Hospital uncompensated care and patient experience: An instrumental variable approach

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Objective: Examine the endogenous relationship between uncompensated care and hospital patient experience scores.

Data Sources/Study Setting: The Hospital Consumer Assessment of Healthcare Providers and Systems Survey, CMS Healthcare Cost Report Information System, and the US Census Bureau.

Study Design: The exogenous change in uncompensated care caused by the 2014 Medicaid expansion was exploited to measure the effect of uncompensated care on patient experience scores using a 2SLS regression with instrumental variables approach.

Data Collection/Extraction Methods: U.S. general, short-term hospitals whose DSH status remained constant and had nonmissing data for 2011-2015, which totaled 969 unique hospitals per year.

Principal Findings: The effect of uncompensated care on patient experience was in the predicted direction, with three of the 10 measures being statistically significant. A one percentage point increase in uncompensated care costs resulted in a 0.25-0.50 percentage point decrease in select patient experience scores.

Conclusions: Results indicate a weak relationship between uncompensated care and patient experience scores, as a reduction in uncompensated care is related to quality improvement for some hospitals. These findings have implications for hospitals as they navigate changing reimbursement structures and policy makers considering changes to Obama-era health care reforms.

Keywords

hospital quality, instrumental variables, uncompensated care

1 | INTRODUCTION

Hospitals play a vital role in the social safety net by providing the majority of the nation's uncompensated care. Uncompensated care includes charity care, provided to patients who are unable to pay, and bad debts, which result from those who are able, but unwilling, to pay.¹⁻⁴ The Emergency Medical Treatment and Labor Act of 1986 contributed to the growth of uncompensated care, as it required hospitals to provide emergency treatment to all patients, regardless of their ability to pay.⁵ In 2013, hospitals provided approximately 60

percent of the nation's uncompensated care⁶ at a cost of \$34.9 billion.⁷ The costs associated with providing uncompensated care can be detrimental to a hospital's financial performance, and by extension, the quality of care it delivers. Hospitals with high uncompensated care burdens tend to experience lower financial margins than those with lower levels of uncompensated care.⁸⁻¹⁰ To mitigate these financial losses, hospitals may choose to cut back on costly quality improvements, such as investments in infrastructure, equipment, or staff.¹¹⁻¹⁴ Thus, as it affects the financial performance of a hospital, high uncompensated care also contributes to an erosion of quality.

Several provisions within the Affordable Care Act (ACA) aimed to reduce the amount of uncompensated care provided by hospitals. The most critical of these provisions was the expansion of Medicaid in 2014, which increased insurance coverage among many individuals who may have otherwise relied upon uncompensated care for their health services. There is strong evidence to suggest that, by enrolling these individuals in Medicaid, hospitals experienced a significant reduction in uncompensated care relative to hospitals in nonexpansion states,¹⁵⁻²¹ reducing uncompensated care costs by 17 percent in 2014 to \$28.9 billion.⁷ One possible consequence of reduced uncompensated care is an improvement in hospital quality. However, the endogeneity between hospital quality and uncompensated care makes the empirical investigation of this relationship a complex one. Endogeneity occurs when the explanatory variable is correlated with the error term. Common causes of endogeneity are simultaneous causality between the dependent and independent variables and/or failing to control for confounding factors that may be causing changes to both the dependent and independent variables. The implementation of the Medicaid expansion in 2014 provides a natural experiment that can be exploited to better understand this relationship. This study contributes to the literature by using a quasi-experimental research design to examine the effect of the exogenous change in uncompensated care caused by the Medicaid expansion on hospital quality outcomes.

2 | UNCOMPENSATED CARE, FINANCIAL HEALTH, AND QUALITY

The effect of uncompensated care on hospital quality operates through its impact on hospital finances. Evidence suggests that a high burden of uncompensated care is often accompanied by financial instability, with safety-net hospitals appearing to be particularly vulnerable to high levels of uncompensated care.⁸⁻¹⁰ Hospitals experiencing financial declines also tend to witness a deterioration of quality standards. Due to the costs associated with quality improvements, including investments in infrastructure, equipment, and staff, it is possible that hospitals might mitigate these efforts as financial health declines in an effort to avoid closure.²² Several studies have empirically tested the relationship between hospital financial health and quality outcomes, such as patient mortality rates,^{11,23} hospital compliance processes,¹³ and patient safety outcomes.^{12,14,24} Studies have also examined a hospital's proportion of low-income patients, an indicator of hospital financial health, in relation to health outcomes,^{25,26} mortality rates,^{27,28} readmission rates,^{27,29} and process of care measures.³⁰ Several studies have also investigated the relationship between hospital proportion of low-income patients and patient experience scores.^{28,31,32} The findings from these studies indicate a positive correlation between financial health and hospital quality outcomes across a variety of measures.

