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Association of Stratification by Proportion of Patients Dually Enrolled in Medicare and Medicaid With Financial Penalties in the Hospital-Acquired Condition Reduction Program

Sukruth A. Shashikumar, AB; R. J. Waken, PhD; Alina A. Luke, MPH; David R. Nerenz, PhD; Karen E. Joynt Maddox, MD, MPH

IMPORTANCE The Hospital-Acquired Condition Reduction Program (HACRP) is a value-based payment program focused on safety events. Prior studies have found that the program disproportionately penalizes safety-net hospitals, which may perform more poorly because of unmeasured severity of illness rather than lower quality. A similar program, the Hospital Readmissions Reduction Program, stratifies hospitals into 5 peer groups for evaluation based on the proportion of their patients dually enrolled in Medicare and Medicaid, but the effect of stratification on the HACRP is unknown.

OBJECTIVE To characterize the hospitals penalized by the HACRP and the distribution of financial penalties before and after stratification.

DESIGN, SETTING, AND PARTICIPANTS This economic evaluation used publicly available data on HACRP performance and penalties merged with hospital characteristics and cost reports. A total of 3102 hospitals participating in the HACRP in fiscal year 2020 (covering data from July 1, 2016, to December 31, 2018) were studied.

EXPOSURES Hospitals were divided into 5 groups based on the proportion of patients dually enrolled, and penalties were assigned to the lowest-performing quartile of hospitals in each group rather than the lowest-performing quartile overall.

MAIN OUTCOMES AND MEASURES Penalties in the prestratification vs poststratification schemes.

RESULTS The study identified 3102 hospitals evaluated by the HACRP. Safety-net hospitals received $111 333 384 in penalties before stratification compared with an estimated $79 087 744 after stratification—a savings of $32 245 640. Hospitals less likely to receive penalties after stratification included safety-net hospitals (33.6% penalized before stratification vs 24.8% after stratification, Δ = −8.8 percentage points [pp], $P < .001$), public hospitals (34.1% vs 30.5%, Δ = −3.6 pp, $P = .003$), hospitals in the West (26.8% vs 23.2%, Δ = −3.6 pp, $P < .001$), hospitals in Medicaid expansion states (27.3% vs 25.6%, Δ = −1.7 pp, $P = .003$), and hospitals caring for the most patients with disabilities (32.2% vs 28.3%, Δ = −3.9 pp, $P < .001$) and from racial/ethnic minority backgrounds (35.1% vs 31.5%, Δ = −3.6 pp, $P < .001$). In multivariate analyses, safety-net status and treating patients with highly medically complex conditions were associated with higher odds of moving from penalized to nonpenalized status.

CONCLUSIONS AND RELEVANCE This economic evaluation suggests that stratification of hospitals would be associated with a narrowing of disparities in penalties and a marked reduction in penalties for safety-net hospitals. Policy makers should consider adopting stratification for the HACRP.

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Supplemental content

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As the Centers for Medicare & Medicaid Services (CMS) implements value-based payment programs that reward or penalize hospitals based on the quality of care they provide, establishing an equitable measure of quality becomes a critical aim. The Hospital-Acquired Condition Reduction Program (HACRP) is one such value-based payment program; it deducts 1% of Medicare payments from the quartile of hospitals that perform the worst with respect to 6 measures of in-hospital infection and other adverse events (eg, standardized infection ratios for central catheter–associated bloodstream infection; catheter-associated urinary tract infection; surgical site infection; methicillin-resistant *Staphylococcus aureus* bacteremia; *Clostridium difficile* infection; and the Patient Safety Indicator 90 (PSI-90), a claims-based composite of in-hospital safety events, such as blood clots and postoperative infections).[1] The HACRP has been controversial, in part because hospitals serving a greater proportion of patients from minority, low-socioeconomic, and other disadvantaged backgrounds, as well as those serving more patients with medically complex conditions, are more likely to have worse performance scores than the national benchmark and to receive penalties.[2-4] The HACRP could thus exacerbate health care inequities by withholding Medicare dollars from hospitals that care for patients from the most vulnerable backgrounds.[5]

