



Original Research

# Nonresponse Bias on Inpatient Rehabilitation Hospitals' Experience of Care Quality Measure Scores



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## KEYWORDS

Neurological rehabilitation;  
Nonresponse bias;  
Outcome assessment (health care);  
Patient reported outcomes;  
Quality indicators;  
Rehabilitation

**Abstract Objective:** To describe the magnitude of nonresponse bias on inpatient rehabilitation facility (IRF) experience of care survey data in patients with neurologic disorders.

**Design:** Cohort study of patients at 2 IRFs. Patients reported experience of care via an IRF-administered survey as part of routine operations approximately 2 weeks after discharge. A partially overlapping sample of research participants completed a similar survey approximately 2 weeks and 30 days after discharge.

**Setting:** Two inpatient rehabilitation facilities.

**Participants:** Patients aged  $\geq 18$  years with neurologic disorders who were discharged from 2 IRFs.

**Interventions:** None.

**Main Outcome Measures:** Experience of care data collected via an IRF Survey (self-report or proxy responses) and a Research Survey (self-report only).

**Results:** Of the 1055 patients admitted during the study period who met the age and diagnosis criteria, 490 (46.4%) completed one or both of the surveys. Of the 325 IRF Survey respondents, 202 were self-report, 99 were proxy respondents, and 24 were unknown respondents. Only patients completed the Research Survey (N=285). One hundred twenty patients completed both surveys, of which 7 were proxy IRF Survey respondents. IRF Survey respondents had higher

*List of abbreviations:* ACA, Affordable Care Act; CAHPS, Consumer Assessment of Healthcare Providers and Systems; HCAHPS, Hospital Consumer Assessment of Healthcare Providers and Systems; IRF, inpatient rehabilitation facility; PAC, postacute care.

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cognitive function than nonrespondents; patients with spinal cord injuries were more likely to complete the IRF Survey than other patients. There were no differences in the proportions of patients answering favorably on the IRF Survey (all respondents) compared with the Research Survey, except for physician communication and discharge information. Mutual information analysis revealed agreement between the scores produced by the 2 data sources.

**Conclusions:** There were subtle, potentially important differences in quality measure results across surveys, reflecting the extent to which patients are encouraged to complete experience of care surveys. There was higher agreement on questions about global hospital perceptions than specific aspects of patients' experience.

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Inpatient rehabilitation facilities (IRFs) provide comprehensive, intensive medical rehabilitation services for patients who experience a major illness or injury that results in functional limitations with a goal of optimizing patients' functional abilities and maximizing community participation.<sup>1</sup> Gans<sup>2</sup> identified experience of care as a key aspect of IRF quality of care. The Centers for Medicare and Medicaid Services' IRF Quality Reporting Program sponsored research to develop an IRF experience of care survey, which could be used to develop experience of care quality measures.<sup>3</sup>

If IRF experience of care quality measures were implemented under an accountability program, understanding potential nonresponse bias would be an important consideration, because many patients in IRFs have neurologic conditions such as stroke, spinal cord injury, and brain injury that result in motor and/or cognitive functional limitations that may affect a patient's ability to respond to experience of care surveys. Further, patients with both motor and cognitive limitations may be at higher risk for receiving lower quality care during an IRF stay because of their complex care needs and the involvement of multiple clinicians from different disciplines. Patients often have cognitive and communication limitations that affect patient-staff communication and are dependent on care staff for daily needs.

Previous research has focused on short-stay acute care hospitals' experience of care survey data used to calculate quality measures for the inpatient acute care hospital value-based purchasing program.<sup>4</sup> These studies have found moderate, selective nonresponse rates that may translate to a small amount of nonresponse bias in hospital-level data that are not case-mix adjusted.<sup>5,6</sup> Case-mix adjustment eliminates most nonresponse bias.<sup>5,6</sup> Simon et al<sup>7</sup> found no evidence of nonresponse bias for mental health providers with a response rate of 33.8%. Similarly, Fowler et al<sup>8</sup> tested various administrative modes for the Consumer Assessment of Healthcare Providers and Systems (CAHPS) surveys for primary care practices and found little evidence of nonresponse bias despite response rates that varied from 20%-40%.

We had the opportunity to explore nonresponse bias, including the use of proxy responses, in IRF experience of care survey data for a sample of patients from 2 IRFs admitted in 2015. We matched data from 2 sources (1) routinely collected experience of care data from patients discharged from 2 IRFs ("IRF Survey") and (2) research project experience of care data ("Research Survey").<sup>9,10</sup> A team of researchers expended considerable effort to obtain the

Research Survey data from research participants after discharge. This contrasts with the IRFs' real-world efforts to obtain responses to a mailed survey, which are typically more limited. Access to both routinely collected IRF Survey data and Research Survey data offers the ability to compare experience of care data when respondents completed only the IRF Survey, both surveys, or only the Research Survey.

