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Medicare's comprehensive care for joint replacement model increased public hospitals' inpatient length of stay

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Abstract

Background The Comprehensive Care for Joint Replacement (CJR) model is an alternative Medicare payment model for joint replacement that mandated participation by hospitals in randomly selected Metropolitan Statistical Areas (MSAs). On average, the program decreased inpatient length of stay and increased home discharge rates. It is unclear if these effects differed based on hospital ownership type, even though ownership may impact care redesign opportunities.

Methods We used the 2014–2017 California Patient Discharge Datasets. The study included 113,590 hospitalizations for hip and knee joint replacement from 287 hospitals in the treated and control MSAs in California. The primary outcomes were inpatient length of stay and home discharge rates. Home discharge status included self-care, the use of home health, and hospice care at home. To determine whether the impact of the CJR model differed by hospital ownership type, we used event study, difference-in-differences (DID), and triple differences (DDD) models to estimate changes in health care services utilization in treated relative to control areas before versus after CJR implementation (April 2016) by hospital ownership type.

Results Of the 113,590 hospitalizations, 51,708 (45.52%) were in treated MSAs and 61,882 (54.48%) were in control MSAs; 81,649 (71.88%) were from nonprofit hospitals, 20,247 (17.82%) were from for-profit hospitals, and 11,694 (10.29%) were from government-owned hospitals. DID analyses showed that after policy implementation, nonprofit and for-profit hospitals experienced a decrease in inpatient length of stay of 0.02 days (95% CI, -0.04 to -0.01) and 0.04 days (95% CI, -0.06 to -0.01), respectively, while government-owned hospitals experienced an increase by 0.11 days (95% CI, 0.04 to 0.18). For home discharge rates, nonprofit hospitals experienced an increase of 0.02 (95% CI, 0.01 to 0.03), while other hospitals did not show statistically significant changes. DDD analyses confirmed that inpatient length of stay increased in public compared to nonprofit hospitals in treated relative to control MSAs after policy implementation.

Conclusions The impacts of the CJR program differed by hospital ownership type. Government-owned hospitals, with their unique financial circumstances, may have faced challenges that hindered the reductions in inpatient length of stay observed in other types of hospitals under the CJR Model.

Keywords Medicare, Alternative Payment Models, Bundled Payment Program, Hospital Ownership Type, Health Policy, Health Insurance

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Background

An extensive literature describes how hospital ownership impacts hospital performance and care in the United States (US) [1–5]. For-profit hospitals are generally more responsive to profit-making opportunities and provide health care services based primarily on their relative profitability compared to nonprofit and government-owned hospitals [1, 3, 4]. At the other extreme, government-owned hospitals, which are exempt from most taxes and financially supported by tax revenues [6], are under less pressure to make profits and therefore offer relatively fewer profitable health care services and more charity care to socioeconomically disadvantaged populations [1, 2, 4, 6]. Nonprofit hospitals, which receive tax exemptions contingent upon providing charity care and community benefits, are positioned between for-profit and government-owned hospitals in terms of service provision [1, 6].

In recent decades, varying forms of alternative payment policies have been introduced to reduce spending while maintaining quality of care in the traditional Medicare program [7–9]. To date, however, no evidence has established whether these payment policies differentially affect hospitals based on ownership type. Adoption and effectiveness of voluntary payment programs may vary based on ownership type depending on their distinctive financial incentives and operational structures [7]. For-profit and government-owned hospitals' participation in voluntary bundled payment programs has been low [10, 11]. For example, nationally, only 5.9% (61 out of 1,034 in 2015) of for-profit hospitals and only 1.1% (11 out of 983 in 2015) of government-owned hospitals participated in the Bundled Payments for Care Initiative's (BPCI) for joint replacement. Additionally, hospitals experiencing financial losses subsequently opted out of the voluntary program [12].

The Comprehensive Care for Joint Replacement (CJR) model, the first Medicare bundled payment model that required program participation based on a random selection process, provides a rare opportunity to examine differential hospital response based on ownership type. Implemented in 2016, it required participation by hospitals in Metropolitan Statistical Areas (MSAs) randomized to the program and not already participating in BPCI. The CJR increased the proportion of for-profit hospitals reimbursed for joint replacement procedures via bundled payment to 19.0% (197 out of 1,035 in 2016) and the proportion of government-owned hospitals to 11.4% (109 out of 956 in 2016) [10, 11]. Whether they responded differently to the CJR than non-profit hospitals, however, remains poorly understood.

