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Will Hospital Peer Grouping by Patient Socioeconomic Status Fix the Medicare Hospital Readmission Reduction Program or Create New Problems?

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Background: In 2016 the U.S. Congress directed the Centers for Medicare & Medicaid Services (CMS) to implement the 21st Century Cures Act to fix a flaw in the Hospital Readmissions Reduction Program (HRRP). One section of the Act is intended to remove bias in calculating penalties for hospitals treating large percentages of low socioeconomic status (SES) patients. A study was conducted to analyze the effect of the introduction of SES hospital peer groups on the number and distribution of the hospitals being penalized.

Methods: The CMS analysis files for the fiscal year 2017 HRRP final rule and Disproportionate Share Hospital adjustments were used to assign hospital peer groups. The median excess readmission ratios for hospital peer groups were calculated, and the resulting pattern of hospital penalties within peer groups was analyzed.

Results: The findings suggest that because CMS assigns individual HRRP penalties on six clinical conditions but proposes to assign hospitals to a single SES peer group based on all admissions, it will ignore substantial differences in the distribution of peer group medians across these conditions. For surgical cases, as expected, hospitals with fewer patients had higher readmission rates, while for medical cases, hospitals with fewer patients had fewer readmissions. These findings may result in distortion of the peer group adjustment intended to correct for SES.

Conclusion: Hospital peer groups may create unintended redistributions of penalties through distortion of peer group medians. An observed relationship between lower-volume hospitals and fewer readmissions for medical conditions requires additional research to establish its basis.

With the introduction of the Hospital Readmissions Reduction Program (HRRP) on October 1, 2013, the Centers for Medicaid & Medicare Services (CMS) began adjusting payments made to hospitals with higher readmission rates. In response, a number of stakeholders raised concerns over possible payment penalty biases,[1–5] prominently including hospitals caring for larger numbers of poor people, who were more likely to be penalized. In 2016 the US Congress passed the 21st Century Cures Act,[6] which directs CMS to construct hospital peer groups on the basis of their proportion of Medicare patients of low socioeconomic status (SES), in keeping with a proposal offered by the Medicare Payment Advisory Commission (MedPAC) in 2013.[7] CMS has subsequently proposed (and, in 2017, finalized[8]) adjustments to the HRRP that do the following:

- Assign hospitals to one of five peer groups (quintiles) on the basis of SES ranges determined by the proportion of Medicare beneficiaries who are also eligible for full Medicaid benefits ("dual eligibles") as reported in the State Medicare Modernization Act (MMA) file of dual eligibility
- Calculate the median excess readmission ratios (ERRs) within each peer group to use as the basis for determining penalties
- Apply a budget neutrality factor to scale the resulting penalties such that the sum of penalties resulting from the move to peer groups equals the sum of penalties without peer groups

In this article, we analyze the effect of peer grouping on the median ERRs to be used as the standard on which penalties are based. Specifically, we assess whether variation in the relative case volume of hospitals assigned to peer groups distorts that standard. We focus on relative case volume as a particular concern because there is a wide array of literature that has highlighted the role of hospital volume as a driver of outcomes and quality. Although volume-outcome studies have typically examined the relationship between hospital or surgeon volume and patient mortality, particularly for surgical admissions,[9–11] researchers have found links with other quality metrics, including readmissions, that follow the same "practice makes perfect" format of increased volumes resulting in better outcomes.[12–14] The relationship between volume and outcomes has encouraged efforts to reduce or eliminate low-volume surgeries.[15,16]

The positive relationship between hospital volume and surgical procedures has been discussed extensively for many years, with particular attention being paid to coronary artery bypass graft (CABG) surgery, a measure included within the