3 | CONTRIBUTION TO THE LITERATURE

This study builds on the literature in several ways. First, it operationalizes hospital quality as patient experience scores, which have

thus far been overlooked in the literature linking financial performance to quality but are increasingly highlighted by policy makers as important indicators of quality. While several studies have found that patient experiences are related to commonly accepted measures of quality, such as improved clinical care outcomes³³ and lower readmission rates,^{34,35} there remains a lack of consensus as to how patient experience scores correlate with clinical markers of quality.³⁶ However, given that some programs within the ACA, including the Hospital Value-Based Purchasing (VBP) program, have tied provider reimbursement to how well patient experience scores improve, it is important that factors related to this particular outcome are examined regardless of how well they correlate to other quality measures. The results of our study provide meaningful insights for hospital administrators as they navigate recently implemented value-based reimbursement models. Second, it examines the understudied relationship between uncompensated care and patient experience scores. Third, it takes advantage of the natural experiment presented by the Medicaid expansion to mitigate the empirical challenges related to analyzing the relationship between two endogenous variables: uncompensated care and hospital quality. It is plausible that a loop of causality exists between uncompensated care and quality. If hospitals with lower levels of quality are unable to successfully compete with higher-quality hospitals, they may only attract low-income patients, resulting in high levels of uncompensated care. As a result, high levels of uncompensated care would reduce a hospital's ability to invest in quality improvements, which would then contribute to a further deterioration of quality. Furthermore, there may be unobserved, difficult to measure variables that affect both uncompensated care and hospital quality that are not accounted for in the model, such as hospital culture, which would lead to biased results. To overcome these challenges, this study employs an instrumental variable (IV) approach wherein the exogenous variation in uncompensated care caused by the Medicaid expansion is used to estimate the association between uncompensated care and hospital quality.

4 | DATA AND METHODS

Data for the dependent variable, hospital inpatient experience, come from the Hospital Consumer Assessment of Healthcare Providers and Systems Survey (HCAHPS), which was developed by the Centers for Medicare and Medicaid Services (CMS) in conjunction with the Agency for Healthcare Research and Quality (AHRQ). The HCAHPS is a publicly available data set that offers a standardized instrument for measuring patient hospital experiences. The survey is administered to a random sample of adult patients, across payment type and medical condition, between 48 hours and 6 weeks after discharge. It is adjusted for hospital case mix, which allows for the comparison of responses across hospitals with different patient profiles and includes 32 questions on a variety of topics relevant to patient experience. Short-term, acute-care, nonspecialty hospitals participate in the HCAHPS. The individual-level data are aggregated and reported at the hospital level. The second major source of data is the CMS

Healthcare Cost Report Information System (HCRIS), also known as Medicare cost report data. Medicare-certified institutional providers are required to submit a yearly cost report to CMS, which is made up of a series of worksheets that collect information on hospital uncompensated care, facility characteristics, utilization data, cost and charge data, and financial statement data. This study also includes county-level demographic data that were accessed online through the US Census Bureau.