Using data from these 2 sources, this study had 5 aims (1) to evaluate the representativeness of respondents with neurologic disorders who returned a completed IRF Survey after discharge; (2) to compare IRF Survey responses for self-report and proxy respondents on individual questions; (3) to compare the association between IRF Survey and Research Survey responses for similar experience of care questions when both surveys were completed; (4) to compare "top-box" scores (numerator, reflecting the most favorable response options) between IRF Survey and Research Survey respondents; and (5) to compare top-box scores for the IRF Survey and Research Survey when both surveys were completed.

## Methods

### Sample

At 2 IRFs, patients reported experience of care in 2 ways (1) IRFs administered an identical survey as part of routine operations approximately 2 weeks after discharge; and (2) research participants completed a survey approximately 30 days after discharge. Study eligibility criteria were admission between March 25 and October 23, 2015, a primary neurologic condition requiring IRF admission, and age  $\geq 18$  years. Research participants provided informed consent.

### Survey instruments

**IRF Survey:** The 2 IRFs contracted with Press Ganey,<sup>11</sup> a national vendor, to gather patients' perspectives of their IRF care experiences. Survey questions addressed topics such as clinician communication, responsiveness of the staff, support and encouragement, discharge information, cleanliness of the hospital, and overall rating of the hospital.<sup>12</sup> Patients rated the extent of agreement with statements about their care using response categories that ranged from 1 (very poor) to 5 (very good). The IRF Survey has demonstrated

evidence of adequate reliability and validity.<sup>13</sup> Proxies could complete the IRF Survey in lieu of patients.

**Research Survey:** The Research Survey adapted the acute care version of the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey,<sup>12</sup> a patient experience of care survey for use in inpatient rehabilitation. HCAHPS questions address communication with nurses and doctors, responsiveness of hospital staff, cleanliness and quietness of the hospital environment, pain management, communication about medicines, discharge information, overall hospital rating, and likelihood of recommending the hospital. The Research Survey added 3 questions about therapists' communication and 3 questions about patient care technicians' communication that parallel the HCAHPS doctor and nurse questions. Only patients completed the Research Survey.

### Study protocol

**IRF Survey:** As part of hospital operations, the IRFs securely transmitted patient contact information electronically to a vendor for all discharged patients, after removing patients who requested not to be contacted or were deceased. Within 2 weeks of discharge, the vendor mailed a paper survey with a cover letter and self-addressed, stamped return envelope to all the former patients except those who had received a paper or electronic survey in the previous 90 days. The request to complete the survey was on the hospitals' letterhead and included the chief executive officer's signature; the return address was the vendor's data processing facility. IRF staff contacted discharged patients by telephone about 1 week after the vendor received contact data to remind patients to return the survey. For patients who did not respond within 30 days of the original mailing, the vendor mailed a second survey. During the study period, a total of 325 surveys (30.8%) were returned.

**Research Survey:** For the research project primary data collection, patient eligibility, accrual, and retention rates were described previously.<sup>10</sup> Briefly, the research project sought to evaluate IRF inpatients' willingness and ability to complete a patient experience of care survey and the burden of completion on patients and staff. Of the 1055 patients admitted with neurologic conditions, 781 (74%) met the study eligibility criteria, 398 (51%) of eligible patients completed the survey at discharge, and 285 (36%) of eligible patients completed the survey 1 month after discharge. Half of the respondents required at least 2 reminder calls; research staff made up to 4 reminder calls. Research Survey respondents who completed the postdischarge Research Survey had significantly higher cognitive abilities at IRF admission as evidenced by higher functional independence measure (FIM) instrument cognitive scores<sup>14-16</sup> than non-completers, and those discharged to institutional settings were less likely to complete the study (65%) than patients discharged home (76%).

### Data linking

An IRF staff member linked the IRF Surveys and the Research Survey using patients' medical record number and admission dates.

### Survey question matching

Two investigators reviewed the IRF Survey questions as well as the Research Survey questions and proposed matches based on item content. Project staff reviewed the initial matches and reconciled differences in matching. Table 1 shows the matched questions from the 2 surveys.