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HRRP.[17,18] Consideration of the relationship between outcomes for medical conditions and hospital volume has attracted less research. Hospitals that treat greater volumes of congestive heart failure (HF) and chronic obstructive pulmonary disease (COPD) patients have been observed to produce better outcomes, including fewer readmissions,[19,20] leading to hypotheses that smaller hospitals lack resources to invest in quality improvement. However, initial MedPAC analysis, at a time when the HRRP was confined to medical conditions, found that smaller hospitals (defined as those with fewer than 100 beds) were less likely to receive HRRP penalties, which was attributed to the construction of the CMS readmission measure (which we return to in discussion) rather than superior performance by small hospitals.[7]

If hospital volume has a bearing on hospital performance and thereby readmission rates, then median ERR differences across SES peer groups might be influenced by variation in the distribution of large and small hospitals within the peer groups. This is a concern because the CMS modification to the HRRP establishes individual peer group median ERRs as the basis for calculating penalties. Thus the composition of individual peer groups determines their ERR benchmark. Differences in the relative distribution of hospitals for factors (such as volume) across peer groups that may affect performance but are not accounted for within the risk adjustment model may be expected to affect the median ERR of the peer group and thereby adjust penalties for reasons unrelated to SES.

In this article, we attempt to determine (1) the structure and boundary effects of SES peer groups, (2) whether a volume-outcome relationship persists after HRRP risk adjustment and SES peer group stratification, and (3) whether the distribution of high- and low-volume hospitals varies across the peer groups such that a peer median may be affected by the distribution of differently sized hospitals.

METHODS

For fiscal year (FY) 2017, CMS published HRRP results for six clinical conditions: AMI, HF, COPD, CABG, pneumonia (PN), and total hip/knee arthroplasty (THKA). Conditions are measured individually before being combined into the overall HRRP readmission performance penalty.[21]

Data Sources and Equivalency

In the CMS approach to computing SES peer groups, a ratio of Medicare (including Medicare Advantage) admissions for full-benefit dual eligibles to all Medicare admissions is calculated for each hospital. The ratio is used as the basis of assignment to a single peer group used in all conditions (that is, is not recalculated by condition). Identification of full-benefit dual eligibles from within the MMA dual eligibility file is performed on a concurrent month basis with Medicare admissions over a three-year period coinciding with the experience period used for the HRRP. Because source CMS data on numbers and ratios of dual eligible beneficiaries used within their peer grouping calculation were unavailable, we instead used an alternative CMS data source providing the proportion of a hospital's Medicare patient days for beneficiaries receiving Supplemental Security Income (SSI) for FY 2014[22] as the basis for assigning peer groups. This differs from the CMS process by using a different data source (that is, a single year within the period and days associated with admissions rather than a count of admissions). Yet we believe that this approach should provide a reasonable approximation, as the data source is reviewed by CMS for accuracy and used within the Inpatient Prospective Payment System (IPPS) for payment purposes, also includes Medicare Advantage admissions, and has a high degree of overlap for the SSI population because almost all full-benefit dual eligibles are SSI recipients.[23] Relative SSI rankings are unlikely to vary greatly when determined using the share of hospital SSI days as opposed to admissions; moreover, given that all admissions are used to construct the SSI share, they should exhibit sufficient stability year on year such that measurement for a single year should resemble that based on three years.

Hospitals were assigned to mutually exclusive peer groups on the basis of their SSI day ratio (inpatient days for Medicare beneficiaries receiving SSI to total inpatient days for all Medicare beneficiaries) with decile SSI ranges calculated from the full subset of hospitals ($N = 3{,}480$) reporting SSI ratios for FY 2014.[22] The use of deciles, an option offered for comment by CMS and the basis of earlier studies, differs from the approach ultimately adopted in the final rule.[8] We elected to construct decile ranges to assess the variation in hospital performance across neighboring deciles that are combined into quintiles in the CMS model. The FY 2017 HRRP results, impact file, and SSI ratios published by CMS for the FY 2017 final rule were downloaded from the CMS website.[22,24] CMS FY 2017 HRRP calculations were based on a three-year data period (July 1, 2012–June 30, 2015).[25]

