241 (57.7)		191/245 (78.0)	
Overall health rating (n=1026)			<.001		.48		.04		<.001		.08
Excellent	77 (7.5)	8/36 (22.2)		26/51 (51.0)		18/68 (26.5)		29/76 (38.2)		53/77 (68.8)	
Very good	256 (25.0)	31/92 (33.7)		90/166 (54.2)		34/221 (15.4)		121/248 (48.8)		186/255 (72.9)	
Good	378 (36.8)	64/167 (38.3)		106/229 (46.3)		54/317 (17.0)		222/372 (59.7)		298/378 (78.8)	
Fair/poor	315 (30.7)	87/155 (56.1)		88/178 (49.4)		58/247 (23.5)		178/310 (57.4)		248/313 (79.2)	

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**TABLE 1. Continued**

Factor	Total cohort (n=1045) (No. [%])	Pain management (n=460)		Communication about medicines (n=631)		Discharge information (n=863)		Care transition (n=1020)		Summary score (n=1040)	
		Low score (%)	P value	Low score (%)	P value	Low score (%)	P value	Low score (%)	P value	Low score (%)	P value
Education (n=1019)			.36		.45		.74		.87		.47
>4-y college	173 (17.0)	30/70 (42.9)		54/106 (50.9)		28/148 (18.9)		89/169 (52.7)		139/173 (80.3)	
4-y college graduate	120 (11.8)	23/50 (46.0)		42/74 (56.8)		24/104 (23.1)		64/118 (54.2)		94/120 (78.3)	
Some college or 2-y graduate	336 (33.0)	71/154 (46.1)		97/202 (48.0)		53/284 (18.7)		178/331 (53.8)		249/335 (74.3)	
≤ High school graduate	390 (38.3)	66/178 (37.1)		110/237 (46.4)		56/307 (18.2)		214/381 (56.2)		297/388 (76.5)	

HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems.

[n=150/335];  $P=.02$ ) and Discharge Information (22.5% [n=97/432] vs 15.8% [n=68/431];  $P=.01$ ) compared with men. Except for discharge information, patient experience scores did not vary by route of admission (emergency department admission vs other). Care Transition scores significantly worsened over the 4-year study period, with the percentage of low scores increasing from 49.1% (n=130/265) in 2013 to 57.7% (n=139/241) in 2016 ( $P=.04$ ). No improvement or decline over time was seen in the overall Summary scores or any of the other HCAHPS composite scores (all  $P>.05$ ) (Table 1).

In multivariable models adjusting for age, education, and overall health, diagnosis was not associated with low Summary, Communication About Medicines, Discharge Information, or Care Transition scores. However, patients with neurologic diagnoses other than stroke, epilepsy, and neurodegenerative disease were significantly more likely to report lower Pain Management scores compared with patients with cancer (odds ratio [OR], 2.42; 95% CI, 1.19-4.92;  $P=.02$ ) (Table 2).

Key driver analysis in patients admitted to a neurology service showed Care Transition as a key driver of the Global score, with a low average score and an above-average correlation with the Global score. Pain Management, Communication About Medicines, Discharge Information, and Environment composite scores also had relatively low averages but low correlation with the Global score and were, therefore, identified as low-scoring non-key drivers (Figure 1). Care Transition remained a key driver across all diagnosis groups, and Communication About Medicines was a key driver in patients with cancer and patients with other neurologic diagnoses. Environment was an additional key driver in patients with cancer, and Pain Management was an additional key driver in patients with other neurologic diagnoses (Figure 2).

**Comparison With Neurosurgical and General Internal Medicine Admission Services**

The comparison cohorts included adult inpatients with a returned HCAHPS survey after an admission to a neurosurgical service (n=2190) or a general internal medicine service (n=3401).

TABLE 2. Multivariable Odds That Patients Reported Low HCAHPS Scores in Patients Admitted to a Neurology Service<sup>a,b</sup>