### Quality measure score calculations

We used the HCAHPS top-box algorithm to calculate quality measure results using the IRF Survey and Research Survey data.<sup>17</sup> We calculated quality measure results as the percentage of "very good" responses on IRF Survey questions and the percentage of "always" responses on research study questions. Consistent with the HCAHPS approach, quality measure results were calculated using either one or multiple responses. Quality measure score calculations that rely on response to a single item were cleanliness of hospital environment, responsiveness of hospital staff, support and encouragement, and overall rating of the hospital. The remaining quality measure score calculations used responses to multiple items: doctor communication (3 items), nurse communication (2 items), therapist communication (2 items), and discharge information (2 items). The research project's nurse communication measure used 3 items; however, the IRF Survey had no analogous third question, so the quality measure results were calculated based on the 2 similar questions. The IRF Survey questions specified the *type of therapists* as physical therapist or occupational therapist, whereas the research study questions asked about therapists without specifying the type of therapist. For comparison to the general therapist questions in the Research Survey, the top-box percentages of the IRF Survey were defined as responses of either (1) "very good" for both physical therapy questions; (2) "very good" for both occupational therapy questions; or (3) "very good" for all 4 therapy questions (2 physical therapy and 2 occupational therapy questions). This top-box comparison was compared to the 2 broad therapy questions from the Research Survey. We also compared the top-box percentage of the 2 IRF Survey *occupational therapy* questions with the top-box percentage of 2 broad therapy questions from the Research Survey. When comparing the Research Survey data (2 broad therapy questions) with the IRF Survey data, the comparison was limited to 2 questions, and the IRF Survey defined top-box as "very good" for both physical therapy questions, "very good" for both occupational therapy questions, or "very good" for all 4 therapy questions (2 physical therapy and 2 occupational therapy questions).

### Statistical analysis

The demographic and clinical characteristics of patients with neurologic conditions who completed the IRF Survey were compared with those who did not complete the survey using Pearson chi-square tests. Patient characteristics were then compared by the source of information (patients or proxy respondents) using the Mann-Whitney *U* test to identify statistically significant differences between self and proxy respondents on IRF Survey responses. A Bonferroni

**Table 1** Spearman correlation coefficients for responses of similar Research Survey and IRF Survey questions.

Research Study Questions	IRF Survey Questions	Self-Respondents Only (N=202)			All Respondents (N=325)		
		n	Correlation	P	n	Correlation	P
<b>Doctor communication</b>							
How often did your doctor listen carefully to you?	Doctor's concern for your questions and worries	58	0.37	.004	71	0.35	.003
How often did your doctor explain things in a way that was easy for you to understand?	How well the doctor explained your hospital rehabilitation program	57	0.46	<.001	69	0.49	<.001
How often did your doctor treat you with courtesy and respect?	Courtesy of the rehabilitation doctor	100	0.46	<.001	117	0.46	<.001
<b>Nurse communication</b>							
How often did your nurses explain things in a way that was easy for you to understand?	How well nurses kept you informed about your treatment and progress	99	0.56	<.001	115	0.56	<.001
How often did your nurses treat you with courtesy and respect?	Courtesy of the nurses	100	0.55	<.001	115	0.59	<.001
<b>Therapist communication</b>							
How often did your therapists explain things in a way that was easy for you to understand?	How well the occupational therapist explained your treatment and progress	98	0.35	<.001	114	0.37	<.001
How often did your therapists explain things in a way that was easy for you to understand?	How well the physical therapist explained your treatment and progress	100	0.39	<.001	116	0.46	<.001
How often did your therapists treat you with courtesy and respect?	Courtesy of the occupational therapist	98	0.29	.004	113	0.34	<.001
How often did your therapists treat you with courtesy and respect?	Courtesy of the physical therapist	101	0.14	.165	116	0.25	.007
<b>Responsiveness of hospital staff</b>							
After you pressed the call button, how often did you get help as soon as you wanted it?	Promptness in responding to the call button	99	0.60	<.001	114	0.58	<.001
<b>Support and encouragement</b>							
How often did you feel supported and encouraged by your rehabilitation team?	Extent to which staff gave you encouragement	100	0.32	.001	115	0.37	<.001
<b>Discharge information</b>							
During this rehabilitation hospital stay, did the rehabilitation team provide you with the training and information you and your family needed for your discharge?	Training given to you and your family about care after discharge	95	0.51	<.001	111	0.53	<.001
When you left the rehabilitation hospital, were you given all the information needed to manage your medications?	How well the nurses instructed you about caring for yourself at home (including medications)	90	0.35	.001	105	0.39	<.001
<b>Cleanliness of hospital environment</b>							
How often were your room and bathroom kept clean?	Daily cleaning of your room	98	0.44	<.001	114	0.46	<.001
<b>Overall hospital rating</b>							
Using any number from 0 to 10, where 0 is the worst rehabilitation hospital possible and 10 is the best rehabilitation hospital possible, what number would you use to rate this rehabilitation hospital?	Overall rating of care you received during your stay	97	0.49	<.001	113	0.53	<.001
<b>Willingness to recommend hospital</b>							
Would you recommend this rehabilitation hospital to your friends and family?	Likelihood of your recommending our facility to others	97	0.60	<.001	113	0.67	<.001

correction of  $P < .003$  was applied to account for 14 multiple comparisons.

The association between responses to the IRF Survey questions and analogous research study questions were calculated using Spearman correlation coefficients because of the ordinal nature of the rating scales.