Analytical Framework

Hospitals were identified as incurring penalties for the HRRP conditions when their ERR for the condition exceeded 1.0. Not every hospital is measured for every condition because of minimum-volume requirements of 25 cases. As shown in Table 1, the percentage of SSI patient days to determine hospital peer groups ranged from 0 to 2.28 in the lowest decile to 17.64 or more in the highest. We also ranked hospitals by descending case volume for each condition and assigned them to high-, medium-, and low-volume categories, depending on their share of total reported case volume. Hospitals in the top 20% of volume were labeled "high," those in the bottom 20% "low," and the remainder "medium." We elected to evaluate volume in categories rather than as a continuous variable to treat the volume-outcome relationship

Table 1. Distribution of Hospitals with a Reported SSI Ratio and ERR by Condition FY 2017

SSI Decile	Cutoff	PN	HF	AMI	THKA	COPD	CABG
Decile 1	0.0228	174	158	112	205	154	45
Decile 2	0.0357	296	286	214	293	283	93
Decile 3	0.0465	307	305	238	302	303	111
Decile 4	0.0568	315	306	236	295	310	127
Decile 5	0.0670	320	314	250	280	315	126
Decile 6	0.0802	317	311	248	269	309	142
Decile 7	0.0968	321	313	248	258	316	132
Decile 8	0.1204	327	325	231	245	324	107
Decile 9	0.1764	306	295	179	189	297	88
Decile 10*	> 0.1764	282	263	163	125	259	53
ALL		**2,965**	**2,876**	**2,119**	**2,461**	**2,870**	**1,024**

Source: FY2017 Final Rule HRRP Supplemental Files (Condition-Specific ERRs)[24] / Disproportionate Share Hospital home page (SSI Ratios).[22]
*Decile 10 contains hospitals with the highest percentage shares of low-SES patients.
SSI, Supplemental Security Income; ERR. excess readmission ratio; FY, fiscal year; PN, pneumonia; HF, heart failure; AMI, acute myocardial infarction; THKA, total hip/knee arthroplasty; COPD, chronic obstructive pulmonary disease; CABG, coronary artery bypass graft; SES, socioeconomic status.

as one of reaching a threshold.[26] For a volume effect "to matter" (that is, affect a group median), the effect should be observed within a nontrivial number of hospitals. We hypothesized that if a volume threshold sufficiently affected 20% of hospitals relative to the baseline, it could potentially affect an ERR median for peer groups with a disproportionate number of low- or high-volume hospitals.

We examined the distribution of penalized hospitals (ERR > 1.0) and the median ERRs for peer groups after subdividing hospitals by SES decile. We used a regression model to observe if hospital volume, after controlling for hospital SES peer groups, is associated with lower readmission rates.

The regression model was structured as follows:

$$\mathrm{ERR}_{i,c} = \alpha + \mathrm{SES}_i + \mathrm{Vol}_{i,c} + \varepsilon_i$$

where the ERR at hospital i for condition C is considered a function of the SES peer group for hospital i and size (Vol) for hospital i for condition C. The model tests if hospital case volume, for each condition, has a significant effect after assigning membership to an SES peer group (that is, does the SES adjustment layered onto the risk adjustment model remove potential volume effects).

RESULTS

Table 1 reports the number of hospitals in FY 2017 with an ERR reported for a condition subdivided by their SES peer group for FY 2017. The number of hospitals within each peer decile for each condition varied, from a low of 45 in decile 1 for CABG (smallest low-SES share) to a high of 327 in decile 8 for PN. Variation in the number of hospitals per condition occurs because many hospitals lacked the minimum number of cases for inclusion in the HRRP program.

Distribution of HRRP Penalties

Figure 1 charts the median ERR, as well as the percentage of penalized hospitals for each decile for each of the six conditions. Every hospital with at least one condition with an ERR > 1 will have a penalty applied to its final payment amount under the HRRP. The percentage of hospitals with penalties (84.5%) therefore exceeds the percentage of hospitals with a penalty for any single condition.