Factor	Low pain management score		Low communication about medicines score		Low discharge information score		Low care transition score		Low summary score	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Diagnosis type										
Cancer (ref)	1.00	—	1.00	—	1.00	—	1.00	—	1.00	—
Neurodegenerative	1.02 (0.28-3.71)	.98	1.67 (0.57-4.91)	.35	0.61 (0.16-2.40)	.48	2.40 (0.94-6.14)	.07	3.34 (0.91-12.23)	.07
Stroke	1.26 (0.66-2.42)	.49	1.14 (0.66-1.96)	.65	0.83 (0.43-1.59)	.57	1.28 (0.79-2.08)	.32	1.60 (0.93-2.75)	.09
Epilepsy	1.62 (0.77-3.42)	.21	0.59 (0.31-1.13)	.11	1.18 (0.60-2.31)	.64	1.22 (0.73-2.04)	.45	1.22 (0.69-2.15)	.50
Other neurologic	2.42 (1.19-4.92)	.02	1.02 (0.54-1.93)	.95	0.61 (0.28-1.32)	.21	1.00 (0.58-1.73)	.99	1.18 (0.64-2.15)	.60
Other	1.52 (0.29-7.91)	.62	0.98 (0.18-5.40)	.98	1.98 (0.57-6.86)	.28	0.88 (0.30-2.53)	.81	0.78 (0.25-2.38)	.66
Age										
18-49 y	1.04 (0.56-1.91)	.90	1.08 (0.63-1.85)	.78	1.19 (0.67-2.11)	.55	1.06 (0.71-1.60)	.77	1.19 (0.75-1.89)	.47
50-59 y	1.05 (0.58-1.92)	.87	0.82 (0.49-1.37)	.45	1.65 (0.93-2.91)	.08	1.73 (1.13-2.65)	.01	1.69 (1.01-2.82)	.046
60-69 y (ref)	1.00	—	1.00	—	1.00	—	1.00	—	1.00	—
70-79 y	0.79 (0.43-1.44)	.43	0.97 (0.62-1.53)	.90	1.05 (0.60-1.85)	.87	1.12 (0.77-1.64)	.55	0.97 (0.63-1.49)	.88
≥80 y	0.76 (0.37-1.56)	.45	1.10 (0.64-1.90)	.73	1.60 (0.84-3.05)	.15	1.31 (0.85-2.04)	.23	1.31 (0.78-2.22)	.31
Overall health rating										
Excellent (ref)	1.00	—	1.00	—	1.00	—	1.00	—	1.00	—
Very good	1.84 (0.74-4.58)	.19	1.17 (0.62-2.22)	.64	0.48 (0.25-0.94)	.03	1.49 (0.87-2.54)	.14	1.26 (0.71-2.21)	.43
Good	2.30 (0.97-5.48)	.06	0.77 (0.41-1.43)	.40	0.53 (0.28-1.00)	.049	2.23 (1.33-3.73)	.002	1.74 (1.00-3.01)	.05
Fair/poor	4.75 (1.98-11.38)	<.001	0.94 (0.50-1.79)	.86	0.81 (0.43-1.52)	.52	2.12 (1.25-3.58)	.005	1.88 (1.07-3.32)	.03
Education										
>4-y college (ref)	1.00	—	1.00	—	1.00	—	1.00	—	1.00	—
4-y college graduate	1.02 (0.48-2.21)	.95	1.34 (0.73-2.47)	.34	1.27 (0.67-2.41)	.46	1.05 (0.65-1.70)	.85	0.87 (0.49-1.56)	.64
Some college or 2-y graduate	1.04 (0.57-1.89)	.90	0.93 (0.58-1.51)	.77	0.99 (0.59-1.67)	.98	1.01 (0.69-1.47)	.98	0.68 (0.43-1.08)	.10
≤ High school graduate	0.73 (0.40-1.34)	.31	0.89 (0.56-1.44)	.64	0.94 (0.56-1.58)	.81	1.05 (0.72-1.53)	.81	0.73 (0.46-1.15)	.17

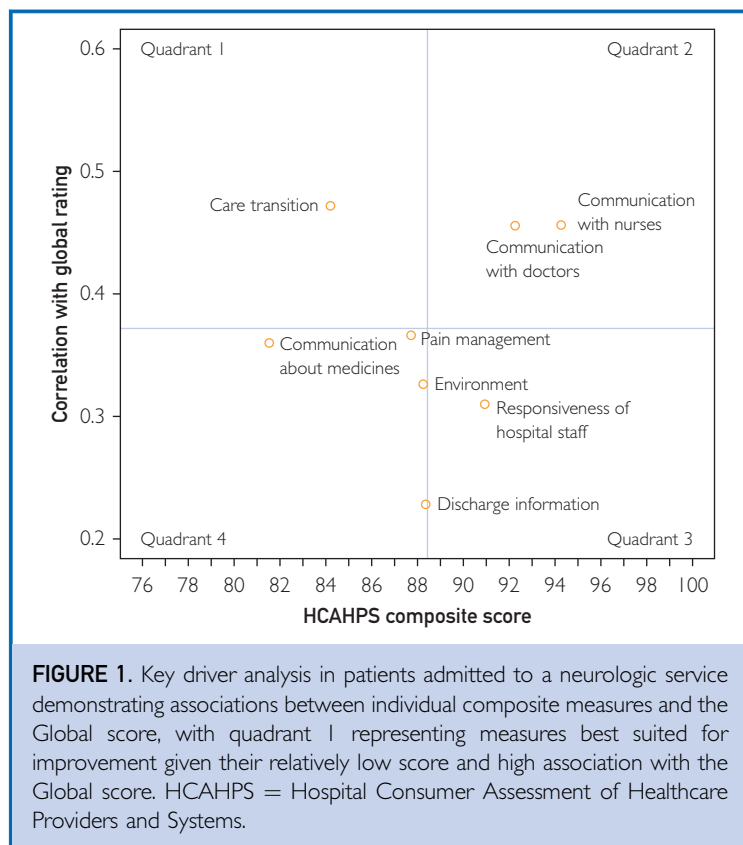
<sup>a</sup>HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems; OR = odds ratio; ref = reference.