Understanding how to make the program more equitable requires understanding what might drive differences in performance. Prior studies[6-10] suggest that some disparities might be attributable to differences in the underlying health and susceptibility of hospitals' patient populations rather than differences in the quality of care delivered. The measures included in the HACRP are adjusted for only a limited number of variables (eg, surgical site infection is adjusted for age, diabetes, obesity, and surgical risk classification, and the other infection metrics are only adjusted for hospital-level covariates). The models do not include most medical comorbidities or social risk factors, such as Medicaid insurance status, which is associated with poverty, poorer health, and a higher burden of comorbidities that may predispose patients to infection and which is an independent risk factor for catheter-associated urinary tract infections[11] and surgical site infection.[10] They also do not include elements such as frailty and disability, which are associated with adverse outcomes in the hospital and are also more common among people with social risk factors, such as poverty.[12-14]

Given similar disparities in other CMS value-based pay-for-performance programs, including the Hospital Readmissions Reduction Program (HRRP),[6,15-17] many stakeholders have argued for the inclusion of social risk adjustment when evaluating hospital performance.[5,18-20] In response, the US Congress passed the 21st Century Cures Act in 2016. This act mandates that hospitals in the HRRP be stratified into, and evaluated within, quintiles based on their "proportion dual," which is the proportion of their patients dually enrolled in Medicare and Medicaid. Dual eligibility has consistently been reported to be an independent factor strongly associated with adverse outcomes. Thus, evaluating performance within quintiles of proportion dual compares hospitals that serve patients with similar poverty and social risk levels. Under this new stratification policy in the HRRP, safety-net hospitals were markedly more likely to see a reduction in penalties compared with the prestratification scheme, being assessed an estimated $22 million less in penalties.[17]

Key Points

Question How would financial penalties change if hospitals in the Hospital-Acquired Condition Reduction Program (HACRP) were evaluated within 5 strata based on the proportion of their patients who were dually enrolled in Medicare and Medicaid?

Findings In this economic evaluation using observational data from 3177 hospitals from July 1, 2016, to December 31, 2018 (HACRP in fiscal year 2020), hospitals with the most dually enrolled patients saw a collective savings of $32.2 million. Hospitals less likely to receive penalties included those with the most patients from minority backgrounds and the most patients with disabilities.

Meaning Stratification was associated with a narrowing of disparities and a decrease in penalties for safety-net hospitals; policy makers should consider implementing stratification for the HACRP as they have for similar value-based programs.

The HACRP currently evaluates individual hospital performance compared with all hospitals' performance nationally. Evaluating hospitals in the HACRP within peer groups based on the proportion dual may represent a practical solution to addressing potential biases, if any, in the assessment of hospital performance. However, the potential associations of such a change with CMS penalties are unknown. This study thus had 3 aims: to describe the characteristics of the hospitals penalized in the most recent year of the HACRP (fiscal year 2020); to simulate stratification by proportion dual and determine the association this might have with penalty rates for key hospital groups of interest, including safety-net and teaching hospitals; and to calculate the change in financial penalties among these groups after stratification. Patient-level data were used to calculate the proportion of, for example, Black or Hispanic patients at a hospital. Those data contain personal health information although no patient names. This study was approved by the Human Research Protection Office at Washington University. The requirement for informed consent was waived by the Human Research Protection Office.

Methods

Data

For this economic evaluation, we used a variety of publicly available data to compile information about the characteristics of hospitals, the patients they serve, and penalties incurred before stratification. For fiscal year 2020, the HACRP evaluated hospitals on 6 benchmarks: the PSI-90, a claims-based composite measure of the rate of 10 adverse outcomes from July 1, 2016, through June 30, 2018; and the standardized infection ratios for 5 hospital-acquired infections from January 1, 2017, through December 31, 2018 (eTable 1 in the Supplement).[1] We obtained hospitals' PSI-90 score from the performance period of July 1, 2016, to June 30, 2018, using

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the CMS 2020 Hospital Compare Annual Files and calculated their 5 standardized infection ratios from the 2017 and 2018 Hospital Compare Annual Files. We determined the penalization status of the hospitals (before stratification) using the 2020 Hospital Compare Annual Files.