Figure 1 demonstrates a consistent association of deciles with higher proportions of SSI days and higher median ERRs for every condition. There is, however, considerable variation in the pattern of this increase. For example, the five lowest SSI deciles (smallest shares of low-SES patients) within HF have similar median ERRs, followed by rapidly increasing ERRs in the highest five SSI deciles. If we were to collapse the peer group deciles into larger groups for each condition independently and base peer group consolidation purely on the similarity of median ERRs (as these will form the performance standard for the group), we would not uniformly create quintiles. For PN and HF, we would retain the highest decile SSI peer groups, while for AMI, we would create two groups composed of SSI deciles 8–10 and 1–7, respectively. Patterns vary across conditions as to where deciles should be combined to form equitable peer groups (that is, those observed as having similar median ERRs). Inconsistency in where to draw peer boundaries across conditions is an important observation, as CMS is defining uniform peer group ranges across all conditions. It should be remembered that the purpose of the policy is to group hospitals within similar SES bands so as to adjust for similar effects on readmissions.

Volume Effects

In Table 2 we report results of the regression analysis. The intercept, which serves as the reference hospital peer group,

Figure 1: Although median ERRs and penalties climb by SSI decile for the six HRRP conditions, the pattern of increase varies by condition. SSI decile 10 contains hospitals with the highest percentage shares of low-SES patients.
ERR, excess readmission ratio; SSI, Supplemental Security Income; MI, myocardial infarction; COPD, chronic obstructive pulmonary disease; THKA, total hip/knee arthroplasty; CABG, coronary artery bypass graft. HRRP, Hospital Readmissions Reduction Program; low-SES, low socioeconomic status. **Source:** FY 2017 Final Rule HRRP Supplemental Files (Condition-Specific ERRs)[24] / Disproportionate Share Hospital home page (SSI Ratios).[22]

Table 2. Effect of Hospital Volume on ERR by Condition After Controlling for SSI Decile FY 2017

	Pneumonia		Heart Failure		Acute MI		THKA		COPD		CABG	
	Coeff	T	Coeff	T	Coeff	T	Coeff	T	Coeff	T	Coeff	T
Intercept	0.9795	143.92*	0.9795	163.22*	0.9944	159.81*	0.9858	102.76*	0.9935	181.02*	1.0037	78.21*
Decile 2	–0.0034	–0.41	–0.0069	–0.95	–0.0046	–0.61	0.0189	1.58	–0.0077	–1.16	–0.0032	–0.21
Decile 3	0.0044	0.54	0.0022	0.31	–0.0011	–0.14	0.0261	2.18*	–0.0098	–1.49	0.0097	0.65
Decile 4	0.0025	0.31	0.0003	0.05	–0.0073	–0.98	0.0266	2.22*	–0.0030	–0.46	–0.0083	–0.57
Decile 5	0.0160	1.95*	0.0112	1.56	0.0063	0.85	0.0267	2.21*	–0.0026	–0.41	–0.0050	–0.34
Decile 6	0.0167	2.04*	0.0206	2.87*	0.0102	1.38	0.0440	3.60*	0.0015	0.22	–0.0002	–0.01
Decile 7	0.0269	3.27*	0.0316	4.40*	0.0137	1.86	0.0403	3.26*	0.0158	2.42*	0.0029	0.20
Decile 8	0.0451	5.53*	0.0432	6.05*	0.0285	3.83*	0.0446	3.55*	0.0110	1.69	0.0274	1.83
Decile 9	0.0552	6.70*	0.0515	7.09*	0.0334	4.28*	0.0411	3.06*	0.0246	3.74*	0.0145	0.93
Decile 10†	0.0698	8.32*	0.0688	9.29*	0.0390	4.90*	0.0206	1.36	0.0241	3.58*	0.0184	1.07
Low	–0.0187	–4.42*	–0.0084	–2.32*	–0.0090	–2.46*	0.0129	1.86	–0.0124	–3.84*	–0.0091	–1.32
High	0.0102	2.45*	0.0022	0.61	–0.0075	–2.05*	–0.0578	–8.32*	0.0248	7.74*	–0.0244	–3.57*