After calculating quality measure scores, Pearson chi-square tests were used to test for differences between self- and proxy-reported responses. A mutual information technique<sup>18</sup> was used to estimate the shared information between the IRF Survey and Research Survey responses. The technique approximates a chi-square statistic, allowing estimation of statistical significance. In situations the mutual information value is statistically significant and the calculated agreement level is greater than the disagreement level, the questions are considered to provide congruent (or concordant) information. Likewise, if the mutual information value is statistically significant and the agreement level is lower than the disagreement level, then the 2 instruments provide discordant information. A Bonferroni correction of  $P < .005$  was applied to account for 11 multiple comparisons. After assessing the shared survey information, the McNemar test was used to identify significant differences in the proportions of IRF Survey and Research Survey top-box scores.<sup>19</sup>

Northwestern University’s Institutional Review Board approved this study. IRF operations staff provided deidentified, matched data records to research staff to maintain patient privacy.

## Results

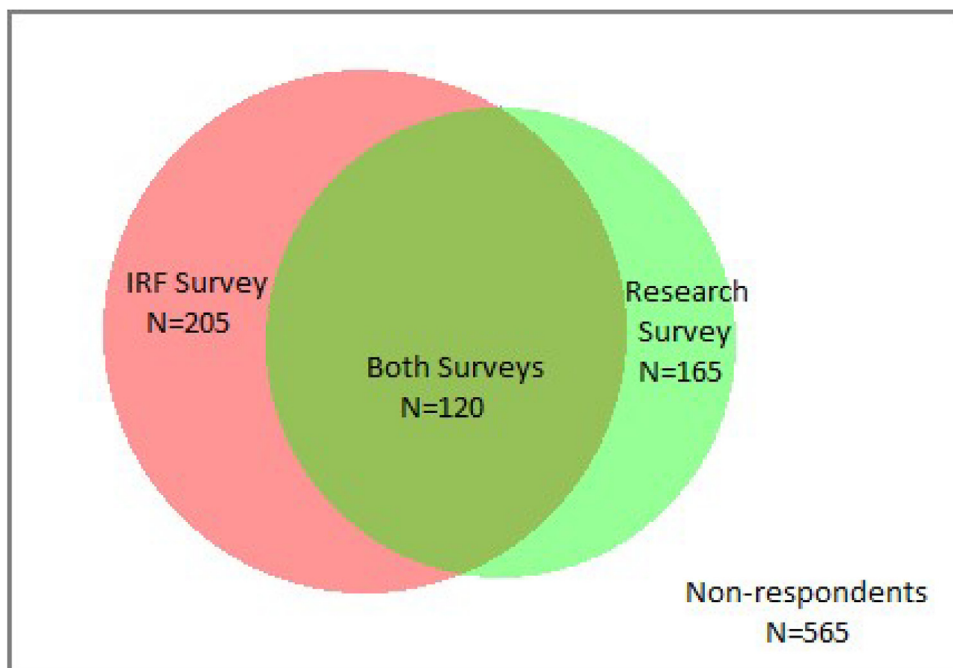
Of the 1055 patients with neurologic conditions admitted during the study period who met the age criterion, 490 (46.4%) completed one or both of the surveys. [Figure 1](#)

displays the unique and overlapping sets of survey respondents. A total of 325 IRF Surveys were completed (30.8%), of which 202 were self-report, 99 were proxy respondents, and 24 were unknown respondents. Only patients completed the Research Survey (N=285). Both surveys were completed by 120 respondents, of which 7 were proxy respondents for the IRF Survey and self-reported for the Research Survey and 10 were unknown respondents for the IRF Survey and self-reported for the Research Survey. Notably, none of the 273 patients (or their proxies) who were ineligible for participation in the Research Survey responded to the IRF Survey, suggesting nonresponse bias.

### IRF Survey

[Table 2](#) shows that that the IRF Survey response rate was unrelated to age, sex, ethnicity, length of stay, marital status, discharge living arrangement, or admission self-care and mobility abilities (FIM instrument scores). Response rate was related to race, discharge location, and cognitive abilities (FIM instrument cognition scores) such that IRF Survey respondents had higher cognition than did nonrespondents. Response rates were also related to primary medical condition such that respondents were more likely to have spinal cord injuries and nonrespondents were more likely to have traumatic brain injuries and strokes.

[Table 3](#) shows that proxy response was unrelated to the patient’s age, race, ethnicity, education, marital status, primary impairment, discharge living arrangement, or length of stay. However, patients for whom proxies responded had lower self-care, mobility, and cognition abilities (ie, lower FIM instrument scores) than did self-respondents. Proxies were more likely to be the respondent for male patients, patients with interrupted stays, and those discharged to acute care hospitals or skilled nursing facilities.



