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Mode and Patient-Mix Adjustment of the Inpatient Rehabilitation Facility Experience of Care Survey

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Abstract

The purpose of this document is to explain the process for developing adjustments for mode and patient risk factors on the Inpatient Rehabilitation Facility Experience of Care (IRF EOC) Survey. Mode and patient risk adjustment, also known as patient mix or case mix adjustment, is a statistical process that adjusts facility performance scores up or down to account for significant sources of bias in facilities' data that are beyond their control. The adjustments were developed based on data from a mode experiment of 2,297 patients discharged from 65 IRFs. Patients were randomized to three modes: mail-only mode, telephone-only mode, and mixed-mode. The analyses found that mode of data collection and the following 13 patient risk factors significantly affect survey scores, and therefore should be included in adjustments of facility scores: age, length of stay, overall health, overall mental health, marital status, education, ethnicity, race, language spoken at home, patient self-care functioning at admission (from data collected by the IRF on the IRF Patient Assessment Instrument (IRF-PAI)), patient mobility functioning at admission (from the IRF-PAI), impairmement category (neural versus orthopedic versus other, from the IRF-PAI), and type of respondent (patient or proxy). After the final mode and patient-mix adjustment model were applied to the survey data, a nonresponse bias analysis was conducted. This analysis revealed that nonresponse-adjusted weights were not needed to further adjust the adjusted facility scores.

Typically, the coefficients of patient risk adjusters are updated using survey data each survey period. The set of patient risk adjusters determined through the mode experiment is retained. The coefficients for mode adjusters determined through the mode experiment are re-used each survey period (see Recommended Mode and Patient-mix Adjustment Model section).

Currently, CMS is not implementing the IRF EOC Survey but may do so after future Rulemaking. This explanation of mode and patient-mix adjustment as well as the survey materials for implementing the IRF EOC Survey are in the public domain and may be used by any IRF or survey vendor which wishes to do so.

Introduction

The intent of the IRF EOC Survey is to provide a standardized instrument and data collection methodology for measuring the experience of consumers—consisting of the patient and family or caregiver(s)—in IRFs. These materials provide a mechanism for IRFs to study and improve patient experience, for CMS to monitor quality in CMS-approved IRFs, and for consumers to view publicly available and reliable information when making decisions about seeking care in IRFs.

To ensure that publicly reported IRF EOC performance scores allow fair and accurate comparisons across IRFs, it is necessary to adjust for factors not in the control of IRFs that affect patient's perspectives of care. The mode experiment studied the impact of three types of factors that could affect how patients/proxies evaluate experience of care.

1) Mode of survey administration. IRFs will be given a choice of administering the survey in one of three modes: mail-only, phone-only, and mixed-mode (mail with telephone follow-up). The mode of administration can systematically impact patient responses; therefore, it is necessary to measure these impacts, if any, and adjust for them if they are present.
2) Patient characteristics. Certain patient characteristics, such as education, age, and health status, can systematically impact patients' survey responses. For example, individuals with higher levels of education tend to give statistically significantly lower scores compared to individuals with a high school education. If a facility had an above-average prevalence of higher-educated people, that facility's performance scores would suffer as a result. Therefore, this facility's performance scores would have to be adjusted higher in accordance with the education level of its respondents. This is a simple example of only one factor, education, but in reality, these adjustments are determined in a multivariate approach that evaluates the relative impact of all potential factors.
3) Nonresponse. Frequently, certain types of individuals systematically participate at lower or higher rates compared to other types of individuals. Should these differential participation rates result in skewed survey estimates, then the survey data will be biased.

IRF EOC Survey Mode Experiment

Sixty-five IRFs participated in the mode experiment. They represented a diverse group in terms of number of beds, geographic location, urban versus rural, and whether they were freestanding or a unit within an acute care hospital. Most of the participating IRFs were already surveying all their patients using proprietary surveys, and agreed to suspend these surveys to participate in the mode experiment. All eligible patients discharged in the months of April and May 2017 were included in the survey sample. To assure uniformity in administration, a single organization, RTI International, conducted all surveys. The survey was designed to obtain a minimum of 623 completed surveys per mode.

RTI randomly assigned all eligible April and May discharged patients to one of the three modes. ***Table 1*** displays the response rates from the IRF EOC Survey mode experiment.

