

Hospital Safety-Net Status and Performance on Publicly Reported Episode Spending Measures

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Given widespread concerns about the high costs of inpatient care,¹ Medicare continues to implement initiatives to contain hospital spending. One potentially promising strategy is to publicly report hospital spending for specific episodes of care.² By quantifying spending specifically related to given care episodes, such measures provide hospitals, payers, and patients with information that is more clinically relevant and granular than that provided through existing global spending measures. Episode-based spending measures also enable Medicare to identify and track spending for particular episodes, information that could be used to adapt such measures into formal bundled payment or other episode-based payment models. However, because publicly reported hospital episode spending is a novel approach that remains understudied compared with episode-based payment models and other forms of public reporting (eg, quality data), there is a dearth of knowledge about it.

Medicare explored this strategy in 2017 by implementing 6 Clinical Episode-Based Payment (CEBP) measures in the national Hospital Inpatient Quality Reporting Program.^{3,4} These measures reflect spending efficiency for hospital care and provide a view of “how expensive a hospital is” by capturing all facility and professional payments for an episode spanning between 3 days prior to hospitalization and 30 days following discharge. The measures also differ from existing spending measures in their specificity and clinical salience: CEBPs capture all facility and professional payments specifically related to a given episode and are subdivided as appropriate to reflect different clinical situations. For instance, the cellulitis CEBP measure captures spending for services related to diagnosing and treating the infection but not for other, unrelated services; there are also measure subtypes to reflect infections in patients with and without major complications or comorbidities or diabetes diagnoses.

Early evidence suggests that CEBP spending differs by specific episode type and spending patterns mirror those observed in episode-based bundled payment models, reinforcing that hospitals may have particular savings opportunities in reducing skilled nursing facility (SNF) care across different episode types.² However,

ABSTRACT

OBJECTIVES: As part of its strategy to improve health care value and contain hospital costs, Medicare trialed public reporting for episode-based spending via 6 novel Clinical Episode-Based Payment (CEBP) measures for cellulitis, kidney/urinary tract infection, gastrointestinal hemorrhage, spinal fusion, cholecystectomy, and aortic aneurysm. Because safety-net hospitals may fare more poorly than other hospitals under value-based reforms, we evaluated the relationship between safety-net status and CEBP episode spending.

STUDY DESIGN: Observational study.

METHODS: We used data from Medicare and the American Hospital Association to identify and describe characteristics of safety-net and non-safety-net hospitals subject to CEBP measures nationwide. Multivariable linear regression, controlled for hospital characteristics, was used to evaluate the association between hospital safety-net status and risk-adjusted, standardized episode spending for each CEBP episode type.

RESULTS: Of 1771 hospitals eligible for CEBPs, 28% (491) were safety-net and 72% (1280) were non-safety-net hospitals, with the former being larger and more likely to be nonprofit, nonteaching hospitals. The magnitude of episode spending varied by episode type, ranging from the lowest for cellulitis episodes to the highest for aortic aneurysm episodes. Skilled nursing facility care accounted for a considerable proportion of spending variation for procedure-based episodes but not condition-based episodes. In multivariable analysis, safety-net status was not associated with risk-adjusted episode spending for any of the 6 episode types (spending differences ranging from $-\$111$ to $\$638$ by episode; $P > .05$ for all).

CONCLUSIONS: These findings provide the first description of baseline episode spending patterns for safety-net hospitals and suggest that such spending does not vary by safety-net status.

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TAKEAWAY POINTS

One promising but relatively understudied strategy for containing hospital spending is to publicly report hospital spending for specific episodes of care. Analyzing 6 novel Clinical Episode-Based Payment (CEBP) measures implemented by Medicare in the Hospital Inpatient Quality Reporting program, we found that:

- ▶ Among hospitals subject to CEBP measures nationwide, safety-net hospitals were larger and were more likely to be nonprofit, nonteaching hospitals than non-safety-net hospitals.
- ▶ The magnitude of episode spending varied by episode type, ranging from the lowest for cellulitis episodes to the highest for aortic aneurysm episodes.
- ▶ Episode spending was not associated with hospital safety-net status for any episode type.