From the HRRP Supplemental Data File[21] from the CMS's Inpatient Prospective Payment System final rule for 2020, we determined the percentage of each hospital's patient base that was dually enrolled in Medicare and Medicaid. We excluded hospitals that did not have such data available, as well as hospitals in Maryland, which are exempt from the HACRP. We linked hospital characteristics from the American Hospital Association 2018 Annual Survey.[22] We then used 100% of Medicare inpatient claims for admissions in 2017 to determine each hospital's proportion of Black patients, Hispanic patients, and patients originally eligible for Medicare because of disability. Race/ethnicity were defined according to the Medicare Master Beneficiary Summary File,[23] which uses beneficiaries' self-reported race/ethnicity at the time of Medicare enrollment, treating race and ethnicity as a single variable rather than allowing both race and ethnicity to be recorded (eg, beneficiaries cannot be both Hispanic and Black or Hispanic and White). We used the Area Deprivation Index for 9-digit zip codes, which ranks neighborhoods by socioeconomic status disadvantage, to estimate patient neighborhood characteristics[24] and each hospital's case mix index (mean diagnosis related group weight of inpatient discharges) to estimate medical complexity. We used estimated 2017-2018 total Medicare inpatient payments from the publicly available RAND Hospital Data tool, a directory of public cost reports based on the CMS's Healthcare Provider Cost Reporting Information System, to calculate penalties.[25]

Simulating the Association of Stratification by Proportion Dual With Penalization Status

We segmented our hospitals into 5 quintiles of proportion dual by using the same stratification that the CMS uses for the HRRP. For each hospital, following the CMS's typical approach to assessing performance, we then winsorized the PSI-90 and the 5 standaardized infection ratio measures at the 5th and 95th percentiles within each quintile, calculated *z* scores for each of the 6 measures, applied an equal weight to each score, and summed the contributions to obtain the total score. Within each quintile, the worst-performing quartile of hospitals was tagged for penalization. All analyses followed the latest HACRP method[26] but were performed within each quintile of proportion dual instead of within 1 national cohort. For the purposes of this article, we use the term *safety-net hospitals* to refer to hospitals in the fifth quintile of proportion dual, caring for the highest proportion of patients dually enrolled in Medicare and Medicaid.

Covariates

We evaluated the association of stratification with financial penalties by several characteristics, including hospital size, profit status (public, not for profit, or investor owned), teaching status, geography (Northeast, Midwest, South, or West), rurality (urban or rural), and location within a Medicaid-expansion or non–Medicaid-expansion state. We categorized hospitals in the top quintile of case-mix index, proportion of patients with disability, and proportion of Black and Hispanic patients as high complexity, high disability, and serving populations from minority backgrounds, respectively. We classified hospitals in neighborhoods in the top quintile of Area Deprivation Index as those serving patients from the most socioeconomically disadvantaged backgrounds (high-disadvantage hospitals).[27]

Outcome: Change in Penalties

We calculated penalties as deductions of 1% from the estimated total Medicare inpatient payments to the worst-performing quartile of hospitals, both within the national cohort (ie, before stratification) and within each quintile of dual enrollment (after stratification). Our primary outcome was the change in penalties levied between the prestratification and poststratification schemes. We assessed these changes within each quintile of dual enrollment and at the state level.

Statistical Analysis

We assessed baseline characteristics of hospitals evaluated by the HACRP in fiscal year 2020. We then tested for association between baseline characteristics and penalization status under the prestratification scheme using Pearson χ^2 tests. We repeated these analyses on the cohort of hospitals after stratification by proportion dual and subsequent assignment of penalties. At the level of each hospital characteristic, we tested the percentage of change in penalization status under the prestratification vs poststratification schemes using the McNemar test. Last, we estimated (1) a logistic model to calculate odds ratios (ORs) for change in status from penalized before stratification to nonpenalized after stratification and (2) a similar multivariate logistic model, controlling for hospital characteristics.

All analyses were conducted using Stata/IC software, version 16.0 (StataCorp LLC). We considered a 2-tailed $P < .05$ to be statistically significant.

Results

Characteristics of Hospitals Evaluated by the HACRP

We identified 3102 hospitals evaluated by the HACRP in fiscal year 2020 (**Table 1**). A total of 1952 hospitals (62.9%) were privately owned (nonprofit), whereas 420 (13.5%) were public (government owned) and 705 (22.7%) were proprietary (for profit). A total of 1272 hospitals (41.3%) were located in the South. Hospitals were more often urban (2333 [75.8%]) and in a state that had implemented Medicaid expansion by the HACRP's 2020 performance period (1757 [56.6%]). There was an approximately even distribution of hospitals among teaching status (teaching vs nonteaching) and size (small, medium, or large).