Source: FY 2017 Final Rule HRRP Supplemental Files (Condition-Specific ERRs)[24] / Disproportionate Share Hospital home page (SSI Ratios).[22]
*Statistically significant result.
†Decile 10 contains hospitals with the highest percentage shares of low-SES patients.
ERR, excess readmission ratio; SSI, Supplemental Security Income; FY, fiscal year; MI, myocardial infarction; THKA, total hip/knee arthroplasty; COPD, chronic obstructive pulmonary disease; CABG, coronary artery bypass graft; SES, socioeconomic status.

is composed of the intersection of SSI decile 1 (smallest low-SES share) and medium hospital volume.

The model is structured such that a coefficient of 0.01 for any variable indicates an increase of 1% in the ERR. Thus, for PN a low-volume hospital has an ERR that is, on average, 1.87% lower than the reference group of medium-volume hospitals. Table 2 yields two major findings. First, the THKA and CABG conditions return statistically significant (*t*-statistic [T] > 1.96) coefficients for higher-volume hospitals, indicating ERRs 5.78% and 2.44% lower for THKA and CABG, respectively. This is consistent with the hypothesis of an underlying positive volume-outcome relationship for surgical procedures. Second, and conversely, medical conditions (PN, HF, AMI, and COPD) return statistically significant coefficients, indicating that low-volume hospitals have lower ERRs. While not shown, the pattern of these findings are repeated when selecting a more restrictive hospital volume threshold at the 10th percentile.

Figure 2 graphs the median ERR for each SSI decile for low- and high-volume hospitals compared with the overall median for all hospitals, for COPD and THKA. It shows the separation of higher- and lower-volume hospitals from the median ERR for all hospitals within the peer group. For COPD the median ERR is less than the peer median for low-volume hospitals and greater for high-volume hospitals for every peer group. This pattern is reversed for THKA. A similar pattern emerges for surgical and medical conditions within the other HRRP conditions. These differences are quite apparent with the median ERR in decile 5 for THKA decreasing from 1.040 in the low-volume group to 0.977 in the high-volume group. Conversely, for COPD, the median ERR in decile 5 increases from 0.984 to 1.015 from low- to high-volume groups.

In Table 3, we provide a summary of the effect on the peer median rates by calculating a "weighted" median comparison. The median ERR for each decile/volume category combination was weighted by the number of hospitals within the category to calculate a representative median ERR for the peer group adjusted for volume. This estimation is intended to provide a sense of the issue rather than providing a precise quantification of the effect. Table 3 compares the implied correction to the median ERR through the use of the peer groups (Diff to All) and the correction to the ERR through the use of the weighted median. The absolute and percentage differences in the amount of correction are shown in the right-hand columns. It may be expected for the magnitude of correction to differ purely as a result of weighting medians rather than computing medians (that is, the overall peer median rate has been altered). Nevertheless, the change in the degree of correction due to volume effects for any peer group can be clearly distinguished.

DISCUSSION

The purpose of our analysis was to assess the similarity of ERRs across peer groups facing consolidation and the potential for hospital volume to confound calculation of the median ERR within a peer group. The results of our analysis lead us to three observations. First, uniform grouping of hospitals within SES peer groups across conditions is problematic. In its final rule, CMS adopted a policy of assigning hospitals to quintiles rather than deciles, which it justified by stating, "increasing the number of peer groups also increases the likelihood that hospitals with similar exposure to dual-eligible patients will be compared to different thresholds in the payment adjustment formula."[8] The CMS

Effect of Volume on Median ERR by SES Peer Group for Chronic Obstructive Pulmonary Disease and Total Hip/Knee Arthroplasty, FY 2017 Hospital Readmissions Reduction Program