Initially, 484 hospitals were omitted from the 2011-2015 HCRIS data for duplicate cost reports, which was less than two percent of all hospitals that submitted a cost report from 2011-2015 ($n = 29\,518$). The sample was restricted to general, short-term, nonfederal U.S. hospitals residing in states that either participated in the full Medicaid expansion on January 1, 2014, or who had not yet expanded as of the end of 2015, the last year of study data ($n = 10\,830$). States that fully expanded on January 1, 2014, include Arizona, Hawaii, Illinois, Kentucky, Maryland, Massachusetts, Nevada, New Mexico, New York, North Dakota, Ohio, Oregon, Rhode Island, Vermont, and West Virginia. Delaware also expanded on January 1, 2014; however, it has so few hospitals that none of them had nonmissing data for all 5 years of the study. Nonexpansion states include Alabama, Florida, Georgia, Idaho, Kansas, Maine, Mississippi, Missouri, Nebraska, North Carolina, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, and Wyoming. Given that the full expansion went into effect on January 1, 2014, this study assumes that a hospital had to be exposed to the treatment for at least two-thirds of a year for it to have had an effect. As such, the sample was restricted to hospitals with fiscal years ending in September, October, November, or December ($n = 6871$). All hospitals with nonmissing data for each study year from 2011 to 2015 were retained ($n = 5265$). Given that the Medicaid expansion had the potential to affect a hospital's Medicare DSH status, and thus its financial performance, the sample was restricted to those hospitals whose Medicare DSH status remained constant across study years ($n = 4845$). The final full sample includes a total of 4845 hospital-year observations, with 969 unique hospitals observed in each fiscal year from 2011 to 2015. Of the 969 unique hospitals, 365 reside within treatment states, with 604 residing in control states.

4.1 | Independent and dependent variables

Data from the Medicare cost reports were used to construct the independent variable, uncompensated care costs, measured as a percent of total hospital operating expenses. The dependent variables (DV) for this analysis are measures of patient experience derived from the HCAHPS. CMS reports scores for seven composite measures of patient experience, with each measure made up of two or three survey questions asking about inpatient experiences. Topics include nurse communication, doctor communication, responsiveness of hospital staff, pain management, communication about medications, discharge information, and care transitions. Questions regarding care transitions are not available for all study years and are therefore not included in the analysis. The survey includes two

additional questions about hospital cleanliness and noise level, as well as two global measures: an overall rating of the hospital from 0-10 and a willingness to recommend measure. Results are reported at the hospital level as the percentage of patients at each hospital who give a certain response. Positive responses to the 10 measures of patient experience are used as the DVs for this study, which are measured as continuous variables with a range of responses between 0 and 100.

4.2 | Control variables

Factors other than a hospital's level of uncompensated care may also affect patient experience scores, such as hospital characteristics and community characteristics. Hospital characteristics, derived from the Medicare cost reports, include the following: hospital teaching status, measured as a dichotomous dummy variable; hospital employees measured as the number of full-time equivalencies (FTE); hospital ownership status, measured as a series of dichotomous dummy variables indicating nonprofit, for-profit, or government ownership; whether the hospital has Medicare DSH status due to treating a large proportion of low-income patients, measured as a dichotomous dummy variable equal to one if the hospital retains this status for each study year and zero if it does not have this status for each study year; and Medicare share of hospital days, measured as a percent of total hospital days. Community characteristics include percent of population living in poverty, percent of the population that is nonwhite, and unemployment rate, all of which are measured at the county level and derived from US Census Bureau data. While data limitations precluded the inclusion of hospital-level patient mix variables, these variables capture the distribution of the demographics of the patient population served by each hospital. A variable for hospital competition as measured by a Hirschman-Herfindahl Index (HHI) is also included and calculated on the basis of total discharges at the county level.

4.3 | Research design

The effect of uncompensated care on hospital patient experience scores was estimated using a two-stage least squares (2SLS) regression with instrumental variables (IV) approach. The IV approach exploits the exogenous variation in uncompensated care caused by the Medicaid expansion. The true, unbiased specification modeling the effect of uncompensated care on hospital quality can be estimated using the following OLS regression model:

$$\text{Qual}_{it} = \beta_0 + \beta_1 \text{UC}_{it} + \beta_2 \mathbf{X}_{it} + \beta_3 \mathbf{Z}_{it} + \beta_4 \text{Year}_t + \beta_5 \text{State}_i + \varepsilon_{it}, \quad (1)$$

where Qual_{it} is a continuous measure of quality for hospital i in time period t , UC_{it} is a continuous measure of the uncompensated care for hospital i in time period t , $\mathbf{X}_{it}$ is a vector of hospital-level controls, $\mathbf{Z}_{it}$ is a vector of community-level controls, Year_t is a vector of year-specific dummy variables, State_i is a vector of state-specific dummy

variables, and ε_{it} is the error term. However, a hospital's level of uncompensated care is not exogenous, meaning estimates resulting from Equation (1) would be biased due to hospital uncompensated care being correlated with the error term. To obtain an unbiased estimate of B_1 , we must identify exogenous variation in uncompensated care.