Characteristics of Hospitals Penalized Before Stratification

We identified 774 hospitals that received a penalty in fiscal year 2020 (eTable 2 in the Supplement). A total of 207 (26.7%) of

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Table 1. Characteristics of Hospitals Evaluated by the Hospital-Acquired Condition Reduction Program in Fiscal Year 2020

Characteristic	No. (%) (N = 3102)
Quintile of proportion dually enrolled	
1 (Fewest dually enrolled patients)	621 (20.0)
2	624 (20.1)
3	618 (19.9)
4	622 (20.1)
5 (highest; considered safety net)	617 (19.9)
Teaching status	
Nonteaching	1609 (52.3)
Teaching	1468 (47.7)
Size	
Small	1081 (35.1)
Medium	943 (30.7)
Large	1053 (34.2)
Ownership	
Public	420 (13.5)
Private, nonprofit (voluntary)	1952 (62.9)
Private, investor owned (proprietary)	705 (22.7)
Geographic location	
Northeast	474 (15.4)
Midwest	720 (23.4)
South	1272 (41.3)
West	611 (19.9)
Rurality	
Rural	744 (24.2)
Urban	2333 (75.8)
Medicaid expansion status	
Nonexpansion state	1345 (43.4)
Expansion state	1757 (56.6)
Minority	
Lower population from minority backgrounds	2483 (80.1)
High population from minority backgrounds	619 (20.0)
Disability	
Lower-disability population	2483 (80.1)
High-disability population	619 (20.0)
Case-mix index	
Lower-complexity population	2487 (80.2)
High-complexity population	615 (19.8)
Area Deprivation Index	
Lower socioeconomic disadvantage	2354 (76.5)
High socioeconomic disadvantage	723 (23.5)

the penalized cohort were safety-net hospitals (in the fifth quintile of dual enrollment), whereas 97 (12.5%) were in the first quintile of dual enrollment. The percentage of contribution to the penalized cohort tended to increase with each successive quintile of proportion dually enrolled: hospitals in the second quintile made up 19.6%, hospitals in the third quintile made up 19.4%, and hospitals in the fourth quintile made up 21.7% of the penalized cohort (eTable 2 in the Supplement). The difference in penalized proportions was unequal across quintiles of dual enrollment ($\chi^2_4 = 54.91$, $P < .001$).

The distributions of several characteristics, including proportion of patients in minority groups, proportion of patients with disabilities, teaching status, size, ownership, geography, and Medicaid-expansion status, differed significantly between the penalized and nonpenalized hospitals. For example, hospitals in states that had not expanded Medicaid comprised 1050 (45.1%) of the nonpenalized cohort but 295 (38.1%) of the penalized cohort ($P = .001$).

In contrast, the distributions of other characteristics, including rurality, patient medical complexity, and neighborhood disadvantage, were not found to differ significantly.

Characteristics of Hospitals Penalized After Stratification

After stratifying and assessing hospitals within quintiles of proportion dual, we identified 771 hospitals that would receive a penalty (eTable 3 in the Supplement). Our simulated stratification scheme was designed to penalize an equal proportion (the worst-performing quartile) of hospitals within each quintile of proportion dually enrolled.

As in the prestratification scheme, the distributions of several characteristics, including proportion of patients from minority backgrounds, proportion of patients with disabilities, teaching status, size, and ownership, remained significantly different between the penalized and nonpenalized hospitals. The distributions of other characteristics, including rurality, patient medical complexity, and neighborhood disadvantage, did not differ significantly. In contrast to the prestratification scheme, the distributions for geographic and Medicaid expansion status characteristics did not remain significantly different between the penalized and nonpenalized hospitals.

Hospital Characteristics Associated With Penalization Before vs After Stratification

At the level of each hospital characteristic, we compared the proportion that received penalties under the prestratification and the poststratification schemes and assessed these differences for significance (**Table 2**). A total of 207 safety-net hospitals (33.6%) were penalized in the prestratification scheme compared with 153 (24.8%) in the poststratification scheme. This 8.8-percentage point (pp) change (Δ) was statistically significant ($P < .001$). In the poststratification scheme, hospitals in the first quintile of dual enrollment (ie, those caring for the fewest dually enrolled patients) were most likely to change from nonpenalized to penalized when the poststratification scheme was used (Δ = +9.2 pp).