Prior work demonstrates that in response to mandated participation in the CJR, some hospitals redesigned entire care delivery systems to align with target costs and quality incentives [13]. In particular, participating hospitals tried to reduce cost by increasing preoperative preparation to reduce inpatient length of stay and have tighter controls on patient discharge disposition — expanding networks with home health agencies and reducing referrals to skilled nursing facilities (SNFs), and referring to a more select group of SNFs [9–12]. To date, only one study found that nonprofit hospitals achieved greater savings compared to for-profit or government-owned hospitals under the CJR model; however, that study was limited to the first year of policy implementation [14].

To bridge the current knowledge gap, this study used the 100% California patient discharge dataset to estimate the differential effects of the CJR model by hospital ownership type.

Methods

The study protocol was approved by the State of California's Committee for the Protection of Human Subjects (CPHS) and the University of Southern California's Institutional Review Board. California's CPHS waived informed consent based on the infeasibility of obtaining consent and the minimal risk of harm. The findings were reported using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Data sources and sample population

This study analyzed California's Patient Discharge Data (PDD) from 2014 to 2017, the 2014 Hospital Annual Utilization Report dataset and the 2014 Four Quarter Summary Hospital Utilization Patient Days by Type of Ownership dataset provided by the California Department of Health Care Access and Information (HCAI). The PDD dataset contains comprehensive information on 100% of hospitalizations for major hip or knee joint replacement (MS-DRG 469 and 470), including the admitting hospital, admission and discharge dates, patient's age, race, and discharge disposition (e.g., discharged to home or a skilled nursing facility), irrespective of primary payer. The other datasets provide detailed information on hospital characteristics, most importantly ownership status. The authors had no access to information that could identify individual participants during or after data collection.

Hospitalizations of traditional Medicare patients were included in the study based on their primary payer information in the dataset. We limited Medicare beneficiaries to those ages 65 and over, assuming that those who are under the age of 65 but receive Medicare benefits would have other medical conditions that could complicate estimation. Our treatment group consisted of hospitals

located in the three MSAs randomized to the CJR participation – San Francisco-Oakland-Hayward, Modesto, and Los Angeles-Long Beach-Anaheim. The control group consisted of hospitals in the other 23 MSAs. The hospitalizations from 37 hospitals participating in the BPCI initiatives were excluded from both the treatment and control groups because they were excluded from the CJR participation. In addition, 62 hospitalizations without information on primary payer were excluded.

Outcomes

Our primary outcomes of interest were inpatient length of stay and discharge to home, which are the two most frequently studied outcomes in previous research examining behavioral changes associated with the CJR model [15–20]. For inpatient length of stay, we used the HCAI's recommended adjusted length of stay variable, which replaced 0 days in the length of stay variable with 1 to give value to patients who were admitted for hospitalization but discharged home on the same day [21]. We further applied a logarithmic transformation to the adjusted length of stay to handle the outcome's skewed distribution. To analyze discharge status, we created a binary indicator for home discharge (1 = being discharged to home; 0 = otherwise). Home discharge included self-care at home as well as care at home from an organized home health service organization or a hospice at home [22].

Covariates

We controlled for a series of patient and hospital characteristics of that could affect the outcomes of interest. Specifically, we included patient age and its square, a binary indicator for female (1 = female, 0 = otherwise) and a categorical variable for race/ethnicity. We also controlled for hospital characteristics such as bed size (small = bed counts 0–99, medium = 100–249, large = 250 +), whether a hospital was merged with other hospitals (1 = Yes, 0 = No), whether it was a teaching hospital (1 = Yes, 0 = No) and whether it was located in a rural area (1 = Yes, 0 = No.) To control for severity of the illness and underlying health conditions of patients, we also included MS-DRG codes (MS-DRG 469 or 470) and an indicator for admission from emergency department (1 = admission from emergency department, 0 = otherwise) as covariates. Lastly, we included both hospital and quarter-year fixed effects in the analysis model to control for time-invariant, unobservable characteristics of each hospital and general trends in outcomes across California.

Statistical analysis

To estimate the varied impact of the CJR model by hospital ownership type, we divided the treatment and control hospitals into three groups – nonprofit, for-profit and government-owned hospitals – and conducted event study and difference-in-differences (DID) analyses separately for each hospital group. With the event study, we estimated quarter-year patient-level changes in the outcomes of interest – adjusted length of stay and home discharge rates – before and after CJR implementation (Appendix Information 1A). In the DID models, we estimated the differential changes in outcomes after relative to before policy implementation in treated relative to control hospitals (Appendix Information 1B). Lastly, we employed a triple difference (DDD) analysis, an extended version of DID, to test whether the differences by patient group and hospital ownership status were statistically distinguishable from zero (Appendix Information 1C). In the DDD analysis, nonprofit hospitals served as the reference group because they are the most common type of hospital serving the largest number of patients in the US.