**Fig 1** Unique and overlapping sets of survey completion by admitted patients with neurologic disorders (N=1055).

**Table 2** Comparison of IRF Survey respondents and nonrespondents, patients with neurologic conditions (N=1055).

Variable	Survey Returned	Survey Not Returned	P
	N=325	N=730	
Mean age $\pm$ SD (y)	61.1 $\pm$ 18.3	62.5 $\pm$ 19.0	.257
Range	18-91	18-98	
Sex			.240
Male	192 (69%)	403 (55%)	
Female	133 (31%)	327 (45%)	
Race	N=152	N=257	.002
White	128 (84%)	175 (68%)	
Black/African American	17 (11%)	57 (22%)	
Asian	2 (1%)	7 (3%)	
More than once race	0 (0%)	6 (2%)	
Other	5 (4%)	12 (5%)	
Ethnicity	N=304	N=679	.260
Hispanic	10 (3%)	35 (5%)	
Not Hispanic or Latino	294 (97%)	644 (95%)	
Marital status	N=323	N=726	.057
Single (never married)	78 (24%)	176 (24%)	
Married	173 (54%)	341 (47%)	
Divorced	20 (6%)	79 (11%)	
Widowed	49 (15%)	115 (16%)	
Separated	3 (1%)	15 (2%)	
Primary impairment			<.001
Traumatic SCI/nontraumatic SCI	87 (27%)	121 (17%)	
TBI/nontraumatic brain injury	70 (21%)	186 (45%)	
Stroke	120 (37%)	328 (45%)	
Other	48 (15%)	95 (13%)	
Interrupted stay			.030
Yes	19 (6%)	21 (3%)	
No	306 (94%)	709 (97%)	
Discharge location			<.001
Home	172 (53%)	279 (38%)	
Short-term acute care hospital	40 (4%)	88 (12%)	
Skilled nursing facility	49 (15%)	171 (23%)	
Home health organization	60 (25%)	185 (25%)	
Hospice (home)	–	1 (<1%)	
Intermediate care	–	5 (1%)	
Another IRF	2 (1%)	–	
Not listed	1 (<1%)	1 (<1%)	
Discharge living arrangement			.390
Alone	7 (4%)	18 (7%)	
Family/relatives	158 (92%)	249 (89%)	
Friends	2 (1%)	6 (2%)	
Attendant	1 (1%)	2 (1%)	
Other	4 (2%)	4 (1%)	
Mean length of stay $\pm$ SD (d)	22.72 $\pm$ 15.94	20.7 $\pm$ 16.1	.059
Range	1-118	1-171	
Median	19	17	
Mean FIM cognition score $\pm$ SD	27.4 $\pm$ 7.0	23.9 $\pm$ 8.1	<.001
Range	5-35	5-35	
Median	29	25	
Score <21	137	373	
Score 21-27	90	215	
Score 28-35	98	142	
Mean FIM mobility score $\pm$ SD	9.4 $\pm$ 5.49	8.7 $\pm$ 5.5	.180
Range	0-26	1-30	
Median	9	8	

(continued)

Table 2 (Continued)

Variable	Survey Returned	Survey Not Returned	P
Score < 8	139	356	
Score 8-12	102	198	
Score > 12	84	176	
Mean FIM self-care score $\pm$ SD	16.8 $\pm$ 7.2	16.5 $\pm$ 7.4	.061
Range	5-32	5-35	
Median	17	16	
Score <21	130	313	
Score 21-27	123	224	
Score 28-35	72	193	

NOTE: Response categories were combined for the following variables for analysis: race (White vs Black vs all other), marital status (married vs all other), occupational status (working vs all other), discharge location (home vs all other), and discharge living arrangement (alone vs all other).

Abbreviations: SCI, spinal cord injury; TBI, traumatic brain injury.

Table 1 summarizes item-level correlations between self-report and all respondents using Spearman's  $\rho$  for 16 survey questions that were analogous on the IRF Survey and the Research Survey. When self-reported data only were examined, values ranged from 0.14 (therapists treat you with courtesy/courtesy of physical therapist) to 0.60 (responsiveness of hospital staff, willingness to recommend the hospital). When all data were examined, including proxy- and self-reported and unknown source data, correlations were generally of the same or greater magnitude.

Table 4 reports quality measure results calculated from the IRF Survey sample data and Research Survey sample data. The quality measure results based on the Research Survey data indicate better experiences than scores from the IRF Survey from self-respondents, except in the case of "responsiveness to hospital staff" and "overall hospital rating." The quality measure results based on all respondents to the IRF Survey were 0-5 percentage points lower than quality measure results based on self-respondents, except for "nurse communication" and "therapist communication," suggesting a more favorable perception by proxies.