Compared with the prestratification scheme, hospitals that were significantly less likely to receive penalties after stratification included facilities that were serving more patients from minority backgrounds (Δ = -3.6 pp, $P < .001$), high disability (Δ = -3.9 pp, $P < .001$), publicly owned (Δ = -3.6 pp, $P = .003$), in the West (Δ = -3.6 pp, $P < .001$), and in Medicaid-expansion states (Δ = -1.6 pp, $P = .003$). Conversely, hospitals that were penalized in significantly greater proportions included those in the South (Δ = +2.2 pp, $P < .001$) and in non-Medicaid-expansion states (Δ = +1.9 pp, $P = .001$). No significant changes were observed in the proportions of hospitals

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Table 2. Hospitals Penalized by Hospital Characteristic Before vs After Stratification

Characteristic	No. (%) of hospitals[a]		Change, %	*P* value
	Before stratification	After stratification		
Total penalized	774 (25.0)	771 (24.8)	0.1	.81
Quintile of proportion dual				
1 (Fewest)	97 (15.6)	154 (24.8)	9.2	<.001
2	152 (24.4)	155 (24.8)	0.5	.41
3	150 (24.3)	154 (24.9)	0.6	.21
4	168 (27.0)	155 (24.9)	−2.1	.002
5 (Safety net)	207 (33.6)	153 (24.8)	−8.8	<.001
Teaching status				
Nonteaching	364 (22.6)	362 (22.5)	−0.1	.83
Teaching	404 (27.5)	405 (27.6)	0.1	.91
Size				
Small	228 (21.1)	235 (21.7)	0.6	.40
Medium	241 (25.6)	242 (25.7)	0.1	.86
Large	299 (28.4)	290 (27.5)	−0.9	.22
Ownership				
Public	143 (34.1)	128 (30.5)	−3.6	.003
Private, nonprofit	478 (24.5)	486 (24.9)	0.4	.40
Private, investor owned	147 (20.8)	153 (21.7)	0.8	.33
Geographic location				
Northeast	138 (29.1)	131 (27.6)	−1.5	.07
Midwest	174 (24.2)	174 (24.2)	0	>.99
South	292 (23.0)	320 (25.2)	2.2	<.001
West	164 (26.8)	142 (23.2)	−3.6	<.001
Rurality				
Rural	171 (23.0)	168 (22.6)	−0.4	.53
Urban	597 (25.6)	599 (25.7)	0.1	.86
Medicaid expansion status				
Nonexpansion state	295 (21.9)	321 (23.9)	1.9	.001
Expansion state	479 (27.3)	450 (25.6)	−1.7	.003
Minority				
Lower population from minority backgrounds	557 (22.4)	576 (23.2)	0.8	.10
High population from minority backgrounds	217 (35.1)	195 (31.5)	−3.6	<.001
Disability				
Lower-disability population	575 (23.2)	596 (24.0)	0.8	.06
High-disability population	199 (32.2)	175 (28.3)	−3.9	<.001
Case-mix index				
Lower-complexity population	606 (24.4)	606 (24.4)	0	>.99
High-complexity population	168 (27.3)	165 (26.8)	−0.5	.63
Area Deprivation Index				
Lower socioeconomic disadvantage	580 (24.6)	581 (24.7)	0	.93
High socioeconomic disadvantage	188 (26.0)	186 (25.7)	−0.3	.73

[a] Data are expressed as the number (percentage) of each category that was penalized before or after stratification. For example, 207 safety-net hospitals (33.6% of all safety-net hospitals) were penalized in the prestratification scheme compared with 153 (24.8% of all safety-net hospitals) in the poststratification scheme.

penalized with respect to teaching status, size, rurality, patient medical complexity, or neighborhood disadvantage.

Finally, after controlling for other hospital characteristics, we found that hospitals in the fourth (adjusted OR, 7.55; 95% CI, 2.04-27.91; $P = .002$) and the fifth (adjusted OR, 26.61; 95% CI, 7.43-95.30; $P < .001$) quintiles of dual enrollment were more likely to move from a penalized prestratification status to a nonpenalized poststratification status compared with hospitals in the first quintile of dual enrollment (**Table 3**). Compared with those hospitals with patients with less medically complex conditions, hospitals that care for patients with highly medically complex conditions were more likely to see a status change from penalized to nonpenalized (adjusted OR, 2.26; 95% CI, 1.20-4.26; $P = .01$).