We conducted several sensitivity analyses to test the robustness of our findings. First, we conducted DID analyses without any age restrictions. Additionally, we conducted DID analyses to identify changes in patient mix in government-owned hospitals that experienced distinctive changes after the policy implementation compared to other types of hospitals. Lastly, we employed a wild cluster bootstrap in the DID and DDD analysis using MSA clusters to address potential concerns about inference with a treatment (program participation) that was clustered at the MSA level but with only a small number of treated and control clusters.

Statistical results were considered significant at a confidence level of 95% and all analyses were performed using linear regression models. We used Stata/MP 16.1 for all analyses.

Results

Excluding hospitals participating in the BPCI initiatives, which were exempt from the CJR, a total of 287 hospitals were included in the study. Among them, 142 were in the treated MSAs and 145 were in control MSAs. The treatment group had a higher proportion of for-profit (33.1% vs. 14.5%), teaching (9.1% vs. 6.4), urban (99.3% vs. 76.6%), and large (43.7% vs. 26.9%) hospitals compared to the control group (Table 1).

The total number of hospitalizations included was 113,590. Among them, 51,708 were from treated and 61,882 were from control hospitals. Overall demographic characteristics of the patients admitted to the treated and control hospitals were not substantially different except for race and ethnicity. The proportion of non-Hispanic White patients was lower in treated relative to control hospitals (72.6% vs. 81.7%). Differences in racial and ethnic composition were also notable within hospital ownership type. Government hospitals were less likely to have

Table 1 Descriptive statistics of hospitals and patients in California from 2014 to 2017 ($N = 113,590$)

	No. (%)							
	Treated MSAs				Control MSAs			
	Total	Nonprofit Hospitals	For-profit Hospitals	Government Hospitals	Total	Nonprofit Hospitals	For-profit Hospitals	Government Hospitals
n of hospitals	142 (100.0)	84 (59.2)	47 (33.1)	11 (7.7)	145 (100.0)	93 (64.1)	21 (14.5)	31 (21.4)
n of observations	51,708 (100.0)	37,163 (71.9)	10,435 (20.2)	4,110 (7.9)	61,882 (100.0)	44,486 (71.9)	9,812 (15.9)	7,584 (12.2)