Data from patients who completed both surveys were examined to better understand the response differences between the 2 surveys. Adjusting for multiple comparisons with the McNemar test, table 5 summarizes no differences in the proportions of patients answering favorably on the IRF Survey compared with the Research Survey, except for doctor communication (regardless of source) and discharge information (only when all respondents were included in the IRF Survey). Favorable ratings for doctor communication ranged from 42% (n=35) based on the IRF Survey to 61% (n=51) based on the Research Survey data (bottom half of table 5 in the doctor communication and discharge information rows). One-quarter of the respondents (n=21) who reported less favorably on the IRF Survey reported more favorably on the Research Survey. Five respondents (6%) who reported unfavorably on the Research Survey reported favorably on the IRF Survey.

Table 5 also reports comparison of paired quality measure scores using the IRF Survey for self-respondents and all respondents with Research Survey data. Mutual information analysis revealed significant shared information for all measures (far right column). Local mutual information agreement levels for all measures were higher than the local

disagreement levels, indicating agreement between the scores produced by the 2 data sources.

## Discussion

This study compared experience of care data reported by patients with neurologic conditions from 2 IRFs using 2 different data sources: routine IRF data collection and a Research Survey. Across the 2 data sources, we observed subtle, potentially important differences on quality measure scores that may be attributable to motor and cognitive limitations and reflect the extent to which patients are encouraged to provide hospital ratings. Nonresponse bias may be more important in IRFs than general acute hospitals given the higher rates of motor and cognitive limitations in patients in IRFs. We observed higher agreement for questions about global aspects of hospital performance than specific aspects of patients' experience. Efforts to develop quality measures for IRFs should consider as risk adjusters some of the variables associated with top-box variations in this study.

Our results are consistent with previous research examining experience of care survey data from patients discharged from short-stay acute care hospitals, which found moderate, selective nonresponse bias prior to risk adjustment.<sup>5,20</sup> In contrast, other studies examining data for mental health providers<sup>7</sup> and primary care providers<sup>8</sup> did not find nonresponse bias, despite low-response rates.

We noted differences in proxy responses compared with patient responses, which may indicate the need for risk adjustment for type of respondent. Response rates for the IRF Survey varied for some patient characteristics, including race, discharge location, cognitive function, and primary medical condition. Efforts that improve response rates will result in quality measure results that are more generalizable to IRFs' entire patient populations; they also may be less favorable.

As noted by Gans,<sup>2</sup> the patient's voice represents an important aspect of quality measurement for inpatient rehabilitation. If quality measures based on experience data are implemented for IRFs, consideration of nonresponse and proxy bias will be important. To allow more robust comparisons, future research should collect data from a larger

**Table 3** IRF Survey: comparison of self and proxy respondents (N=301).\*

	Self-Respondent n=202	Proxy Respondent n=99	P
<b>Mean age ± SD (y)</b>	60.7±17.8	61.4±19.5	.756
Range	18-91	18-91	
Median	63.5	65	
<b>Sex</b>			.026
Male	108 (53.5%)	67 (67.7%)	
Female	94 (46.5%)	32 (32.3%)	
<b>Race</b>			.478
White	148 (74.4%)	68 (69.4%)	
Black/African American	35 (17.6%)	18 (18.4%)	
Asian	2 (1.0%)	5 (5.1%)	
Other	14 (7.0%)	7 (7.1%)	
<b>Ethnicity</b>			>.999
Hispanic	6 (3%)	3 (3%)	
Not Hispanic or Latino	185 (97%)	89 (97%)	
<b>Education</b>			.839
<HS	3 (3%)	—	
HS/GED	22 (18%)	3 (19%)	
Some college	36 (30%)	4 (25%)	
College degree	59 (49%)	9 (56%)	
<b>Marital status</b>			.363
Single (never married)	49 (24.4%)	26 (26.3%)	
Married	103 (51.2%)	57 (57.6%)	
Divorced	11 (5.5%)	4 (4.0%)	
Widowed	34 (16.9%)	11 (11.1%)	
Separated	4 (2.0%)	1 (1.0%)	
<b>Primary impairment</b>			.434
TSCI/NTSCI	54 (26.7%)	29 (29.3%)	
TBI/NTBI	40 (19.8%)	21 (21.2%)	
Stroke	73 (36.1%)	39 (39.4%)	
Other	35 (17.3%)	10 (10.1%)	
<b>Interrupted stay</b>			.032
Yes	8 (4%)	11 (11%)	
No	194 (96%)	88 (89%)	
<b>Discharge location</b>			.014
Home	115 (57.2%)	41 (41.4%)	
Short-term general hospital	17 (8.5%)	22 (22.2%)	
Skilled nursing facility	26 (12.9%)	18 (18.2%)	
Home health organization	42 (20.9%)	17 (17.2%)	
Another IRF	1 (.5%)	1 (1.0%)	
<b>Discharge living arrangement</b>			.942
Alone	5 (4.3%)	1 (2.4%)	
Family/relatives	106 (92.2%)	38 (92.7%)	
Friends	2 (1.7%)	0 (0.0%)	
Attendant	—	1 (2.4%)	
Other	2 (1.7%)	1 (2.4%)	
<b>Mean length of stay ± SD</b>	22.3±15.4	24.8±19.6	.026
Range	1-90	1-118	
Median	18	20	
1-14 d	29 (29.3%)	75 (37.1%)	.365
15-23 d	28 (28.3%)	55 (27.1%)	
>23 d	42 (42.4%)	72 (35.6%)	
<b>Mean FIM cognition score ± SD</b>	28.3±6.5	25.4±7.9	<.001
Range	5-35	10-35	
Median	30	27	
<21	58 (58.6%)	69 (34.2%)	
21-27	19 (19.2%)	64 (31.7%)	