Changes in Financial Penalties Before vs After Stratification

We estimated a total of $393 297 761 levied in penalties in the prestratification scheme, with safety-net hospitals (19.9%

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Table 3. Associations Between Hospital Characteristics and Odds of Status Change From Penalized (Before Stratification) to Nonpenalized (After Stratification)

Characteristic	No. (%)[a]	Univariate OR (95% CI)	*P* value	Multivariate OR (95% CI)	*P* value
Quintile of proportion dual					
1 (Fewest)	4 (0.6)	1 [Reference]	NA	1 [Reference]	NA
2	5 (0.8)	1.25 (0.33-4.66)	.74	1.75 (0.38-8.14)	.47
3	3 (0.5)	0.75 (0.17-3.38)	.71	1.29 (0.25-6.67)	.76
4	15 (2.4)	3.81 (1.26-11.55)	.02	7.55 (2.04-27.91)	.002
5 (Safety net)	55 (8.9)	15.1 (5.44-41.92)	<.001	26.61 (7.43-95.30)	<.001
Teaching status					
Nonteaching	42 (2.6)	1 [Reference]	NA	1 [Reference]	NA
Teaching	36 (2.5)	0.94 (0.60-1.47)	.78	0.55 (0.32-0.96)	.04
Size					
Small	31 (2.9)	1 [Reference]	NA	1 [Reference]	NA
Medium	16 (1.7)	0.58 (0.32-1.08)	.08	0.51 (0.27-0.97)	.04
Large	31 (2.9)	1.03 (0.62-1.70)	.92	0.79 (0.44-1.39)	.41
Ownership					
Public	20 (4.8)	2.15 (1.10-4.20)	.03	1.85 (0.90-3.82)	.10
Private, nonprofit	42 (2.2)	0.95 (0.53-1.70)	.85	1.05 (0.55-2.01)	.88
Private, investor owned	16 (2.3)	1 [Reference]	NA	1 [Reference]	NA
Geographic location					
Northeast	11 (2.3)	0.93 (0.43-1.98)	.84	0.51 (0.23-1.16)	.11
Midwest	18 (2.5)	1 [Reference]	NA	1 [Reference]	NA
South	16 (1.3)	0.5 (0.25-0.98)	.04	0.51 (0.22-1.21)	.13
West	33 (5.4)	2.23 (1.24-4.00)	.01	0.91 (0.45-1.83)	.79
Rurality					
Rural	13 (1.8)	0.62 (0.34-1.13)	.12	0.6 (0.29-1.25)	.17
Urban	65 (2.8)	1 [Reference]	NA	1 [Reference]	NA
Medicaid expansion status					
Nonexpansion state	19 (1.4)	1 [Reference]	NA	1 [Reference]	NA
Expansion state	63 (3.6)	2.6 (1.55-4.36)	<.001	1.5 (0.68-3.30)	.31
Minority					
Low population from minority backgrounds	56 (2.3)	1 [Reference]	NA	1 [Reference]	NA
High population from minority backgrounds	26 (4.2)	1.9 (1.18-3.05)	.01	0.71 (0.40-1.27)	.25
Disability					
Low-disability population	51 (2.1)	1 [Reference]	NA	1 [Reference]	NA
High-disability population	31 (5.0)	2.51 (1.59-3.96)	<.001	1.19 (0.69-2.08)	.53
Case mix index					
Low-complexity population	61 (2.5)	1 [Reference]	NA	1 [Reference]	NA
High-complexity population	21 (3.4)	1.41 (0.85-2.33)	.19	2.26 (1.20-4.26)	.01
Area Deprivation Index					
Low socioeconomic disadvantage	60 (2.6)	1 [Reference]	NA	1 [Reference]	NA
High socioeconomic disadvantage	18 (2.5)	0.98 (0.57-1.66)	.93	0.92 (0.51-1.64)	.77

Abbreviations: NA, not applicable; OR, odds ratio.

[a] These data are expressed as number (percentage) of each category that changed from penalized before stratification to nonpenalized after stratification. For example, 55 safety-net hospitals (8.9% of all safety-net hospitals) that were penalized in the prestratification scheme were not penalized in the poststratification scheme.

of the cohort) receiving 28.3% of all penalties—a total of $111 333 384 in penalties. After stratification, we estimated a total of $385 763 404 in penalties, with safety-net hospitals receiving 20.5% of all penalties ($79 087 744)—a savings of $32 245 640 from the prestratification scheme (**Figure 1**). Hospitals in the first quintile of proportion dual were assessed an additional $18 150 776 in penalties after stratification, bearing 8.6% of all penalties before stratification and 13.4% of all penalties afterward.