Hospital Characteristics								
Level								
Parent Facility	137 (96.5)	82 (97.6)	44 (93.6)	11 (100.0)	143 (98.6)	91 (97.9)	21(100.0)	31 (100.0)
Consolidated Facility	5 (3.5)	2 (2.4)	3 (6.4)	0 (0.0)	2 (1.4)	2 (2.1)	0 (0.0)	0 (0.0)
Teaching Status								
Yes	13 (9.1)	9 (10.7)	0 (0.0)	4 (36.4)	9 (6.4)	5 (6.2)	0 (0.0)	4 (12.9)
No	129 (90.9)	75 (89.3)	47 (100.0)	7 (63.6)	136 (93.6)	89 (93.8)	21 (100.0)	27 (87.1)
Location								
Urban	141(99.3)	84 (100.0)	47 (100.0)	1 (9.1)	111 (76.6)	19 (20.4)	18 (85.7)	19 (61.3)
Rural	1 (0.7)	0 (0.0)	0 (0.0)	10 (90.9)	34 (23.4)	74 (79.6)	3 (14.3)	12 (38.7)
Bed count								
1–99	11 (7.7)	2 (2.4)	8 (17.0)	1 (9.1)	42 (29.0)	26 (28.0)	6 (28.6)	10 (32.3)
100–249	69 (48.6)	35 (41.7)	32 (68.1)	2 (18.2)	64 (44.1)	39 (41.9)	12 (57.1)	13 (41.9)
250 +	62 (43.7)	47 (55.9)	7 (14.9)	8 (72.7)	39 (26.9)	28 (30.1)	3 (14.3)	8 (25.8)
Patient Characteristics								
Age, mean (SD)	75.1 (7.3)	75.2 (7.4)	74.9 (7.1)	74.3 (6.8)	75.0 (7.4)	75.0 (7.4)	74.9 (7.2)	75.5 (7.7)
Women	33,470 (64.7)	24,214 (65.2)	6,642 (63.7)	2,614 (63.6)	39,090 (63.2)	27,959 (62.9)	6,164 (62.8)	4,967 (65.5)
Race / Ethnicity								
White	37,538 (72.6)	27,624 (74.3)	7,857 (75.3)	2,057 (50.1)	50,559 (81.7)	36,899 (83.0)	8,307 (84.7)	5,353 (70.6)
Black	2,068 (4.0)	1,658 (4.5)	291 (2.8)	119 (2.9)	1,118 (1.8)	889 (2.0)	119 (1.2)	110 (1.5)
Hispanics	5,132 (9.9)	3,710 (10.0)	1,131 (10.8)	291 (7.1)	5,903 (9.5)	3,489 (7.8)	728 (7.4)	1,686 (22.2)
Asian / Pacific Islanders	3,694 (7.1)	2,575 (6.9)	827 (7.9)	292 (7.1)	2,072 (3.4)	1,633 (3.7)	273 (2.8)	166 (2.2)
Native American / Eskimo / Aleut	56 (0.1)	45 (0.1)	7 (0.1)	4 (0.1)	165 (0.3)	115 (0.3)	24 (0.2)	26 (0.3)
Others	3,220 (6.2)	1,551 (4.2)	322 (3.1)	1,347 (32.8)	2,065 (3.3)	1,461 (3.3)	361 (3.7)	243 (3.2)
Diagnosis Related Group Code								
469, Major joint replacement with MCC	2,997 (5.8)	2,245 (6.0)	641 (6.1)	111 (2.7)	3,392 (5.5)	2,474 (5.6)	461 (4.7)	705 (3.4)
470, Major joint replacement without MCC	48,711 (94.2)	34,918 (94.0)	9,794 (93.9)	3,999 (97.3)	58,490 (94.5)	42,012 (94.4)	9,351 (95.3)	20,283 (96.6)
Admission from ED	6,762 (13.1)	5,210 (14.0)	1,153 (11.1)	399 (9.7)	9,644 (15.6)	6,563 (14.8)	1,486 (15.1)	2,491 (11.9)