One solution is to exploit the variation in uncompensated care following the Medicaid expansion starting in 2014. To mitigate bias, this study uses the exogenous variation in uncompensated care caused by the Medicaid expansion to estimate the effect of uncompensated care on hospital quality. Two-stage least squared regression occurs in two phases. First, a predicted measure of uncompensated care was estimated using a difference-in-differences estimator as an instrument for uncompensated care in the following linear regression model:

$$UC_{it} = \beta_0 + \beta_1 \text{Expand}_i + \beta_2 \text{Post}_t + \beta_3 (\text{Expand}_i * \text{Post}_t) + \beta_4 X_{it} + \beta_5 Z_{it} + \varepsilon_{it}, \quad (2)$$

where UC_{it} is a continuous measure of uncompensated care for hospital i in time period t , Expand_i is a dummy variable indicating whether hospital i resides in one of the 16 states that implemented the full Medicaid expansion on January 1, 2014 ($\text{Expand}_i = 1$), or resides in one of the 19 states not moving forward with the expansion in any form at the time of this writing ($\text{Expand}_i = 0$), Post_t is equal to one if it is after the introduction of the Medicaid expansion, 2014 or 2015, and $\text{Expand}_i * \text{Post}_t$ indicates the change in uncompensated care caused by the Medicaid expansion and acts as the IV. As the results of the first-stage regression confirm below, there is a strong correlation between the endogenous regressor in Equation (1), uncompensated care, and the IV in Equation (2), $\text{Expand}_i * \text{Post}_t$. The natural experiment created by the Medicaid expansion resulted in an exogenous increase in insurance coverage among qualifying residents in expansion states in 2014. In turn, these changes resulted in exogenous variation in uncompensated care from the pre- to the postexpansion time periods that we use to identify β_1 in Equation 1.

In the second stage regression, the predicted measure of UC_{it} obtained from Equation (2) was used to estimate Equation (3) in the following linear regression model:

$$\text{Qual}_{it} = \beta_0 + \beta_1 \widehat{UC}_{it} + \beta_2 X_{it} + \beta_3 Z_{it} + \beta_4 \text{Expand}_i + \beta_5 \text{Post}_t + \varepsilon_{it}, \quad (3)$$

where $\widehat{UC}_{it}$ represents the exogenous change in uncompensated care caused by the Medicaid expansion and is therefore uncorrelated with the error term. Heteroskedastic-robust standard errors were obtained by clustering at the provider level.

It is important to note that the IV estimates of the relationship between uncompensated care and hospital quality represent a local average treatment effect (LATE), meaning they apply only to those hospitals with uncompensated care that were sensitive to the Medicaid expansion, but that did not experience a Medicare DSH status change as a result of Medicaid expansion. Thus, the results

TABLE 1 Difference-in-differences regression results—parallel trends assumption

	Uncompensated care costs
Expand*2011	0.631 (0.191) ***
Expand*2012	0.181 (0.173)
Expand*2014	-1.312 (0.192) ***
Expand*2015	-1.316 (0.176) ***
Expand	-1.501 (0.314) ***
2011	-0.867 (0.159) ***
2012	-0.255 (0.098) ***
2014	-0.202 (0.116)*
2015	-0.664 (0.149) ***
Employees	-0.000 (0.000) *
For-profit	-1.484 (0.233) ***
Government	3.216 (0.738) ***
DSH	1.998 (0.224) ***
Teaching hospital	0.053 (0.258)
HHI discharges	0.568 (0.370)
Pct. medicare days	-0.050 (0.014)***
Pct. below poverty	-0.005 (0.023)
Pct. nonwhite	0.012 (0.009)
Unemployment rate	0.141 (0.067)**
Constant	5.064 (0.554)***
R ²	0.245
N	4845

Notes: Uncompensated care costs are measured as the percent of total hospital operating expenses. Heteroskedastic-robust standard errors in parentheses are clustered at the provider level. All dollar figures used in the analysis were adjusted to 2015 dollars.