hospitals may differ in their ability to implement care redesign and perform well on episode spending measures. In particular, safety-net hospitals that care for large proportions of vulnerable patients may have fewer resources than other hospitals to invest in tracking (eg, data analytics) and addressing variation in episodic care (eg, staff to implement clinical pathways or processes to affect discharge disposition and postacute care utilization). The social complexity of vulnerable patients and the potential impact of social factors on health care utilization may also complicate efforts to managing episode spending at safety-net hospitals. Collectively, these factors can potentially increase performance gaps between safety-net and non-safety-net hospitals, as observed in other value-based reforms,⁵⁻⁷ and lead safety-net hospitals to be unfairly penalized based on publicly reported measures.

These concerns are particularly relevant to reforms focused on episodes of care. For instance, in a large, nationwide episode-based bundled payment program for lower extremity joint replacement, safety-net hospitals were less likely than other hospitals to achieve financial savings, and those that did achieved smaller savings than non-safety-net counterparts.^{8,9} To inform future public reporting strategies and potential episode-based payment models, it is critical for policy makers and clinicians to first understand if baseline episode spending patterns differ systematically between safety-net hospitals and other hospitals. Therefore, we examined the national implementation of CEBP measures in 2017 to provide insight on this issue by describing episode spending at safety-net hospitals and evaluating the association between hospitals' safety-net status and performance on CEBP spending measures.

METHODS

Data

We used data from the 2016 American Hospital Association (AHA) Annual Survey to identify safety-net hospitals and obtain information about hospitals' organizational characteristics.¹⁰ In line with early work describing CEBP performance,² data from Hospital Compare were used to obtain information about hospital-level episode spending performance on 3 condition-based measures (cellulitis, kidney/urinary tract infection [UTI], and gastrointestinal hemorrhage) and 3 procedure-based measures (spinal fusion, cholecystectomy

and common duct exploration, and aortic aneurysm procedure) tested in 2017.¹¹

Medicare calculated and reported CEBP measure performance only for hospitals meeting minimum volume thresholds for each condition-based (40-episode minimum) or procedure-based (25-episode minimum) episode type. Data were published on Hospital Compare in risk-adjusted, payment-standardized form. CEBP performance was reported as (1) average total episode spending and (2) average spending on specific components

(hospital, SNF, readmissions, emergency department visits, and home health agency use).

Safety-Net Status and Covariates

Consistent with prior approaches, we defined safety-net hospitals as those in the top quartile of Medicaid discharges nationwide and all other hospitals as non-safety net.^{12,13} Hospital characteristics used in our analysis included hospital size (number of beds), teaching status (nonteaching vs minor teaching vs major teaching), profit status (nonprofit, for profit, government), urban status (urban vs rural), and geographic region (Northeast vs South vs Midwest vs West).

Statistical Analysis

We compared organizational characteristics at safety-net vs non-safety-net hospitals. For each episode type, we also compared CEBP spending amounts by safety-net status. Chi-squared tests were used to compare categorical variables, whereas Kruskal-Wallis tests were used to compare continuous variables.

In line with prior work,² we used a residual plot analysis to evaluate how individual episode components contributed to overall episode spending variation. To do so, we first categorized episode components into 3 groups: hospital, SNF, and other (the sum of readmissions, emergency department visits, and home health agency use), evaluating SNF care separately given evidence about well-described savings opportunities in reducing SNF use. We then used linear regression and analysis of variance to generate predicted episode component spending values for each hospital, which were used to calculate the residual (ie, difference) between predicted and actual total episode spending. Variation in episode component residuals were plotted for each CEBP measure type, with lower residual plot variation representing a larger contribution from a spending component to total episode spending variation.

Additionally, we used hospital-level multivariable linear regression, controlling for hospital size, teaching status, profit status, urban/rural status, and geographical region, to evaluate the association between hospital safety-net status (the exposure) and risk-adjusted, standardized average hospital episode spending (the outcome). This was done for each CEBP episode type, and because spending data were reported through Hospital Compare in risk-adjusted and

payment-standardized form, we did not perform any additional risk adjustment on CEBP episode spending amounts.