non-Hispanic White patients, particularly in treated MSAs (Table 1).

When plotting unadjusted quarter-year changes of average inpatient length of stay and home discharge rates from 2014 to 2017, different patterns were observed by hospital ownership type – nonprofit, for-profit and government-owned hospital. Most notably, inpatient length of stay for traditional Medicare patients in nonprofit

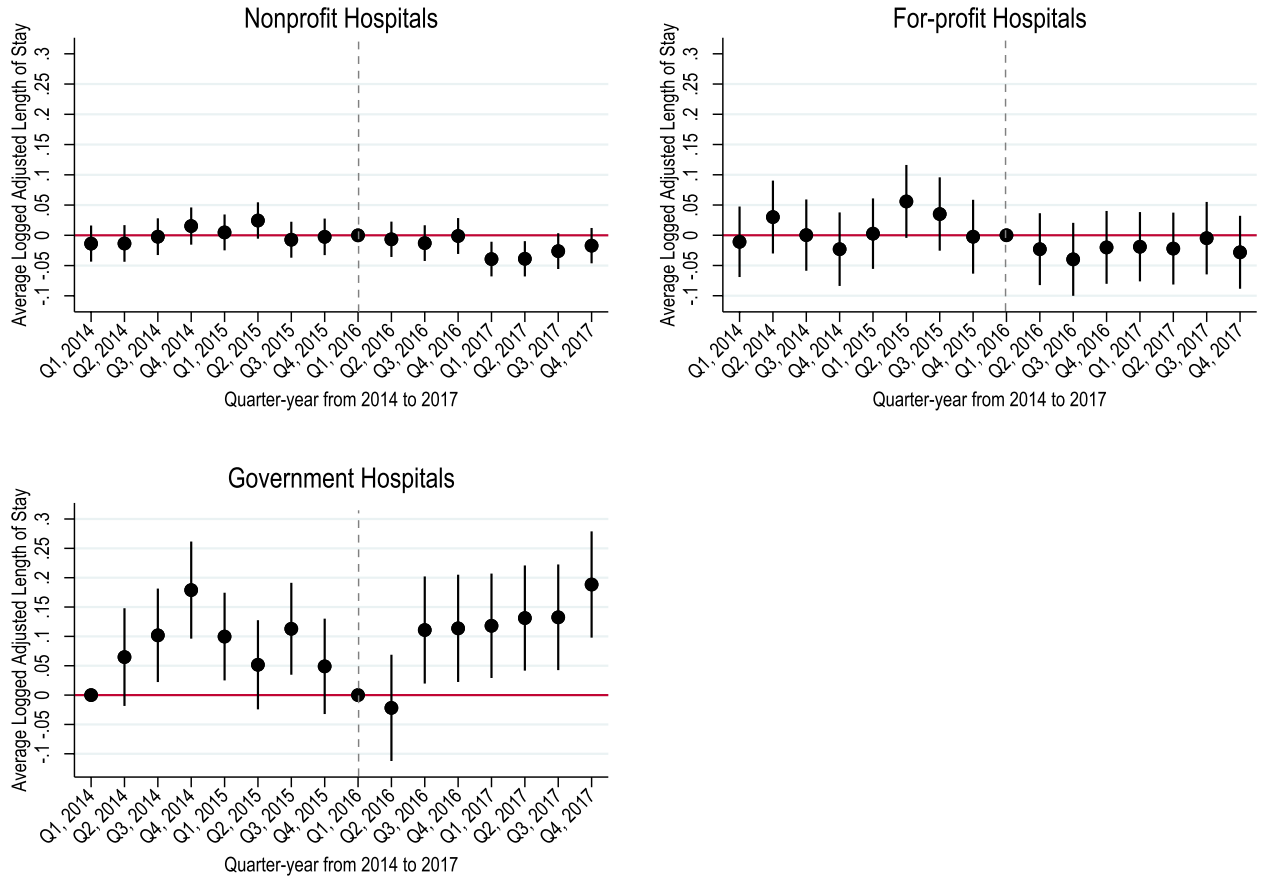

Fig. 1 Changes in length of stay by hospital ownership type in California from 2014 to 2017 (*N* = 113,590)

hospitals in treated MSAs experienced relatively larger decreases after the implementation of the CJR than in for-profit or government hospitals in treated MSAs. For home discharge rates, no notable difference by hospital ownership type was observed (Appendix Fig. 1 & 2).

Figures 1 and 2 show separate event study graphs for inpatient length of stay and home discharge rates by hospital ownership type. The event study models, which control for selected hospital and patient characteristics, isolate the differential impacts of the CJR model over time by hospital ownership type and patient insurance group. Most notably, government hospitals showed a significant increase in length of stay for traditional Medicare patients in treated relative to control MSAs after the CJR implementation, while other hospitals showed a decrease following the policy implementation. In terms of home discharge rates, only nonprofit hospitals showed a clear upward trend (Figs. 1 & 2).

Table 2 shows the results of DID analyses, conducted separately by hospital ownership type, which quantified the differential changes in inpatient length of stay and home discharge rates based on hospital ownership type within traditional Medicare. For log inpatient length of stay, traditional Medicare patients treated at nonprofit hospitals and for-profit hospitals experienced a statistically significant and relative decrease of 0.02 days (95% CI, -0.04 to -0.01) or -2.0%, and a decrease of 0.04 days (95% CI, -0.06 to -0.01) or -4.1%, respectively. In sharp contrast, and as observed in the event study, government-owned hospitals showed a significant increase in log inpatient length of stay of 0.11 days (95% CI, 0.04 to 0.18) or 11.6%. For home discharge rates, only traditional Medicare patients treated in non-profit hospitals experienced a statistically significant and relative increase in home discharge rates of 0.02 (95% CI, 0.01 to 0.03) or 3.4% (Table 2).

Table 3 uses a triple differences (DDD) specification to formally test for differences in the relative changes in inpatient length of stay and home discharge rates after the policy implementation by patient group for government-owned and for-profit hospitals relative to non-profit hospitals. Differences between for-profit and nonprofit hospitals were never statistically distinguishable from zero. In contrast, compared to nonprofit