(continued)



**Table 3 (Continued)**

	Self-Respondent n=202	Proxy Respondent n=99	P
28-35	22 (22.2%)	69 (30.2%)	
<b>Mean FIM mobility score ± SD</b>	10.0±5.4	8.0±5.7	.005
Range	1-26	0-26	
Median	9	7	
<8	51 (16.9%)	78 (25.9%)	
8-12	34 (34.3%)	61 (30.2%)	
>12	14 (14.1%)	63 (31.2%)	
<b>Mean FIM total self-care score ± SD</b>	18.1±7.2	14.5±6.8	<.001
Range	1-26	5-29	
Median	19	14	
<15	54 (54.5%)	65 (32.2%)	
15-22	33 (33.3%)	78 (38.6%)	
>22	12 (12.1%)	59 (29.2%)	

NOTE. Data from 14 surveys were excluded because we did not know whether the patient or a proxy completed the survey. Response categories were combined for the following variables for analysis: race (White vs Black vs all other), marital status (married vs all other), occupational status (working vs all other), discharge location (home vs all other), and discharge living arrangement (alone vs all other).

Abbreviations: GED, general educational development test; HS, high school; NTBI, nontraumatic brain injury; NTSCI, nontraumatic spinal cord injury; TBI, traumatic brain injury; TSCI, traumatic spinal cord injury.

\* Significance was calculated using the Welch-Satterthwaite method; variances are not equal.

**Table 4** Quality measure scores for IRF Survey and Research Survey data for similar questions.

Topics	Research Survey Data (Self-Respondents)			IRF Survey Data (Self-Respondents)			IRF Survey Data (All Respondents*)		
	Numerator	Denominator	%	Numerator	Denominator	%	Numerator	Denominator	%
Doctor communication	173	285	61	63	116	54	96	185	52
Nurse communication	167	277	60	106	201	53	169	311	54
Therapist communication <sup>†</sup>	220	277	79	158	200	66	251	319	79
Therapist communication (PT)	-	-	-	148	201	74	234	319	73
Therapist communication (OT)	-	-	-	139	194	72	220	309	71
Cleanliness of hospital environment	189	281	67	117	198	59	177	316	56
Responsiveness of hospital staff	89	281	32	96	197	49	149	314	47
Overall hospital rating	208	280	74	152	198	77	228	316	72
Willingness to recommend hospital	239	280	85	158	197	80	247	315	78
Support and encouragement	219	282	78	143	197	73	217	314	69
Discharge information	145	281	52	81	198	43	127	309	41

Abbreviations: OT, occupational therapy; PT, physical therapy.

\* Includes self-respondents, with proxy, and unknown respondents.

<sup>†</sup> The Research Survey included questions about therapists broadly, and the IRF Survey included separate questions about PT and OT. To compare the Research Survey responses with the specific IRF Survey responses, we defined IRF Survey top-box as “very good” for both PT questions, “very good” for both OT questions, or “very good” for all 4 therapy questions (2 PT and 2 OT questions).

sample of IRFs and simultaneously collect responses from patients and their proxies. In addition, research focused on case-mix adjusters is needed to determine the extent to which nonresponse bias may be attenuated with risk adjustment.

### Study limitations

Readers should note the study’s limitations. Sample data were collected from 2 IRFs in the Midwestern United States and are not representative of all IRFs. Questions were similar but not identical in the Research Survey and the IRF Survey, and rating scales were not the same. Subtle

differences in item wording and rating scale anchors may have affected responses. We do not know to what extent proxy respondents obtained patient input to provide answers to survey questions. Finally, not all respondents responded to each question; therefore, the denominator for quality measure scores varied.