<sup>b</sup>Multivariable logistic regression models identified independent associations of low HCAHPS summary score with diagnosis type after adjusting for HCAHPS case-mix adjusters (overall health rating, educational level, and age).



Patient factors varied across admission service. Patients admitted to general internal medicine were older (median of 72 years vs 64 years in patients admitted to neurology and 64 years in patients admitted to neurosurgery;  $P < .001$ ), and median LOS was shorter in neurosurgery patients (2 days; IQR, 1-3 days) compared with general internal medicine (3 days; IQR, 2-5 days) and neurology (3 days; IQR, 2-5 days) patients ( $P < .001$ ). Sixty-one percent ( $n = 2076/3401$ ) of general internal medicine patients were admitted through the emergency department compared with 7.6% ( $n = 167/2190$ ) of neurosurgery patients and 50.8% ( $n = 531/1045$ ) of neurology patients ( $P < .001$ ). Neurosurgery patients reported higher levels of education (high school degree or less by 26.5% [ $n = 567/2142$ ] of neurosurgery patients vs 41.4% [ $n = 1358/3284$ ] of general internal medicine patients vs 38.3% [ $n = 390/1019$ ] of neurology patients) and better overall health (excellent or very good health was reported by 49.2% [ $n = 1053/2140$ ] of neurosurgery patients vs 21.9% [ $n = 723/3298$ ] of general internal medicine patients vs 32.5% [ $n = 333/1026$ ] of neurology patients) (both  $P < .001$ ). Sex, race, and English language did not vary by admission service.

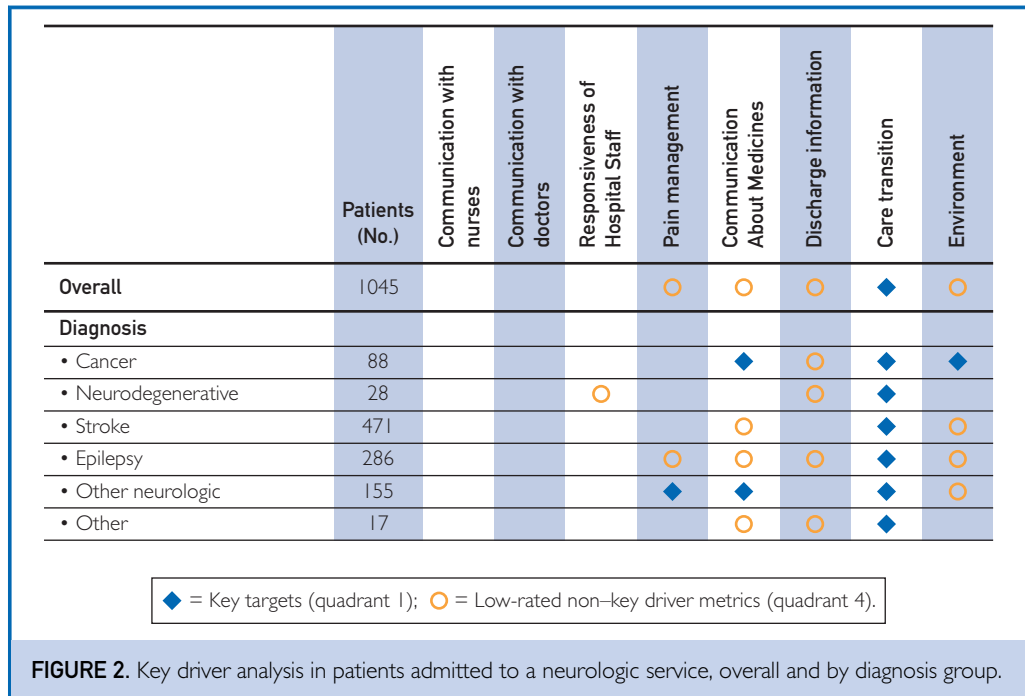
In multivariable logistic regression models adjusting for age, education, and overall health, compared with patients admitted to a neurology service, patients admitted to a general internal medicine service were significantly more likely to report a low Summary score (OR, 1.36; 95% CI, 1.14-1.62;  $P < .001$ ), whereas patients admitted to a neurosurgery service were significantly less likely to report a low Summary score (OR, 0.80; 95% CI, 0.67-0.96;  $P = .02$ ). Compared with neurology patients, general internal medicine patients were significantly more likely to give low scores on the Global score, Communication With Nurses, Responsiveness of Hospital Staff, Pain Management, and Environment composite measures, and neurosurgery patients were significantly less likely to give low scores on the Communication With Doctors, Discharge Information, Care Transition, and Environment composite measures and significantly more likely to give a low score on the Communication With Nurses measure (Table 3).