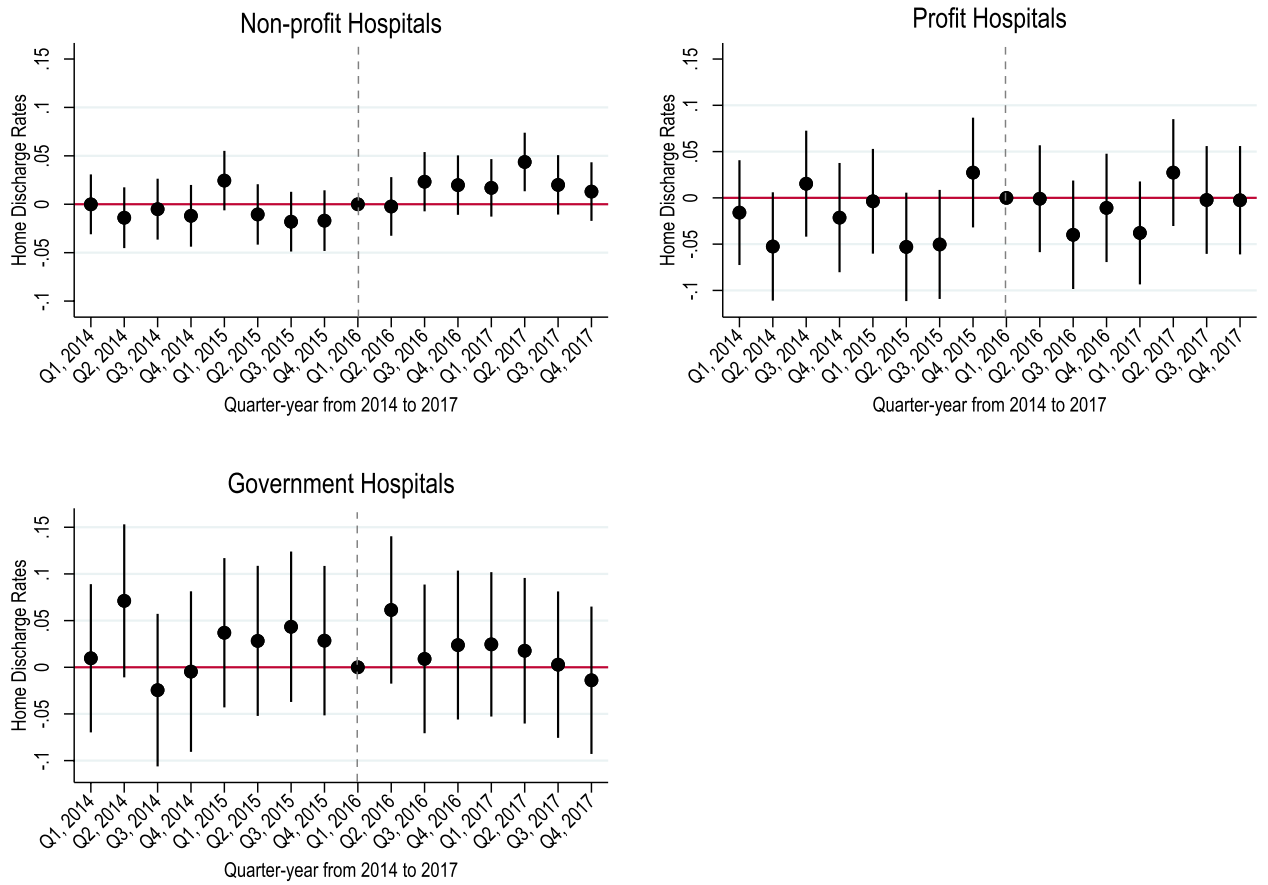

Fig. 2 Changes in home discharge rates by hospital ownership type in California from 2014 to 2017 ($N = 113{,}590$)

hospitals, government-owned hospitals had a 0.10 day (95% CI, 0.01 to 0.16) higher increase in inpatient length of stay. For home discharge rates, however, government-owned hospitals also did not show a statistically significant difference from the nonprofit hospitals (Table 3).

Sensitivity analyses without age restrictions showed similar differential effects of the CJR by hospital ownership type (Appendix Table 1). DID analyses with patient characteristics as outcomes, e.g., proportion of racial minorities, show no increase in socially or medically challenging patient populations at government-owned hospitals (Appendix Table 4), suggesting that the differential response for public hospitals is unlikely to be driven by their distinctive patient mix. When the wild cluster bootstrap was applied to the DID and DDD analyses, the difference between nonprofit and government-hospital in inpatient length of stay was no longer statistically significant (Appendix Table 2 & 3). With only three MSAs in the treatment group, however, the statistical power of the analysis limited our ability to detect significant differences between hospital types.

Discussion

We examined differential effects of the CJR model by hospital ownership type. We found that the CJR model affected government-owned hospitals differently compared to nonprofit and for-profit hospitals. Specifically, government-owned hospitals in treated MSAs showed a significant increase in inpatient length of stay, while nonprofit and for-profit hospitals showed a significant decrease after the policy implementation. Regarding home discharge rates, no statistically significant differences were found between hospitals after the CJR model.