* $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Source: Medicare cost reports, CMS HCAHPS, and the US Census Bureau from 2011 to 2015 for general, short-term, nonfederal hospitals that participate in Medicare and are observed in each year of the study.

of this analysis are most applicable to hospitals in states that have already expanded Medicaid, as well as those in states that may expand in the future.

In order for the difference-in-differences estimator in Equation (2) to qualify as a good IV, several requirements have to be satisfied. First, the results of the regression analysis represented by Equation (2) must pass a test of parallel trends, which is the key identifying assumption for difference-in-differences research design. The parallel trends assumption holds that the outcome of interest for the treatment and control groups would follow the same trend in the absence of the treatment. Meaning that, had the Medicaid expansion never happened, hospitals in expansion and nonexpansion states would have exhibited the same uncompensated care trends in 2014 and 2015. Pretreatment data are used to verify this assumption since the counterfactual cannot be directly observed.

FIGURE 1 Time trends of uncompensated care costs for hospitals in expansion and nonexpansion states
Source: Author's analysis of Medicare cost reports from 2011 to 2015 for general, short-term, nonfederal hospitals that participate in Medicare and were observed in each year of the study

Table 1 shows the results of the parallel trends test for Equation (2). The coefficients on the group and time interactions for the pre-expansion periods, $\text{Expand} \times 2011$ and $\text{Expand} \times 2012$, indicate whether there were differential changes in provision of uncompensated care between the two groups prior to the full expansion of Medicaid in 2014. The coefficient for $\text{Expand} \times 2011$ is statistically significant at the 0.01 level, suggesting that a difference in uncompensated care trends did exist between hospitals in the two groups prior to the expansion. However, this pre-expansion difference should not undermine the findings, which offer strong causal evidence that the Medicaid expansion substantially reduced hospitals' burden of uncompensated care. Figure 1 offers evidence of a clear and precipitous drop in provision of uncompensated care for hospitals in expansion states in 2014 that continued in 2015. A similarly steep reduction does not occur for hospitals in nonexpansion states.

It is plausible that an anticipation effect contributed to a reduction in uncompensated care growth for hospitals in expansion states prior to the implementation of the full Medicaid expansion in 2014. Evidence suggests that individuals may alter their behavior in anticipation of the enactment of future policies. In a study of the anticipatory effect of the announcement of Medicare Part D 2 years before its implementation on the prescription drug consumption behavior of older individuals, Alpert³⁷ found a substantial decline in the overall drug usage of older individuals after the announcement of Part D, which was followed by a spike in usage after the policy went into effect. This suggests that consumers altered their behavior in response to expected price reductions resulting from subsidized prescription drug coverage. Because there was a 4-year lag between when the Medicaid expansion was signed into law and when it was fully implemented, it is possible that forward-looking uninsured individuals in expansion states delayed seeking medical care until they became eligible for Medicaid, thus reducing the supply of uncompensated care provided by hospitals in expansion states relative to those

TABLE 2 Pre-expansion means and proportions (2013)

	Expansion ^a	Nonexpansion
Uncompensated care costs	4.638 (4.794)	6.142 (4.123)
Nurses always communicated well	77.586 (5.003)	79.248 (5.142)
Doctors always communicated well	79.099 (3.878)	82.475 (4.602)
Staff always responsive	64.430 (7.519)	67.283 (7.881)
Pain always managed well	69.367 (4.617)	71.290 (4.913)
Medication info. always communicated well	62.082 (5.055)	64.714 (6.358)
Room always clean	71.090 (7.017)	72.919 (6.61)
Room always quiet	55.164 (7.136)	64.873 (9.007)
Received discharge info.—Yes	85.521 (4.011)	85.854 (3.91)
Overall hospital rating—9 or 10	67.803 (8.394)	71.641 (8.824)
Definitely recommend hospital—Yes	69.323 (9.334)	72.089 (9.739)
Employees	1791.880 (2432.275)	1116.637 (1563.245)
Non-profit	0.849	0.455
For-profit	0.099	0.333
Government	0.052	0.212
DSH	0.896	0.828
Teaching hospital	0.455	0.225
HHI discharges	0.450 (0.34)	0.583 (0.358)
Pct. medicare days	38.372 (11.902)	41.214 (13.34)
Pct. below poverty	15.841 (5.122)	18.014 (6.177)
Pct. nonwhite	18.075 (13.34)	22.530 (15.623)
Unemployment rate	7.824 (1.832)	7.083 (2.03)
N	365	604

Notes: Uncompensated care costs are measured as the percent of total hospital operating expenses. Standard deviations in parentheses for the continuous variables. All dollar figures used in the analysis were adjusted to 2015 dollars.