Readers should note that the samples’ inpatient rehabilitation stays concluded 8 years before publication of this manuscript. Health policy changes, service innovations, and the COVID-19 public health emergency since then may limit the relevance of the findings in today’s context. Arguably, the major health policy change in the past 2 decades was the passage of the 2010 Affordable Care Act (ACA), which led to significant reductions in the uninsured population and

**Table 5** Comparisons between paired Research Survey and patient experience of care top-box measures (N=120).

Topics	Research Survey		IRF Survey			McNemar Test <i>P</i>	Agreement	Disagreement	Mutual Information	<i>P</i>
	Numerator	%	Numerator	%	Denominator					
<b>Self—respondents only</b>										
Doctor communication	44	62	32	45	101	<.001	0.21	−0.14	0.06	.003
Nurse communication	63	64	56	57	99	.189	0.50	−0.25	0.26	<.001
Therapist communication*	79	77	79	77	102	>.999	0.25	−0.16	0.10	<.001
Therapist communication (PT)*	77	75	76	75	102	.678	0.25	−0.16	0.10	<.001
Therapist communication (OT)*	80	81	72	73	99	.405	0.25	−0.25	0.26	<.001
Responsiveness of hospital staff	38	38	49	49	99	.089	0.37	−0.22	0.15	<.001
Support and encouragement	83	82	75	74	101	.108	0.16	−0.11	0.05	<.001
Discharge information	50	54	40	43	93	.030	0.24	−0.17	0.07	<.001
Cleanliness of hospital environment	69	70	59	60	98	.089	0.30	−0.19	0.11	<.001
Overall hospital rating	79	81	82	84	98	.774	0.34	−0.15	0.19	<.001
Willingness to recommend hospital	88	89	85	86	99	.289	0.27	−0.10	0.17	<.001
<b>All respondents<sup>†</sup></b>										
Doctor communication	51	61	35	42	118	<.001	0.22	−0.15	0.08	<.001
Nurse communication	71	62	61	54	117	.064	0.53	−0.25	0.27	<.001
Therapist communication*	89	75	91	77	118	.690	0.27	−0.16	0.11	<.001
Therapist communication (PT)*	89	75	87	74	118	.839	0.33	−0.18	0.14	<.001
Therapist communication (OT)*	87	76	84	73	115	.700	0.26	−0.16	0.10	<.001
Responsiveness of hospital staff	43	37	57	49	114	.052	0.37	−0.22	0.15	<.001
Support and encouragement	93	80	84	72	115	.089	0.21	−0.14	0.08	<.001
Discharge information	59	54	44	40	116	.003	0.27	−0.19	0.08	<.001
Cleanliness of hospital environment	79	69	66	57	114	.037	0.25	−0.18	0.07	<.001
Overall hospital rating	92	81	91	80	113	.804	0.34	−0.16	0.18	<.001
Willingness to recommend hospital	100	87	96	83	113	.180	0.35	−0.12	0.24	<.001

Abbreviations: OT, occupational therapy; PT, physical therapy.

\* The Research Survey included questions about therapists broadly and the IRF Survey included separate questions about PT and OT. To compare the Research Survey responses with the specific IRF Survey responses, we defined IRF Survey top-box as “very good” for both PT questions, “very good” for both OT questions, or “very good” for all 4 therapy questions (2 PT and 2 OT questions).

<sup>†</sup> Includes self-, with proxy, and unknown respondents.

concurrent improvement in quality of care with the rate of hospital-acquired conditions such as adverse drug events, infections, and pressure ulcers declining substantially.<sup>21</sup> However, this policy change predated participant enrollment by 5 years and is unlikely to have affected rehabilitation services after this study concluded. Increases in serial postacute care (PAC) transfers from one PAC setting to another PAC setting began after the implementation of the inpatient rehabilitation prospective payment system in 2002, which is a per-discharge payment system. Prvu Bettger et al<sup>22</sup> examined stroke survivors' postacute service and found  $\geq 3$  care transitions after hospital discharge in a large sample derived from administrative claims data. Similarly, Bryden and Gran's<sup>23</sup> qualitative study of PAC transitions in a spinal cord injury sample found 4 transitions in the first 3 months. The ACA did not include IRF payment changes, only the authorization of an IRF quality reporting program. The Centers for Medicare and Medicaid Services has expressed an interest in implementing experience of care surveys in IRFs, and although a survey was developed, it has not been implemented. Finally, the COVID-19 public health emergency affected health care delivery, including in PAC settings resulting in staff shortages, therapy restrictions, and discharge barriers.<sup>24</sup> The consequences of increased PAC transitions on patient experience of care deserve careful scrutiny. It may be that patients' preparedness for discharge is reduced or that follow-up efforts must be intensified if patients have not returned home. In summary, any influence of the ACA on care transitions following this study seems unlikely. The extent to which patients' perceptions of staff and communication during the rehabilitation stay are affected by more care transitions, and the concordance between experience of care surveys collected at different times or using different methods requires further study.

## Conclusions

There were subtle but potentially important differences in experience of care quality measure scores, reflecting the extent to which patients are encouraged to complete the surveys as well as their functional status. Although responses to questions about the overall perceptions about IRF care were similar, questions about specific aspects of care showed some differences.

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## Disclosures

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