Our study findings suggest that public hospitals responded to the Medicare's bundled payment model differently from their private counterparts. The difference in patient mix served in government hospitals, often considered "safety-net" hospitals, may have contributed to these findings [23–25]. However, the differential changes in hospital behaviors persisted even after adjusting for patient characteristics. Furthermore, despite conducting analyses to determine if government hospitals began receiving more socially and medically complex patients

Table 2 Difference-in-differences analyses results of nonprofit, for-profit and government hospitals in California from 2015 to 2017 (*N* = 238,326)

	DID with Nonprofit Hospitals				DID with For-profit Hospitals			
	N	Coefficient (95% CI)	*P*	Relative change (%)	N	Coefficient (95% CI)	*P*	Relative change (%)
Logged Adjusted Length of Stay	62,753	-0.02 (-0.04, -0.01)	0.000	-2.0	15,128	-0.04 (-0.06, -0.01)	0.007	-4.1
Home Discharge Rates	62,753	0.02 (0.01, 0.03)	0.001	3.4	15,128	0.005 (-0.02, 0.03)	0.693	0.8
	DID with Government Hospitals							
	N	Coefficient (95% CI)	*P*	Relative change (%)				
Logged Adjusted Length of Stay	8,931	0.11 (0.04, 0.18)	0.001	19.6				
Home Discharge Rates	8,931	-0.01 (-0.04, 0.02)	0.624	-1.3				

The pre-policy implementation trend was added to the analysis to adjust for the pre-policy trend identified in the event study results

Table 3 Triple differences results comparing nonprofit versus for-profit versus government-owned hospitals in California from 2015 to 2017 (*N* = 86,812)

For profit relative to Nonprofit Hospitals			
	n	Coefficient (95% CI)	*P*
Logged Adjusted Length of Stay	86,812	-0.01 (-0.07, 0.04)	0.667
Home Discharge Rates	86,812	-0.02 (-0.07, 0.03)	0.537
Government relative to Nonprofit Hospitals			
	n	Coefficient (95% CI)	*P*
Logged Adjusted Length of Stay	86,812	0.10 (0.04, 0.16)	0.002
Home Discharge Rates	86,812	-0.03 (-0.09, 0.03)	0.310

The pre-policy implementation trend was added to the analysis to adjust for the pre-policy trend identified in the event study results

following the policy implementation, no significant increase was observed.

This observation raises important questions about the effectiveness of the CJR model within the government-owned hospitals. Unlike nonprofit and for-profit hospitals, which may have greater flexibility in optimizing their operations and care delivery processes to align with bundled payment models like the CJR, government-owned hospitals may encounter unique challenges. These challenges might stem from bureaucratic processes and resource limitations, which could limit their ability to adapt effectively to such payment models [24]. Another unique factor affecting government-owned hospitals, potentially limiting their adaptability compared to other entities, is the concept of a soft budget constraint. Existing literature shows that the soft budget constraint of government-owned hospitals is associated with decreased cost-efficiency in their operations [26, 27]. These hospitals may lack the motivation to change their behavior as long as they are not concerned about exceeding their budget through penalties or are not actively seeking incentives under the CJR model. Further research is needed to address the specific challenges faced by government-owned hospitals in changing their behavior (i.e., care delivery process) under bundled payment models. Ensuring that government-owned hospitals can effectively participate in and be benefitted from initiatives like the CJR model would advance the success of value-based health care delivery across various types of institutions.

This study has several limitations. Firstly, a potential violation of the parallel trends assumption in the pre-policy period was observed in the event study models. Despite adjustments in the main analyses, we acknowledge that the estimates could still be biased. Secondly, the de-identified patient information in the dataset prevented detection of readmission rates, an important proxy for quality of care. Therefore, reduced volume of care after the CJR model implementation – decreases in length of stay or increases in home discharge –do not necessarily indicate better patient outcomes in this study. In addition, we had limited information available to explain why government-owned hospitals showed different changes in patient care after the implementation of the CJR model compared to other hospitals. Although we conducted several DID analyses to assess whether government-owned hospitals received a higher proportion of high-risk patients after the CJR model implementation compared to other hospitals, we found no support for this type of selection as a cause of the difference. Therefore, we assume that unobservable factors related to the hospital ownership status may have influenced the observed differences in the impact of the CJR model. Lastly, the study findings are limited to California and the small number of treated MSAs reduced our statistical power with clustering. To generalize these results and achieve more accurate estimations with clustering, further research based on national-level data is necessary.

Conclusions

This work provides the first evidence of differential effects of the CJR model based on hospital ownership type. Only government-owned hospitals did not show a reduction in inpatient length of stay. This work underscores the necessity of considering the unique circumstances of government-owned hospitals when using bundled payments to try to increase the efficiency of care.