^aDifferences between groups for all variables are statistically significant at the 0.01 level except for "Received Discharge Info.—Yes" which is not significant at any level.

Sources: Medicare cost reports, CMS HCAHPS, and the US Census Bureau from 2013 for general, short-term, nonfederal hospitals that participate in Medicare and are observed in each year of the study.

in nonexpansion states in the years immediately preceding 2014. Such a change in behavior could have contributed to the reduced uncompensated care growth observed in Figure 1 for hospitals in expansion states from 2012 to 2013. Had the Medicaid expansion never occurred, it is plausible to conclude that hospitals in expansion and nonexpansion states would have maintained parallel trends in uncompensated care across the study years of 2011-2015.

TABLE 3 Two-stage least squares regression results

	First stage	Second stage				
	Uncomp. care costs	Nurse comm. well-always	Doc. comm. well-always	Staff responsive-always	Pain Managed well-always	Meds. info comm. well-always
	(1)	(2)	(3)	(4)	(5)	(6)
Expand*Post	-1.590 (0.235) ***					
Uncompensated care costs		-0.189 (0.100) *	-0.216 (0.098) **	-0.206 (0.168)	-0.068 (0.131)	-0.093 (0.141)
Expand	-1.20 (0.164) ***	-1.459 (0.390) ***	-2.262 (0.351) **	-1.754 (0.562) **	-1.393 (0.377) ***	-1.999 (0.429) ***
Post	-0.123 (0.162)	0.367 (0.209) *	0.367 (0.209) *	-0.384 (0.319)	-0.458 (0.216) **	0.283 (0.262)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.241	0.228	0.283	0.286	0.166	0.207
N	4845	4845	4845	4845	4845	4845

Notes: Uncompensated care costs are measured as the percent of total hospital operating expenses. Heteroskedastic-robust standard errors in parentheses are clustered at the provider level. All dollar figures used were adjusted to 2015 dollars. Control variables include: number of employees, ownership status, Medicare DSH status, teaching hospital status, HHI based on discharges per county, percent Medicare days, percent in county below poverty, percent in county nonwhite, unemployment rate of county.

* $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Source: Medicare cost reports, CMS HCAHPS, and the US Census Bureau from 2011-2015 for general, short-term, nonfederal hospitals that participate in Medicare and are observed in each year of the study.

Consistent with prior research, the results in Table 1 suggest that the Medicaid expansion was strongly correlated with a reduction in uncompensated care.¹⁵⁻²¹ The coefficients on the difference-in-differences estimators in Table 1, Expand*2014 and Expand*2015, are negative and statistically significant at the 0.01 level. They indicate that hospitals in expansion states experienced a 1.3 larger percentage point decline in uncompensated care as a share of total operating expenses relative to hospitals in nonexpansion states in 2014 and 2015. This suggests a strong relationship between the IV and the endogenous regressor, which is a requirement that must be satisfied for the IV approach to be valid. According to Bound et al³⁸ a weak correlation between the excluded instrument and the endogenous regressor can bias the results.

Another key assumption relevant for this study is the exclusion restriction, which holds that the excluded instrument can only influence the outcome of interest through its effect on the endogenous regressor. For the present study, the exclusion restriction assumes that the Medicaid expansion only influenced hospital patient experience scores through its impact on uncompensated care. As noted, evidence suggests that hospitals may attempt to alleviate financial constraints related to high levels of uncompensated care by reducing quality improvement efforts. As such, it follows that reducing uncompensated care would result in quality improvements. Given the abundance of evidence showing that the Medicaid expansion effectively reduced uncompensated care, it is reasonable to assume that this was the primary mechanism through which the Medicaid expansion affected patient experience scores. Additional falsification tests were performed to evaluate the validity of the exclusion restriction. The results, which are included in

Table S2 of the Appendix S1, strengthen our confidence that the exclusion restriction is valid.