Table 1
Response rates from IRF EOC survey mode experiment

	Mail-only mode	Phone-only mode	Mixed-mode	Total
Sample size	2,782	2,781	2,163	7,726
Completed surveys	897	570	830	2,297
Response rate	32.5%	20.5%	38.6%	29.9%

Analysis of the IRF EOC Survey Mode Experiment

Composite Scoring

The following survey items created the four composites and two global ratings:

- Global rating 1: 0 to 10 rating of rehabilitation hospital/unit for IRF (calculated from survey Q40)
- Global rating 2: Likelihood to recommend this rehabilitation hospital/unit (calculated from survey Q41)
- Composite 1: Goal setting and monitoring (calculated from survey Qs 1, 2, 25, and 26)
- Composite 2: Communication with staff at the rehabilitation hospital/unit (calculated from survey Qs 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 24, and 27)
- Composite 3: Experience at this rehabilitation hospital/unit (calculated from survey Qs 28, 29, 30, 31, 32, 33, 35, and 36)
- Composite 4: Preparing for leaving the rehabilitation hospital/unit or hospital (calculated from survey Qs 37, 38, and 39).

The method used for coding the global ratings and composites was a binary top-box approach. The global rating was 1 (top-box) if the respondent's rating was 9 or 10, 0 if the respondent's rating was any score from 0 to 8, and missing if the respondent did not respond. Similarly global rating 2 was coded as 1 (top-box) if the respondent answered "definitely yes," and other responses were coded a 0. Missing values remained missing. The scoring for the questions comprising the composites was similar except the 1 (top-box) was assigned to responses that were the most positive response category ("always," "yes, definitely," "strongly agree"). This recoding occured at the individual respondent level.

The facility score on each composite is calculated as the mean of the proportion of top-box responses for each component question in a composite. For example, the calculation of a facility's score for composite 1 will take the proportions of top-box responses for Q1, Q2, Q25 and Q26; it will then average these four proportions.

When facility performance scores are risk adjusted on the IRF EOC Survey, the adjustments are applied to the proportion of top-box responses for each component question. The proportions post-adjustment are then averaged across the composite, as described above.

Determing the Mode and Patient-Mix Factors

Descriptive statistics were calculated for all candidate patient-mix variables (independent variable) as well as all survey items (dependent variables) to check on the number of missing values for each variable, and the sufficiency of sample sizes in each response category. The candidate variables were: mode of survey administration, length of stay, overall health, overall

mental or emotional health, sex, marital status, education, ethnicity, race, language spoken at home, type of respondent (patient versus proxy), age, patient functioning self care at admission, patient functioning mobility at admission, and patient primary impairment (neural, orthopedic, other).

Next, a correlation analysis was conducted on the patient risk variables. Highly correlated independent variables can cause problems for estimating regression models when both of the correlated variables are included in the models. This analysis included calculating both Pearson correlation coefficients and variance inflation factor (VIF) statistics. The results of the Pearson correlation coefficients and VIFs were used to identify changes needed in the proposed set of patient-mix variables or whether certain categories should be combined.

Next, 33 multivariate regression models were estimated—one for each survey item comprising the four composites plus the two global rating items. The individual patient was the unit of analysis. All independent variables previously noted were included. A facility indicator variable was included as a fixed effect to isolate the effects of potential model and patient-mix variables from the facilities' own characteristics of providing care. Generally, the linear form of the multivariate regression models was:

Dependent variable = sum of (coefficients*mode indicators) + sum of (coefficients*patient characteristic indicators)

Independent variables that were not statistically significant for any of the regression models were sequentially dropped, and the models rerun. To determine the best model, an impact analysis was conducted. Facility-level scores were created from the predicted values of each mode, and compared to determine the impact of dropping variables on the facility-level predicted values.

Analysis of Unit and Item Nonresponse

Unit Nonresponse and Nonresponse Bias Analysis

A logistic regression analysis that included all patient variables known for both respondents and nonrespondents, as well as facility stratification variables of number of beds, indicator for freestanding IRFs, and urban/rural, was conducted. It revealed that younger patients compared to older patients, males compared to females, patients with more than a 16-day stay compared to shorter stays, patients with lower mobility functioning compared to higher mobility functioning, and patients whose impairment category is neural (compared to orthopedic and other categories) were less likely to respond. Also, patients from freestanding IRFs (compared to IRFs that are units within hospitals), urban (compared to rural), and smaller facilities (compared to larger facilities) were less likely to respond. The statistically significant predictors of response propensity were included in the final logistic regression model.

Each respondent's predicted response propensity was output. Each respondent's nonresponse-adjusted weight was calculated as the reciprocal of the predicated response propensity. Finally, the Pearson correlation coefficients between the nonresponse-adjusted

weights and the residuals from regression models including mode and the final set of patient risk factors for all 33 survey items were calculated.

No statistically significant correlations between the nonresponse adjusted weights and the residuals from regression models were found. Therefore, when using the final mode and patient-mix adjustment model, nonresponse-adjusted weights are not needed to further adjust the patient risk-adjusted facility scores.