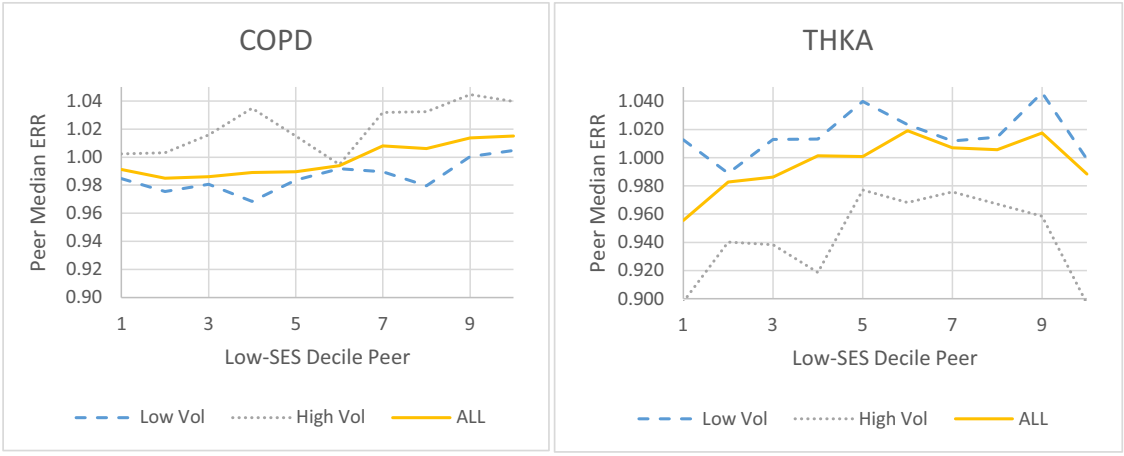

Figure 2: For COPD, the median ERR for the subset of low-volume hospitals is below the peer average, while that for high-volume hospitals is above. This pattern is reversed for THKA, for which the median ERR for high-volume hospitals is above the peer average. Decile 10 contains hospitals with the highest percentage shares of low-SES patients. Note that there are only 4 hospitals in the large category in decile 10 for THKA. Low Volume: hospitals in the lowest 20% ranked by numbers of patients with the condition; High Volume: hospitals is the highest 20% by volume.
ERR, excess readmissions ratio; SES, socioeconomic status; FY, fiscal year; COPD, chronic obstructive pulmonary disease; THKA, total hip/knee arthroplasty. **Source:** FY 2017 Final Rule HRRP Supplemental Files (Condition-Specific ERRs)[24] / Disproportionate Share Hospital home page (SSI Ratios).[22]

argument for the use of quintiles can be summarized as a combination of providing greater stability of the peer median over time (as there are more hospitals within any single peer group), reducing the likelihood of being reassigned to a different group in a subsequent year (as there are fewer groups) and providing a more stable basis for a uniform peer assignment across conditions both current and future (because there are fewer "cliffs" between neighboring peer median ERRs). Ultimately, these concerns appear to be more administratively focused (for example, avoiding penalty differences between hospitals with similar low-SES shares and HRRP performance, which may be challenged or undermine HRRP credibility) than focused on appropriately lowering high penalty rates for hospitals serving greater shares of low-SES patients—which is the purpose of the policy. If hospitals are reassigned because of patient-mix changes or large differences in peer medians for adjacent peer groups (causing cliff effects), this could deservedly result in changes to the HRRP penalty. The objective should remain to provide an appropriate adjustment for SES rather than a stable one. The degree of similarity between median ERRs across neighboring deciles can vary markedly by condition, indicating that more flexibility in assigning hospitals to peer groups across and within conditions is warranted.