Because episode spending data were available only for hospitals meeting minimum volume thresholds for that episode type, hospital sample sizes varied across our analyses. All analyses were performed using SAS version 9.4 (SAS Institute). Statistical tests were 2-tailed and considered significant at $\alpha = .05$.

RESULTS

In 2017, 1778 hospitals nationwide met minimum volume thresholds for CEBP performance to be calculated for 1 or more episode type, and 1771 were matched to hospital characteristics from AHA data. Of these, 28% (491) were safety-net and 72% (1280) were non-safety-net hospitals.

Hospital Characteristics

Across all 6 CEBP measures, hospital groups differed with respect to organizational characteristics (Table 1). In particular, safety-net hospitals were larger and were more likely to be nonprofit, nonteaching hospitals than non-safety-net hospitals. Safety-net and non-safety-net hospitals also differed with respect to geographic distribution.

Episode Spending

The absolute magnitude of episode spending varied by episode type, ranging from the lowest for cellulitis episodes (average spending of \$9859 for safety-net hospitals and \$9990 for non-safety-net hospitals) to the highest for aortic aneurysm episodes (average spending of \$42,457 for safety-net hospitals and \$39,260 for non-safety-net hospitals).

Residual Plot Analysis

Residual plots varied between procedure- and condition-based CEBP measures (Figure). For the 3 procedure-based episode types, the SNF episode component had lower residual plot variation (ie, contributed the most to total episode spending variation) than the hospital episode component, which had the highest residual plot variation (ie, contributed the least to total episode spending variation). In contrast, for the 3 condition-based episodes, residual plot variation was lower for the hospital episode component compared with the SNF episode component. Across all episodes, the “other” episode component tended to have small plot variation, suggesting greater contribution to overall episode variation. These relationships did not vary by hospital safety-net status. For procedure- and condition-based episodes, the relative contribution of episode components to overall episode spending variation was similar for safety-net and non-safety-net hospitals (Figure).

Association Between Hospital Safety-Net Status and Episode Spending

In univariate comparisons of CEBP spending by safety-net status, safety-net hospitals had higher spending than non-safety-net

TABLE 1. Hospital Characteristics, by Safety-Net Status (all episode types)

	Hospital safety-net status		P
	Safety net (n = 491)	Non-safety net (n = 1280)	
Size by number of beds, median (IQR)	321 (190-462)	221 (138-351)	<.001
Profit status, %			
Nonprofit	17.7	7.3	<.001
For profit	67.8	66.5	
Government	14.5	26.2	
Teaching status, %			
Major teaching	25.5	40.3	<.001
Minor teaching	53.4	51.6	
Nonteaching	21.2	8.1	
Urban status, %			
Urban	12.8	10.6	.17
Rural	87.2	89.4	
Region, %			
Northeast	19.6	16.3	<.001
Midwest	23.8	22.0	
South	31.6	46.2	
West	25.1	15.6	

IQR, interquartile range.

hospitals for gastrointestinal hemorrhage (\$11,319 vs \$11,097; $P = .002$) and aortic aneurysm (\$42,457 vs \$39,260; $P = .007$) episodes. Episode spending on the other 4 episode types did not vary by hospital safety-net status.