We further assessed changes in penalties at the state level (**Figure 2**). Fewer hospitals in the West were penalized after stratification, whereas those in the South were more likely to

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be penalized. Hospitals in California saw the greatest reduction in total penalties (−$17 231 376), whereas those in Florida saw the greatest increase ($5 297 138).

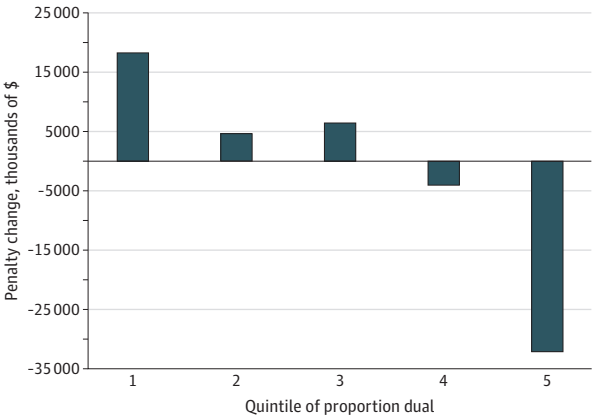
Discussion

In line with previous work, this economic evaluation found that, in fiscal year 2020, the HACRP disproportionately penalized hospitals that were large, publicly owned, teaching, in the Northeast, and in Medicaid-expansion states, as well as those caring for high proportions of patients with disabilities and from racial/ethnic minority backgrounds. To our knowledge, however, this is the first study to simulate the association of social risk stratification with financial penalties levied by the HACRP. After evaluation within peer groups of proportion dual, hospitals that were significantly less likely to receive penalties included those that were publicly owned; in the West; in Medicaid-expansion states; and caring for the highest proportions of patients with medical complexity, with disabilities, and from racial/ethnic minority backgrounds. The study found that stratification on the basis of proportion dual was associated with a considerable change in penalties. Safety-net hospitals saw a $32 million reduction in penalties, whereas hospitals caring for the fewest patients dually enrolled in Medicare and Medicaid faced an additional $18 million in penalties. At the state level, the difference in penalties was most striking for California hospitals, which were assessed $17 million less in penalties after stratification by proportion dually enrolled.

Furthermore, these findings suggest that stratification would keep the HACRP roughly budget neutral with respect to its prestratification status, with $393 million assessed in penalties before stratification and $386 million assessed after stratification. This is in part because the HACRP is designed so that the hospitals with the worst performance statistics are financially penalized regardless of their absolute performance; if all hospitals reduced hospital-acquired conditions by half, there would be no change in penalties.

One potential critique of stratification in the HACRP is that safety-net hospitals may do more poorly under the program because they have fewer resources, perform less quality improvement work, or otherwise provide less-safe inpatient care, and the data used in this study can neither support nor refute that concern. However, stratification would not let any hospitals off the hook per se; it would simply acknowledge that underlying differences in patient population that impact susceptibility to infection and other adverse in-hospital outcomes need to be accounted for. Safety-net hospitals would still have strong incentive to reduce adverse events but would be more fairly judged against other facilities with a more similar case mix. Further, prior work[5,20,28,29] has found that the HACRP has not yet achieved its goal: the receipt of a penalty has not been associated with a change in the rate of hospital-acquired conditions or in patient outcomes. The HACRP as currently constructed could therefore inadvertently serve an institutionalized function of penalizing the safety net while also failing to adequately support and catalyze improvement in patient outcomes.

Figure 1. Change in Total Penalties per Quintile of Proportion of Patients Dually Enrolled in Medicare and Medicaid



These findings suggest that stratifying hospitals in the HACRP by patient social risk is not only practical but also sensible and equitable. Safety-net hospitals, which have low operating margins and rely on volatile, nonclinical sources of revenue to offset costs, are disproportionately affected by value-based payment programs, as are the patients they serve. Stratification of the HACRP provides substantial financial relief for the safety net while narrowing disparities among the hospitals selected for and spared from penalization. This reduction in financial burden may contribute to investment in resources that may improve the quality of care provided by safety-net hospitals, which, compared with their non–safety-net counterparts, serve greater percentages of racial/ethnic minorities and patients with low income.[30]

However, the current study found that disparities in penalties still existed after stratification and assessment by proportion dual. The proportion of patients from minority backgrounds; the proportion of patients with disabilities; and hospital teaching status, size, and ownership were associated with significant differences between the penalized and nonpenalized cohorts in the prestratification and post-stratification schemes. More work is necessary to identify the multifactorial causes, including hospital resources, access, surveillance bias, discrimination, and structural racism, that underlie the racial and socioeconomic disparities in hospital capacity, patient risk profile, and hospital-acquired conditions and infections.[31,32] Understanding such factors may lead to improvement in patient care, outcomes, and risk adjustment and establishment of a truly equitable measure of quality in the HACRP and other value-based payment programs.