Second, the anticipated association of hospital volume and outcomes for surgical procedures is apparent in the lower ERRs for THKA and CABG across SSI peer groups for higher-volume hospitals. The magnitude of this difference is large, with the absolute value for the coefficient for high-volume hospitals (.0244 CABG; .0578 THKA) greater than the absolute value for coefficients associated with SSI decile (Table 2). This supports concerns that the distribution of higher- and lower-volume hospitals within hospital peer groups will affect the calculation of the peer median ERR. In Figure 2, we show the pattern of ERR difference for the THKA and COPD conditions by decile range for the high- and low-volume categories. The pattern is readily discernable and will result in peer groups with a larger concentration of worse-performing lower-volume hospitals having a higher median ERR. In Table 3 we add to this interpretation by offering guidance on the magnitude of this distortion. While the overall adjustments to penalties provided by SES peer groups are likely modest, it can be seen that the volume distortions in median ERR may be significant relative to those adjustments. For all hospitals receiving penalties within a peer group, the magnitude of those penalties will be affected because of the distortion in the peer median rate and the subsequent translation into HRRP penalties via the penalty multiplier.[27] We consider the potential for an unintended and unplanned shift in the HRRP penalties for hospitals sufficient to warrant further analysis.

Third, we observed significant volume-outcome effects for medical conditions, which runs counter to the hypothesis that low-volume hospitals will be resource constrained when trying to manage hospital readmissions. We cannot yet explain why this pattern emerges, and there appears to be no reference of this effect in the literature, yet it is consistent with the small-hospital finding reported by MedPAC for medical

Table 3. Effect of Hospital Volume on SES Correction Through Use of Peer Median ERR Deciles FY 2017

COPD

SSI Decile	Median ERR	Median ERR Difference from Overall ERR*	Weighted Median†	Weighted Median Difference from Overall ERR*	Percentage Over/Under Correction‡
1	0.9912	–0.0058	0.9934	–0.0036	37.20
2	0.9849	–0.0121	0.9861	–0.0109	9.79
3	0.9861	–0.0109	0.9910	–0.0060	44.72
4	0.9890	–0.0080	0.9930	–0.0040	49.77
5	0.9897	–0.0073	0.9928	–0.0042	42.32
6	0.9940	–0.0030	0.9940	–0.0031	–1.51
7	1.0081	0.0111	1.0093	0.0123	–10.95
8	1.0062	0.0092	1.0064	0.0094	–1.88
9	1.0137	0.0167	1.0167	0.0196	–17.60
10	1.0151	0.0181	1.0138	0.0168	7.20
ALL	0.9970				

THKA

SSI Decile	Median ERR	Median ERR Difference from Overall ERR*	Weighted Median†	Weighted Median Difference from Overall ERR*	Percentage Over/Under Correction‡
1	0.9556	–0.0423	0.9612	–0.0367	13.33
2	0.9827	–0.0152	0.9817	–0.0161	–6.13
3	0.9862	–0.0117	0.9815	–0.0164	–40.49
4	1.0013	0.0035	0.9877	–0.0101	393.17
5	1.0007	0.0029	0.9964	–0.0014	150.16
6	1.0190	0.0211	1.0164	0.0186	12.13
7	1.0069	0.0091	1.0059	0.0080	11.68
8	1.0055	0.0076	1.0028	0.0049	36.06
9	1.0176	0.0197	1.0158	0.0179	9.19
10	0.9885	–0.0094	0.9839	–0.0140	–48.81
ALL	0.9979				

*Median ERR difference from overall ERR is calculated as the difference between the median ERR for the decile (weighted and unweighted) and the median for the population (All).

†Weighted Median for each decile calculated as the median ERR for each volume group multiplied by the proportion of hospitals in each volume group and summed across the decile.

‡Percentage Over/Under correction calculated as the difference between the median ERR difference from overall and the weighted median ERR difference from overall divided by the median ERR difference from overall.