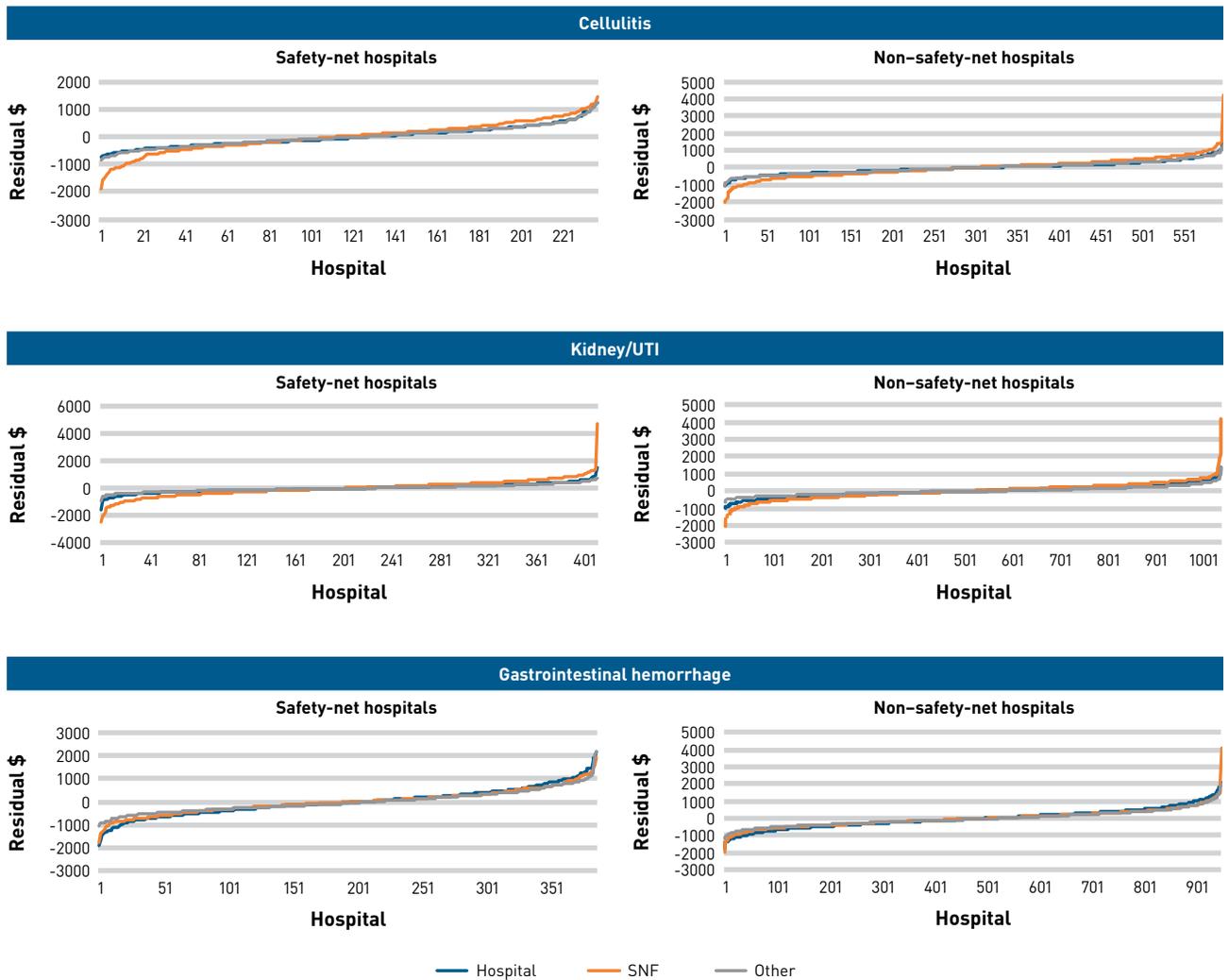
In multivariable analysis, safety-net status was not associated with episode spending for any of the 6 CEBP episode types (Table 2). For instance, average spending on cellulitis and kidney/UTI episodes was lower by \$111 and \$34, respectively, at safety-net vs non-safety-net hospitals, whereas spending on gastrointestinal hemorrhage, aortic aneurysm, cholecystectomy, and spinal fusion episodes was higher by between \$85 and \$638 at safety-net vs non-safety-net hospitals ($P > .05$ for all).

DISCUSSION

This study used novel CEBP measures for 6 distinct episode types to demonstrate that hospital safety-net status was not associated with differences in episode spending or the relative contribution of episode components to overall episode spending variation.