Item Missing Data

Surveys can be affected by item missing data, such as when a patient/proxy elects to leave a question blank. Should a patient/proxy decline to answer a survey item that is part of a composite, the patients' and the facility's top-box scores are not impacted because the calculation method drops all missing responses from both numerator and denominator. Therefore, missing data do not lower performance scores.

Should data be missing on patient risk adjustment variables within the survey, missing values should be imputed using hot-deck imputation with facility as the imputation class variable. The imputed data can be used for computing the adjusted facility-level performance scores.

RECOMMENDED MODE AND PATIENT-MIX ADJUSTMENT MODEL

The final recommended model has mode of data collection and the following 13 patient risk variables: patient age, overall health, overall mental health, marital status, education, race, ethnicity, language spoken at home, patient self-care functioning, patient mobility functioning, primary impairment group, and type of respondent. The adjusted R-squared values assess the fit of the 33 models. These R-squared values ranged from ranged from 0.020 to 0.099. The median value was 0.049, the 25th percentile 0.038, and the 75th percentile 0.059.

Table 2 shows the mode adjustments in the recommended model. One mode must be chosen as the reference category (RC). Any mode can be chosen, and this analysis chose mixed-mode as the reference category.

Table 2
Mode adjustments from the IRF EOC mode experiment

		Mode		
		Phone-only	Mail-only	Mixed-mode
Global Rating 1	**Q40.** Using any number from 0 to 10, where 0 is the worst rehabilitation hospital/unit possible and 10 is the best rehabilitation hospital/unit possible, what number would you use to rate this rehabilitation hospital/unit?	0.0246	0.0272	RC
Global Rating 2	**Q41.** Would you recommend this rehabilitation hospital/unit to a family member or friend?	0.0373	0.0698	RC
Goal Setting and Monitoring Composite	**Q1.** When the patient was admitted to the rehabilitation hospital/unit, did the staff fully explain to the patient or the family/friend involved with the patient's care what the patient's stay would be like?	0.0462	0.0761	RC
	Q2. During this rehabilitation stay, did the staff work with the patient or the family/friend involved with the patient's care to set the patient's goals?	0.0135	0.0263	RC
	Q25. During this rehabilitation stay, did staff discuss the patient's progress with the patient or the family/friend involved with the patient's care?	0.0131	0.0442	RC
	Q26. During this rehabilitation stay, how often was the patient or the family/friend involved with the patient's care able to discuss needs and concerns with the staff?	−0.0105	0.0533	RC
Communication with Staff at the Rehabilitation Hospital/Unit Composite	**Q4.** During this rehabilitation stay, how often did the nursing aides/assistants and patient care technicians treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0400	0.0271	RC
	Q5. During this rehabilitation stay, how often did the nursing aides/assistants and patient care technicians explain things in a way the patient or the family/friend involved with the patient's care could understand?	−0.0191	0.0643	RC

(continued)

Table 2 (continued)
Mode adjustments from the IRF EOC mode experiment

		Mode		
		Phone-only	Mail-only	Mixed-mode
Communication with Staff at the Rehabilitation Hospital/Unit Composite (continued)	**Q7.** During this rehabilitation stay, how often did the nurses treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0414	0.0238	RC
	Q8. During this rehabilitation stay, how often did the nurses explain things in a way the patient or the family/friend involved with the patient's care could understand?	−0.0126	0.0492	RC
	Q10. During this rehabilitation stay, how often did the doctors treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0154	0.0644	RC
	Q11. During this rehabilitation stay, how often did the doctors explain things in a way the patient or the family/friend involved with the patient's care could understand?	−0.0018	0.0353	RC
	Q13. During this rehabilitation stay, how often did the physical therapy staff treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0216	0.0046	RC
	Q14. During this rehabilitation stay, how often did the physical therapy staff explain things in a way the patient or the family/friend involved with the patient's care could understand?	0.0240	0.0153	RC
	Q16. During this rehabilitation stay, how often did the occupational therapy staff treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0336	0.0060	RC
	Q17. During this rehabilitation stay, how often did the occupational therapy staff explain things in a way the patient or the family/friend involved with the patient's care could understand?	0.0074	0.0356	RC

(continued)