Limitations

This study has limitations. First, it evaluated only 1 year of penalties (based on 2 years of performance data) in the HACRP. Second, the study used publicly available data from the CMS, including measures derived from the Centers for Disease Control and Prevention, which calculates standardized infection ratios by dividing the number of observed

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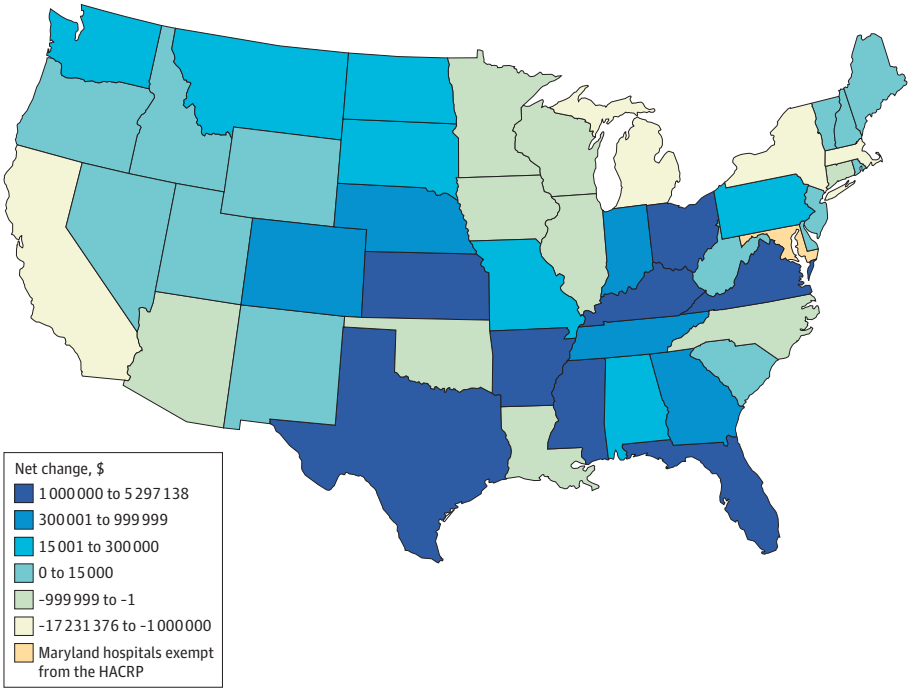
Figure 2. Change in Total Penalties at the State Level (Excluding Alaska and Hawaii)



After stratification, states that each received a total of less than $1 million in penalties compared with the prestratification scheme included California, Massachusetts, Michigan, and New York; states that each received a total of $1 million or more in penalties included Arkansas, Florida, Kansas, Kentucky, Mississippi, Ohio, Texas, and Virginia.

infections by the number of predicted infections; the denominator is calculated using multivariate regression models generated from nationally aggregated data. The impact of using standardized infection ratios recalculated with multivariate regression models generated from quintiles based on proportion dual or another marker of social risk is a direction for future research. Third, the study was able to estimate changes in financial penalties by using historic Medicare inpatient payments to each hospital; an even more accurate account of financial changes will depend on billing updates in fiscal year 2020. Fourth, although among Medicare beneficiaries the variability in Medicaid eligibility is much smaller than for the general public, the proportion of each hospital's Medicare patients who are enrolled in Medicaid varies somewhat according to Medicaid expansion status. Although the US Congress made the choice to use this parameter to stratify the HRRP in the 21st Century Cures Act, passed in 2016, positing that it was the best way to identify patients with likely high levels of social need using claims data, it introduced state-to-state variability that is not perfectly tied to the actual amount of need in each hospital.

Conclusions

This study found that stratification of hospitals in the HACRP by quintiles of proportion dual was associated with a narrowing of some disparities between penalized and nonpenalized hospitals. Safety-net hospitals saw a marked reduction in penalties, with an estimated total savings of more than $32 million. Policy makers and the CMS should consider adopting stratification by proportion dual when assessing hospital performance in the HACRP as they have for the HRRP.

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