These findings provide early support that implementing episode-based spending measures is unlikely to disadvantage safety-net vs non-safety-net hospitals. In particular, our results demonstrate that for at least 6 different episode types, baseline spending patterns and drivers of episode spending variation do not appear to demonstrably differ by hospital safety-net status. Such findings suggest that compared with non-safety-net hospitals, safety-net

FIGURE. Residual Plots for Episode Components, by Hospital Safety-Net Status



(continued)

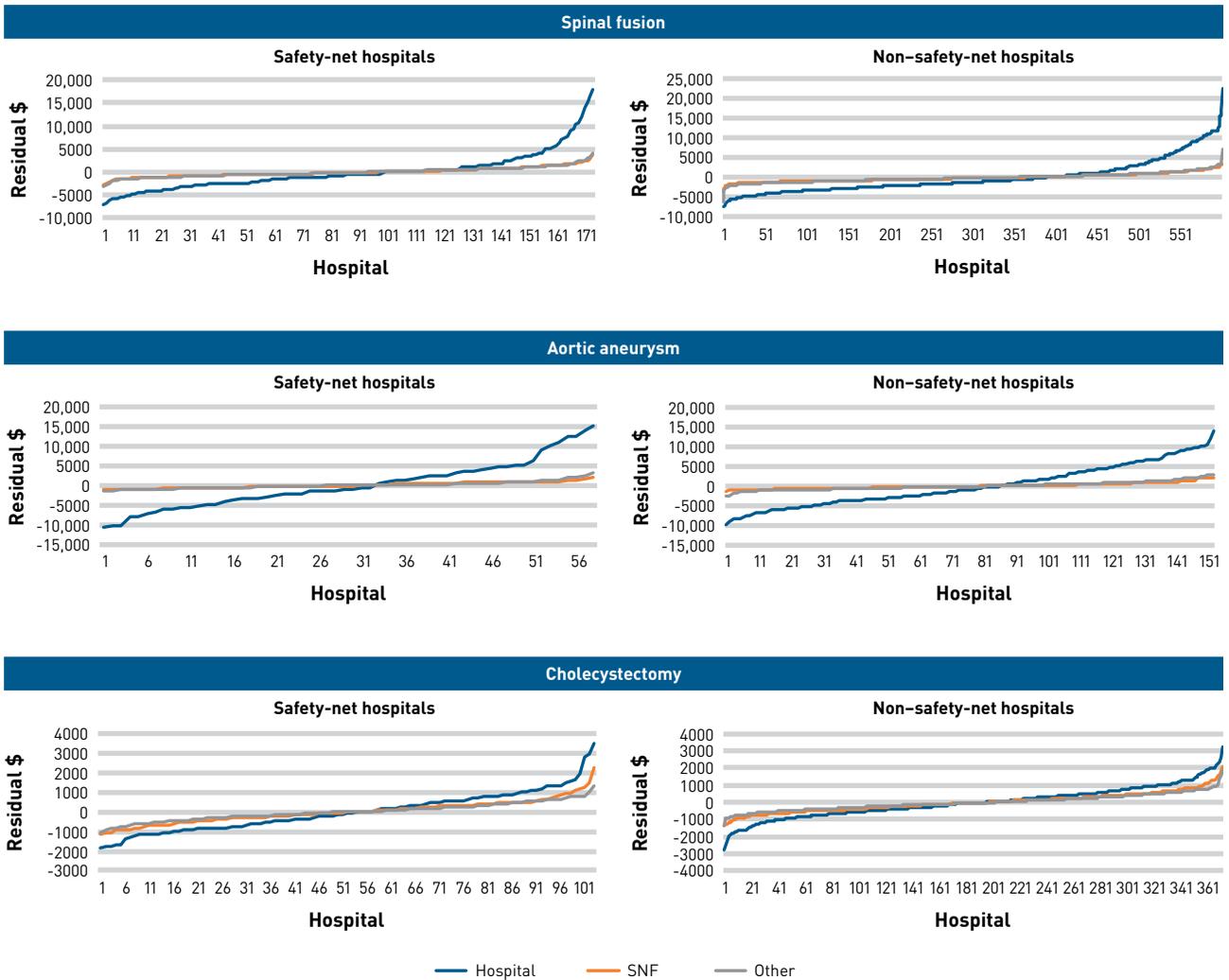
hospitals are not disadvantaged from the perspective of improvement opportunities (ie, opportunities to address episode spending do not appear to vary by safety-net status), improvement areas (ie, areas for spending variation reduction are similar for safety-net and non-safety-net hospitals), or CEBP performance (ie, safety-net status is not associated with higher spending as measured by CEBP measures).