## DISCUSSION

This study of HCAHPS scores in patients admitted to a neurology service shows variation in patient experience by patient demographic characteristics and diagnosis and demonstrates that Care Transition was a key driver of the HCAHPS Global score across all diagnoses in neurology inpatients. This analysis also shows variation in patient experience by admission service. This analysis may help improve patient-centered outcomes across institutions and has the potential to improve hospital ratings and value-based payment, and it highlights the need for in-depth analysis of HCAHPS scores in neurology patients to identify those most in need of interventions aimed at improving patient experience scores.

Although this study did not observe variation in Summary scores by diagnosis in patients admitted to a neurology service, Pain Management scores did vary by diagnosis on univariate and multivariable analyses in this cohort of neurology patients. On univariate analysis, low Pain Management scores were



more likely in patients with epilepsy and those with other neurologic diagnoses not included in the categories of stroke, epilepsy, or neurodegenerative disease. Furthermore, after adjusting for age, education, and overall health, this significant difference persisted, where patients in the other neurologic diagnosis group were significantly more likely to report lower Pain Management scores compared with patients with cancer. Recent studies have similarly found that HCAHPS measures vary by diagnosis and severity of illness<sup>20,21</sup> even after adjusting for patient-reported overall health, as is done during HCAHPS case-mix adjustment, providing further evidence that patient experience varies by patient-level factors not captured by HCAHPS case-mix adjustment. Pain Management in patients hospitalized with neurologic disorders is often complicated by the need for frequent clinical examination, including mental status, which can be adversely affected by certain pain management strategies (eg, opioid therapy) and complicates the perception of inadequate pain management. Setting appropriate expectations, improving communication with patients on the potentially harmful effects of opioids in certain neurologic conditions, and discussing alternative pain

management options may improve outcomes in this area. Although questions currently included in the pain management measures will be replaced with questions that will focus more specifically on communication about pain, the current assessment of variation in patient-reported pain control by diagnosis should inform practice among providers of patients admitted to neurology services.<sup>22</sup>

The Care Transition composite measure was a key driver of the Global score across all admission services and all diagnosis groups, suggesting that interventions targeting improvement in care transitions may be effective in improving the overall patient experience in the population of neurology inpatients. Interventions to improve care transitions should address patient and family caregiver preferences in deciding postdischarge health care needs, ensure that patients have a good understanding of the purpose of each of their medications, and acknowledge patient and caregiver responsibilities regarding management of their health on discharge. Concepts at the core of interventions targeting these survey items include engaging in shared decision making and facilitating patient involvement in their own care, both of which are important components of patient-centered care.<sup>2,23</sup>



TABLE 3. Multivariable Odds of Low HCAHPS Scores by Admission Service<sup>a,b</sup>

Model outcome	Neurology (ref)		General internal medicine		Neurosurgery	
	OR (95% CI)	P value	OR (95% CI)	P value	OR (95% CI)	P value
Low Summary score	1.00	—	1.36 (1.14-1.62)	<.001	0.80 (0.67-0.96)	.02
Low Global score	1.00	—	1.73 (1.43-2.10)	<.001	1.02 (0.82-1.26)	.89
Low Communication With Nurses score	1.00	—	1.46 (1.24-1.71)	<.001	1.23 (1.04-1.46)	.02
Low Communication With Doctors score	1.00	—	1.00 (0.86-1.16)	.97	0.69 (0.58-0.81)	<.001
Low Responsiveness of Hospital Staff score	1.00	—	1.64 (1.39-1.92)	<.001	1.16 (0.97-1.38)	.10
Low Pain Management score	1.00	—	1.66 (1.34-2.05)	<.001	0.97 (0.78-1.20)	.78
Low Communication About Medicines score	1.00	—	1.14 (0.95-1.38)	.15	0.93 (0.76-1.12)	.43
Low Discharge Information score	1.00	—	1.07 (0.87-1.30)	.54	0.55 (0.44-0.69)	<.001
Low Care Transition score	1.00	—	1.09 (0.94-1.27)	.25	0.80 (0.69-0.94)	.006
Low Environment score	1.00	—	1.34 (1.16-1.55)	<.001	0.86 (0.73-1.00)	.048