Table 2 (continued)
Mode adjustments from the IRF EOC mode experiment

		Mode		
		Phone-only	Mail-only	Mixed-mode
Communication with Staff at the Rehabilitation Hospital/Unit Composite (continued)	**Q19.** During this rehabilitation stay, how often did the speech therapy staff treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0329	0.0220	RC
	Q20. During this rehabilitation stay, how often did the speech therapy staff explain things in a way the patient or the family/friend involved with the patient's care could understand?	0.0111	0.0682	RC
	Q22. During this rehabilitation stay, how often did the case managers and social workers treat the patient and the family/friend involved with the patient's care with courtesy and respect?	−0.0326	0.0149	RC
	Q23. During this rehabilitation stay, how often did the case managers and social workers explain things in a way the patient or the family/friend involved with the patient's care could understand?	−0.0150	0.0253	RC
	Q24. During this rehabilitation stay, did the patient or the family/friend involved with the patient's care receive the same information from the different staff about the patient's care?	0.0418	0.0508	RC
	Q27. During this rehabilitation stay, how often did the staff give encouragement and support to the patient or the family/friend involved with the patient's care?	−0.0313	0.0328	RC
Experience at this Rehabilitation Hospital/Unit Composite	**Q28.** During this rehabilitation stay, after the call button was pressed, how often did the patient get help as soon as he/she wanted it?	−0.0129	0.0495	RC
	Q29. During this rehabilitation stay, the patient's room and bathroom were kept clean.	0.0739	0.0035	RC
	Q30. During this rehabilitation stay, the staff were considerate of the patient's need for sleep.	−0.0036	0.0378	RC

(continued)

Table 2 (continued)
Mode adjustments from the IRF EOC mode experiment

		Mode		
		Phone-only	Mail-only	Mixed-mode
Experience at this Rehabilitation Hospital/Unit Composite (continued)	**Q31.** During this rehabilitation stay, the staff were considerate of the patient's personal privacy – such as when showering, dressing, or using the toilet.	0.0211	0.0188	RC
	Q32. During this rehabilitation stay, the staff regularly paid attention to the patient's personal hygiene needs – such as brushing the patient's teeth, using the bathroom, or bathing/showering.	−0.0099	0.0498	RC
	Q33. During this rehabilitation stay, the rehabilitation hospital/unit had therapy equipment to support the patient's rehabilitation goals.	0.0303	0.0563	RC
	Q35. During this rehabilitation stay, the staff were responsive when they were told about the patient's physical pain.	0.0065	0.0418	RC
	Q36. During this rehabilitation stay, the staff gave options about different ways to manage the patient's physical pain.	0.0319	0.0643	RC
Preparing for Leaving the Rehabilitation Hospital/Unit Composite	**Q37.** Towards the end of this rehabilitation stay, did the staff spend enough time talking with the patient or the family/friend involved with the patient's care about what to expect and what would be needed after the patient's stay ended?	−0.0138	0.0642	RC
	Q38. Towards the end of this rehabilitation stay, did the staff give the patient or the family/friend involved with the patient's care information about the medication to be taken after discharge, including what the medication was for, how to take it, and possible side effects?	−0.0083	0.0743	RC
	Q39. Towards the end of this rehabilitation stay, did the staff inform the patient or the family/friend involved with the patient's care that they could contact the rehabilitation hospital/unit with any questions or concerns after the patient left?	−0.0124	0.0526	RC

SAMPLE SIZE AND RESPONSE RATES

Given the variability among facilities in the test data and the variability within facilities, and assuming facility scores are adjusted using the recommended model, a sample size of 240 is sufficient to derive a statistically significant F value and produce a reliability coefficient (signal-to-noise ratio) equal to or above the recommended 0.70 level. The point estimates are sufficiently powered (assuming a top-box score at or above 70% or at or below 30%, margin of error 5.8 percentage points) and could be used by CMS, by an individual facility interested in its own results for quality improvement purposes, and by a consumer comparing one facility's score on a measure to a mean of many facilities' scores on that measure to decide if that facility is better or worse than the mean.

The response rates observed in the mode experiment are noted in ***Table 3***. This experience, as well as an IRF's own experience with response rates on surveys it may be conducting, should guide the IRF in the number of cases to sample to obtain the target of 240 completes per year.

Table 3
Planning the sample size for the IRF EOC based on observed response rates

Mode	Observed response rate	Sample size needed per month for 20 responses/month (or 240 responses/year)
Mail-only	32.50%	62
Phone-only	20.50%	98
Mixed-mode	38.57%	52

If an IRF's patient volume exceeds the sample size needed to obtain 240 completes annually, it may direct its vendor to select a random sample of patients. Acceptable sampling methods are simple random sampling, proportionate stratified random sampling and disproportionate stratified random sampling. If the IRF wishes to receive more survey data, it may direct the vendor to survey all eligible patients. If an IRF's patient volume is lower than the sample sizes needed to obtain 240 completes annually, it will need to direct the vendor to survey all patients.