However, findings about baseline episode spending do not imply that improvements will be similarly easy to attain for safety-net vs non-safety-net hospitals over time, particularly given that sicker patients or those with more challenging socioeconomic circumstances may be more likely to seek care at safety-net hospitals. For instance, the fact that we did not observe differences in episode spending for procedure-based episodes does not preclude more

differences in the ability to address variation across procedural episodes over time.

SNF care accounted for the most episode spending variation for these procedures, and the combination of more limited financial resources and greater patient social complexity at safety-net hospitals could nonetheless create greater challenges managing transitions of care and utilization between hospital and postacute settings. Future work is needed to evaluate the impact of publicly reported episode spending measures on quality and cost outcomes at safety-net and non-safety-net hospitals over time. If additional studies identify discrepancies in performance over time by hospital safety-net status, policy makers may need to implement measures such as those used in other payment reforms to support safety-net hospitals in their efforts to address episode spending (eg, customized

FIGURE. (Continued) Residual Plots for Episode Components, by Hospital Safety-Net Status



SNF, skilled nursing facility; UTI, urinary tract infection.

technical assistance¹⁴) or ensure that spending data are publicly reported in a more equitable fashion (eg, displayed using “peer groups” that compare performance among safety-net hospitals alone, rather than among all hospitals¹⁵).

Limitations

Our study has limitations. First, as with all observational studies, it is susceptible to residual confounding and unable to determine causal relationships between hospital safety-net status and episode spending. Although factors such as episode volume may affect CEBP performance, these data were unavailable through CMS. Moreover, the agency designed episode spending measures to compare all hospitals above minimum episode thresholds without additional volume adjustment. Therefore, our findings, which are adjusted

for hospital size, reflect CMS policy and are therefore policy salient. Second, future work is needed to complement our findings by evaluating patient-level spending outcomes. Third, although we evaluated all available CEBP measures, findings for these 6 episode types may not generalize to others. Fourth, no episode-specific quality data were available for interpretation alongside CEBP spending information, limiting our ability to draw conclusions about outcomes alongside spending.

CONCLUSIONS

Our analysis provides what is to our knowledge the first description of the starting point for safety-net hospitals under novel episode spending measures that are measured and publicly reported for

TABLE 2. Association Between Hospital Safety-Net Status and Episode Spending*

Regression coefficient	Episode type					
	Cellulitis (n=833)	Kidney/UTI (n=1439)	GH (n=1330)	AA (n=210)	Chole (n=474)	Spinal fusion (n=773)
Safety-net status						
Non-safety net (referent)						
Safety net	-111	-34	113	638	128	85
Size	-0.17	-0.29	0.52**	3.74**	0.19	0.04
Profit status						
Nonprofit (referent)						
For profit	320*	21	299**	-495	94	230
Government	69	-173	10	1259	-323	-671
Teaching status						
Nonteaching (referent)						
Minor teaching	-43	-101	188*	-353	-34	-205
Major teaching	-434**	-403*	187	6161*	122	927
Urban status						
Urban (referent)						
Rural	-301	-502***	-595***	-2301	-404	-12
Region						
West (referent)						
Midwest	86	-122	-8.57	-4154**	270	-2635***
South	-341*	-390**	-362***	-3585**	239	-1862***
Northeast	363*	202	321**	-4617**	120	-2575***

AA, aortic aneurysm; chole, cholecystectomy and common bile duct exploration; GH, gastrointestinal hemorrhage; UTI, urinary tract infection.

*P < .05; **P < .01; ***P < .001.