<sup>a</sup>HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems; OR = odds ratio; ref = reference.

<sup>b</sup>Each row represents a separate multivariable logistic regression model assessing variation in low HCAHPS scores by admission service after controlling for HCAHPS case-mix adjusters (overall health rating, educational level, and age).

Other key drivers of the Global score in patients on a neurology service varied by diagnosis, which is consistent with evidence that components of care as measured by HCAHPS vary in their importance to overall assessments of patient experience across service lines and major diagnostic categories.<sup>24</sup> Therefore, interventions that target specific diagnosis groups within inpatients on a neurology service may be beneficial, including interventions aimed at improving patient experience in Communication About Medicines. Recently reported interventions on a neuromedical surgical unit have successfully improved HCAHPS scores in Communication About Medicines and could serve as a model for interventions locally.<sup>25</sup>

The present findings demonstrate that after adjusting for variables used in HCAHPS case-mix adjustment, neurology patients gave lower Summary scores than neurosurgical patients but higher Summary scores than general internal medicine patients. In particular, neurosurgery patients were only half as likely as neurology patients to give a low Discharge Information score, pointing to differences in discharge procedures among services and the possibility of more structured and standardized discharge information after surgical procedures than after medical inpatient stays.<sup>26</sup> In addition, published CMS patient-mix adjustment of HCAHPS scores shows that surgical patients provide higher ratings on all composite measures except for Communication With Nurses. Not only has variation been shown across hospitals of different

types,<sup>27</sup> but this study's finding of variation between services within a single institution is also consistent with a previous publication that found that HCAHPS scores varied widely across surgical specialties.<sup>12</sup> This suggests that HCAHPS scores reflect patient factors that vary across both surgical and medical specialties and are not accounted for in current HCAHPS case-mix adjustment, which is limited to age, educational level, admission type (medical vs surgical vs maternity), patient-reported overall health rating, language, and response percentile.<sup>8</sup> Although differences in HCAHPS scores across admission services may help identify areas for quality improvement at a hospital level, the patient profiles and demographic factors vary widely across services and highly confound any direct comparison of HCAHPS scores between services. Therefore, in-depth analysis of patient-centered outcomes in neurology patients may provide a better approach for identifying patients at risk for low HCAHPS scores.

The primary limitation of this study is the single-center design. However, overall findings and methods used may be repurposed by other institutions to improve the quality of the care. Although analysis of HCAHPS scores is also subject to nonresponse bias, HCAHPS surveys are conducted independently and likely reflect a similar response bias that would be expected to be seen at other institutions and reflect the real-life responses used for hospital comparison and value-based payment. We were unable to assess true response rates in this study owing

to CMS sampling methods; however, the proportion of patients with a returned survey in the present study was only slightly lower than a recently reported mean survey response rate for HCAHPS surveys across all hospitals in the United States.<sup>27</sup> Last, comparisons between patients admitted to a neurology service and those on general medical and neurosurgical-specific services should be interpreted with caution because the present multivariable analysis is likely unable to adjust for the inherent differences in patient populations.

## CONCLUSION

Analysis of institutional HCAHPS data is an effective way to identify patients at risk for reporting poor experiences with their care. This analysis suggests that efforts to improve how neurology patients experience their care should be aimed at targeting adequate, yet appropriate, pain management and improving care transitions. Improving patient-centered and traditional outcomes are crucial components of providing care in the 21st century. In addition, the increasing use of HCAHPS by payers necessitates that all hospitals identify and prioritize targets for improvement of these patient survey responses.

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## SUPPLEMENTAL ONLINE MATERIAL

Supplemental material can be found online at: <http://www.mayoclinicproceedings.org>. Supplemental material attached to journal articles has not been edited, and the authors take responsibility for the accuracy of all data.

**Abbreviations and Acronyms:** CMS = Centers for Medicare & Medicaid Services; HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems; IQR = interquartile range; LOS = length of stay; OR = odds ratio

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