5 | RESULTS

5.1 | Descriptive statistics

Table 2 displays the means and proportions of the variables for hospitals in 2013, prior to the Medicaid expansion. Several noteworthy differences between hospitals in expansion and nonexpansion states exist. Prior to the expansion, hospitals in expansion states experienced lower levels of uncompensated care as well as lower scores for all 10 dimensions of patient experience relative to hospitals in nonexpansion states. This finding is interesting in light of the results of the 2SLS with IV regression below, which indicate an inverse relationship between uncompensated care and patient experience scores.

5.2 | Instrumental variables

Results of the 2SLS with IV regression are shown in Table 3. As a basis of comparison, we included the reduced form version for the second stage regression in Table S1 of the Appendix S1, which displays the coefficients from regressions of each outcome on the explanatory variables. In these regressions, uncompensated care costs have not been instrumented to correct for endogeneity. Columns (2) through (11) in Table 3 show IV estimates of the effect of uncompensated care on the 10 indicators of patient experience. For each measure of patient experience, except for “definitely recommend—yes,” the

Room clean-always (7)	Room quiet-always (8)	Discharge info. comm.—Yes (9)	High rating—9 or 10 (10)	Definitely recommend—Yes (11)
–0.265 (0.164)	–0.300 (0.164) *	–0.123 (0.093)	–0.267 (0.166)	0.056 (0.164)
–1.445 (0.522) **	–7.198 (0.627) ***	–0.520 (0.315) *	–4.613 (0.624) ***	–4.465 (0.664) ***
–0.379 (0.286)	0.208 (0.353)	1.227 (0.159) ***	–0.627 (0.361) *	–1.445 (0.374) ***
Yes	Yes	Yes	Yes	Yes
0.190	0.403	0.280	0.285	0.308
4845	4845	4845	4845	4845

coefficient on the IV estimate, uncompensated care costs, is negative; however, only three of them are statistically significant. The results suggest that a one percentage point increase in uncompensated care costs as a share of total operating expenses is associated with a 0.19 percentage point decrease (a 0.25 percent change from the pre-expansion mean) for the measure “nurse always communicated well” ($P < 0.10$); a 0.22 percentage point decrease (a 0.27 percent change from the pre-expansion mean) for the measure “doctor always communicated well” ($P < 0.05$); and a 0.30 percentage point decrease (a 0.50 percent change from the pre-expansion mean) for the measure “room always quiet” ($P < 0.10$). In addition to only three of the 10 outcomes being statistically significant, the effect sizes are small. When compared to the pre-expansion mean in the outcomes for 2011–2013, the effect sizes represent a modest 0.25–0.50 percent change in score. Furthermore, two of the three statistically significant measures of patient experience, “nurse always communicated well” and “room always quite,” are significant at the 0.10 level. The lack of statistical significance for seven of the outcomes, coupled with the small effect sizes, indicates that reducing uncompensated care is not necessarily accompanied by an improvement in patient experience scores for all hospitals. The implications of these results are discussed more fully below.

Column (1) in Table 3 shows the results of the difference-in-differences analysis represented by Equation (2) in which the IV, $\text{Expand} \times \text{Post}$, predicts the exogenous change in uncompensated care caused by the Medicaid expansion. The coefficient on this variable is negative and statistically significant at the 0.01 level, indicating that uncompensated care costs as a share of total operating expenditures was 1.6 percentage points lower in expansion states

than in the comparison states postexpansion, which is consistent with the results displayed in Table 1. In addition, the Kleibergen-Paap rk Wald F -statistic ($F = 66.98$; $P < 0.01$) from the first-stage regression suggests that the difference-in-differences instrument is adequate to identify the endogenous uncompensated care measure in the first-stage regression equation.