SES, socioeconomic status; ERR, excess readmission ratio; FY, fiscal year; COPD, chronic obstructive pulmonary disease; SSI, Supplemental Security Income; THKA, total hip/knee arthroplasty.

conditions. It is possible that the apparent volume-outcome relationship emerges from HRRP results as a byproduct of the underlying risk adjustment model. It is plausible that sicker patients (that is, those with more comorbid chronic diseases) may be more likely to be treated at the larger hospitals. This would be less of a factor for elective surgical cases, such as those within THKA, as one can assume that any chronic conditions would be stable before surgery is conducted and hence be less likely to significantly increase the risk of readmission. Previous studies have highlighted the instability of HRRP readmission measures for medical conditions.[28]

One limitation of our analysis lies in our inability to directly replicate the CMS assignment to peer groups or to directly compute the dual-eligible ratios. As stated, neither the computed ratios nor data to calculate them were available, which led us to employ the proxy of SSI days. This approach differs from the CMS process in that it uses days instead of admissions, a different data source to identify SSI recipients, and a single year within the period (rather than three) and does not entail a concurrent check of benefit status with admission. However, as we have argued, we do not believe that this limitation would undermine our findings.

We also limited our analysis to the effects of volume on outcomes. It is, however, plausible that peer groups may be biased through factors other than volume, such as teaching mission or urban location, which affect either ERR performance or the underlying risk adjustment model.

While this study assesses if volume effects are present, no attempt was made to find the optimal relationship between ERR performance and volume thresholds. Measurement of the volume effect could also be influenced by the degree to which total hospital volume is influenced by other payers (for example, Medicare Advantage) outside the Fee-for-Service

(FFS) admissions used as the basis of the volume rankings and HRRP penalties.

Our study indicates that more analysis is required before implementing hospital peer groups. That seems unlikely to happen, however, because CMS, having previously been reluctant to require its readmission model to account for SES, was directed to take action under the 21st Century Cures Act[6] and now has little latitude except to implement hospital peer groups. It can, however, propose new models to account for SES in the future. Issues in the construction of peer groups will likely increase with the addition of more conditions, particularly if identification of those conditions overlap, as in the example of HF and CABG.[29] It is hoped that CMS and MedPAC use the opportunity extended within the 21st Century Cures Act to research peer group development and propose alternatives to those currently put forward.

We suggest moving away from treating SES as a distortion of hospital performance measurement by instead accounting for SES at a patient level. The approach to peer grouping taken by CMS identifies a single hospital statistic—the number of low-SES patients across all Medicare admissions (including Medicare Advantage)—to assign hospitals to a single group. While this statistic is based on patient admissions, there is no direct quantification of how variation in this statistic affects the likelihood of a patient being readmitted nor how the relationship between the statistic and readmissions may vary across conditions or over time. In addition, the use of hospital peer groups ignores concerns that the underlying quality of care in hospitals treating high shares of low-SES patients might vary from that of those that do not. By creating low-SES peer groups, and in many approaches to calculating patient-specific adjustment factors, we accept the potential for "setting lower standards for providers that serve vulnerable patients." One way to both deliver a patient-specific adjustment factor and address the potential for inadvertently setting lower standards would be to compute a linkage factor between separate readmission rates, adjusted for clinical risk, for patients classified as low-SES and for those not. The ratio of these rates provides a measure of incremental readmission risk for low-SES patients while controlling for clinical risk and hospital performance.[30] This factor would be applied as an additional adjustment to the estimate provided by the current clinical risk adjustment model applied to individual patients.

CONCLUSION

After reviewing results of the FY 2017 HRRP in accordance with the response to the 21st Century Cures Act laid out by CMS in its FY 2018 proposal, we have identified several issues in adopting hospital peer groups for FY 2019 rate adjustments. Defining hospital peer groups through a single measure of their share of low-SES patients will lead to consolidation of deciles of dissimilar median ERRs. No single pattern for consolidating low-SES deciles holds across all conditions. The use of peer groups introduces differing performance standards for hospitals. These standards may be affected by factors such as volume, as we have explored here, or by factors such as lower-quality care being routinely delivered by hospitals with larger shares of low-SES patients. We also believe that further research is required to better understand the volume-outcome relationship observed within medical conditions in the context of the HRRP.

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