*Episode spending amounts reflect amounts that were reported in risk-adjusted and payment-standardized form (eg, accounts for wage index, medical education, disproportionate share hospital payments) on Hospital Compare.

hospitals nationwide. This is critical insight amid the continued emphasis on hospital spending and the shift toward value-based payment. ■

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REFERENCES

- Daly R. Verma points to hospitals as the largest driver of healthcare costs. Healthcare Financial Management Association. July 24, 2019. Accessed February 19, 2020. <https://www.hfma.org/topics/news/2019/07/verma-points-to-hospitals-as-the-largest-driver-of-healthcare-co.html>
- Liao JM, Zhou L, Navathe AS. Nationwide hospital performance on publicly reported episode spending measures. *J Hosp Med.* 2020;15:E1-E7. doi:10.12788/jhm.3377
- Khan C. Fiscal year 2019 Clinical Episode-Based Payment measures overview. Quality Reporting Center. June 7, 2018. Accessed February 20, 2020. https://www.qualityreportingcenter.com/globalassets/migrated-pdf/cepb_slides_npc-6.17.2018_5.22.18_vfinal508.pdf
- Hospital Inpatient Quality Reporting Program. CMS. Updated September 19, 2017. Accessed February 18, 2020. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/HospitalRHQDAPU.html>
- Werner RM, Goldman LE, Dudley RA. Comparison of change in quality of care between safety-net and non-safety-net hospitals. *JAMA.* 2008;299(18):2180-2187. doi:10.1001/jama.299.18.2180
- Ross JS, Bernheim SM, Lin Z, et al. Based on key measures, care quality for Medicare enrollees at safety-net and non-safety-net hospitals was almost equal. *Health Aff (Millwood).* 2012;31(8):1739-1748. doi:10.1377/hlthaff.2011.1028
- Gilman M, Adams EK, Hockenberry JM, Milstein AS, Wilson IB, Becker ER. Safety-net hospitals more likely than other hospitals to fare poorly under Medicare's value-based purchasing. *Health Aff (Millwood).* 2015;34(3):398-405. doi:10.1377/hlthaff.2014.1059
- Navathe AS, Liao JM, Shah Y, et al. Characteristics of hospitals earning savings in the first year of mandatory bundled payment for hip and knee surgery. *JAMA.* 2018;319(9):930-932. doi:10.1001/jama.2018.0678
- Kim H, Grundtitz JI, Meath THA, Quiñones AR, Ibrahim SA, McConnell KJ. Level of reconciliation payments by safety-net hospital status under the first year of the Comprehensive Care for Joint Replacement program. *JAMA Surg.* 2019;154(2):178-179. doi:10.1001/jamasurg.2018.3098
- AHA data products. American Hospital Association. Accessed February 24, 2020. <https://www.aha.org/data-insights/aha-data-products>
- Hospital Compare datasets. CMS. Accessed February 21, 2020. <https://data.medicare.gov/data/hospital-compare>
- Sutton JP, Washington RE, Fingar KR, Elixhauser A. Characteristics of safety-net hospitals, 2014. Healthcare Utilization and Cost Project. October 2013. Accessed February 19, 2020. <https://www.hcup-us.ahrq.gov/reports/statbriefs/sb213-Safety-Net-Hospitals-2014.pdf>
- Environmental scan to identify the major research questions and metrics for monitoring the effects of the Affordable Care Act on safety net hospitals. C. definition of safety net hospitals. Office of the Assistant Secretary for Planning and Evaluation. June 1, 2013. Accessed February 20, 2020. <https://aspe.hhs.gov/report/environmental-scan-identify-major-research-questions-and-metrics-monitoring-effects-affordable-care-act-safety-net-hospitals/c-definition-safety-net-hospitals>
- Support for small, underserved, and rural practices. CMS. Accessed April 1, 2020. <https://qpp.cms.gov/about/small-underserved-rural-practices>
- McCarthy CP, Vaduganathan M, Patel KV, et al. Association of the new peer group-stratified method with the reclassification of penalty status in the Hospital Readmission Reduction Program. *JAMA Netw Open.* 2019;2(4):e192987. doi:10.1001/jamanetworkopen.2019.2987

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