6 | DISCUSSION

This study has two main findings. First, the negative correlations between uncompensated care and positive patient experience scores suggest that reducing uncompensated care may contribute to improved hospital experience scores. However, only three of the 10 indicators of patient experience were statistically significant, two of which were at the $P < 0.10$ level, indicating that uncompensated care is not a strong predictor of patient experience scores. If hospitals are diverting resources away from investments that would improve patient experiences in order to offset the costs of uncompensated care, as suggested by the literature,²² then as uncompensated care declines, one would expect hospitals to shift resources back toward quality improvements, resulting in better patient experiences. The findings from this study suggest that this may not be occurring, which is an indication that hospitals may utilize these resources for alternative purposes. The second key finding is that for the three indicators of patient experience that were statistically significant, the effect sizes were small. This suggests that financially strained hospitals that are able to substantially reduce higher than average levels of uncompensated care

may see meaningful improvements in patient experience scores. This is in accordance with the literature examining the relationship between financial security and hospital quality,^{25–32} with evidence suggesting that quality is most affected in hospitals with deep financial problems.¹⁴

Understanding the relationship between hospital finances and patient outcomes is particularly important in the context of federal funding cuts to safety-net hospitals and new value-based reimbursement models precipitated by the ACA. One such initiative, the Hospital VBP program, offers incentive payments to acute-care hospitals based in part on improvements in patient experience scores.³⁹ Thus, understanding the factors affecting patient experience scores is of particular concern for hospital administrators as they navigate shifting reimbursement structures. Future work can contribute to a more nuanced understanding of how the relationship between uncompensated care and patient experiences varies based on the hospital's initial level of financial health and by examining how hospitals allocate resources that had previously been dedicated to covering costs associated with uncompensated care. Additional empirical investigations of the effect of uncompensated care on alternative measures of hospital quality, such as mortality or readmission rates, should also be conducted to see whether they yield similar results.

There are also limitations worth noting. Given that the exclusion restriction cannot be empirically confirmed, satisfying this assumption is often the most difficult requirement for the IV approach. While evidence suggests that the Medicaid expansion had strong effect on reducing uncompensated care, it is possible that it might have affected patient experience scores in other ways that are not controlled for in the model. For example, new enrollees with no prior coverage may have reported having satisfactory inpatient experiences due to the fact that they gained access to critical hospital resources that they were previously unable to secure, regardless of the quality of care they actually received. This would be a violation of the exclusion restriction, leaving the IV estimate vulnerable to bias. However, the results of the falsification tests support the validity of the exclusion restriction (see Table S2 in the Appendix S1).

There are also limitations associated with the data used in this study. As noted in prior studies,^{13,14} Medicare cost reports, which rely on financial statements that are not required to be audited, suffer from missing information and measurement error.^{40,41} While modifications to the cost report worksheets in 2010 improved the quality of hospital uncompensated care information,⁴² continuing issues with missing data posed challenges for this study. As a result, this analysis did not stratify the sample based on hospital type or strength of baseline financial health. Future research can contribute to a better understanding of how uncompensated care affects patient experience scores by examining differences resulting from these characteristics. The data used in this study also did not include information on hospital patient case mix, which could potentially be associated with both hospital uncompensated care and patient

experience scores. To mitigate potential omitted variable bias, this study included several county-level controls in order to capture the distribution of the demographics of the patient population served by each hospital.

7 | CONCLUSION

As insurers of last resort, hospitals are often burdened with high levels of care for which they are not reimbursed, resulting in widespread financial implications that reverberate across society as taxpayers and consumers are relied upon to offset the costs of this care. In response, hospitals may resort to reducing costly quality improvements in order to stabilize their financial condition. The endogeneity between uncompensated care and hospital quality has thus far rendered this relationship difficult to empirically examine. The implementation of the Medicaid expansion in 2014 afforded an opportunity to investigate the effect of an exogenous change in uncompensated care on hospital patient experience scores. The findings suggest that an increase in uncompensated care is related to a small decrease in patient experience scores, implying that reducing uncompensated care would result in improvements in patient experiences for financially vulnerable hospitals.

The results from this study have implications for hospitals with high levels of uncompensated care, particularly those in nonexpansion states. Because some patient experience scores are most likely to improve for hospitals who are able to considerably reduce high levels of uncompensated care, hospitals in nonexpansion states might face unique challenges, as strong evidence exists to support the conclusion that the Medicaid expansion caused large decreases in uncompensated care. The financial implications of not expanding Medicaid may also be compounded if, in the face of looming federal funding cuts, these hospitals are further penalized by the Medicare VBP program for failing to show improvement in patient experience scores. These findings should be taken into consideration by policy makers considering changes to the Obama-era health care reforms and the structure of Medicaid funding, as reductions in funding have the potential to reverse the current trend of declining uncompensated care, which has the potential to contribute to an erosion of quality standards.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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