Abbreviations

BPCI	Bundled Payments for Care Initiative
CJR	Comprehensive Care for Joint Replacement
CPHS	California's Committee for the Protection of Human Subjects
DDD	Triple differences
DID	Difference-in-differences
HCAI	Health Care Access and Information
MA	Medicare Advantage
MSA	Metropolitan Statistical Area
PDD	Patient Discharge Data
SNF	Skilled Nursing Facility
TM	Traditional Medicare
US	United States

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

Dr. Kim wrote the main manuscript text, conducted statistical analyses and prepared figures and tables. Dr. Jacobson supervised the research and edited the manuscript.

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Data availability

The datasets supporting the conclusions of this article are provided by the California Department of Health Care Access and Information (HCAI). To use California's Patient Discharge Data (PDD), the authors obtained approval from the Committee for the Protection of Human Subjects (CPHS) at the California Health and Human Services. Access to the data requires creating a data request through the HCAI data request portal (https://datarequest.hcai.ca.gov/csm) and submitting a protocol for IRB review from CPHS (https://www.cdii.ca.gov/committees-and-advisory-groups/committee-for-the-protection-of-human-subjects-cphs/).
The Hospital Annual Utilization Report dataset and the Four Quarter Summary Hospital Utilization Patient Days by Type of Ownership datasets are publicly available from the HCAI dataset repository at https://hcai.ca.gov/data/datasets/. Please note that if you are outside the United States, the links may not be accessible due to regional restrictions on California government websites. If you encounter any issues accessing the provided links, please contact HCAI at HCAIDO@hcai.ca.gov or +1 (916) 440–8300 for assistance.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the State of California's Committee for the Protection of Human Subjects (CPHS) and the University of Southern California's Institutional Review Board. California's CPHS waived informed consent based on the infeasibility of obtaining consent and the minimal risk of harm. The research was based on de-identified publicly available secondary datasets. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication

N/A.

Competing interests

The authors declare no competing interests.

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References

1. Horwitz JR. Making profits and providing care: comparing nonprofit, for-profit and government hospitals. Health Aff (Millwood). 2005;24(3):790–801.
2. Sloan FA, Picone GA, Taylor DH, Chou SY. Hospital ownership and cost and quality of care: is there a dime's worth of difference? J Health Econ. 2001;20(1):1–21.
3. Horwitz JR, Nichols A. Hospital ownership and medical services: market mix, spillover effects, and nonprofit objectives. J Health Econ. 2009;28(5):924–37.
4. Horwitz JR, Nichols A. Hospital service offerings still differ substantially by ownership type. Health Aff (Millwood). 2022;41(3):331–58.
5. Silverman EM, Skinner JS, Fisher ES. The association between for-profit hospital ownership and increased medicare spending. N Engl J Med. 1999;341(6):420–6.
6. Bai G, Zare H, Eisenberg MD, Polsky D, Anderson GF. Analysis suggests government and nonprofit hospitals' charity care is not aligned with their favorable tax treatment. Health Aff (Millwood). 2021;40(4):629–36.
7. Einav L, Finkelstein A, Ji Y, Mahoney N. Voluntary regulation: evidence from medicare payment reform. Q J Econ. 2021;137(1):565–618.
8. NHE Fact Sheet | CMS. Available from: https://www.cms.gov/data-research/statistics-trends-and-reports/national-health-expenditure-data/nhe-fact-sheet. Cited 12 Feb 2024.
9. Bureau UC. Census.gov. Health Insurance Coverage in the United States: 2022. Available from: https://www.census.gov/library/publications/2023/demo/p60-281.html. Cited 14 Feb 2024.
10. Hospitals by Ownership Type. KFF. Available from: https://www.kff.org/other/state-indicator/hospitals-by-ownership/. Cited 15 Feb 2024.
11. Navathe AS, Liao JM, Polsky D, Shah Y, Huang Q, Zhu J, et al. Comparison of hospitals participating in medicare's voluntary and mandatory orthopedic bundle programs. Health Aff (Millwood). 2018;37(6):854–63.
12. Smith B. CMS innovation center at 10 years — Progress and lessons learned. N Engl J Med. 2021;384(8):759–64.
13. Gray CF, Prieto HA, Duncan AT, Parvataneni HK. Arthroplasty care redesign related to the Comprehensive Care for Joint Replacement model: results at a tertiary academic medical center. Arthroplasty Today. 2018;4(2):221–6.
14. Navathe AS, Liao JM, Shah Y, Lyon Z, Chatterjee P, Polsky D, et al. Characteristics of hospitals earning savings in the first year of mandatory bundled payment for hip and knee surgery. JAMA. 2018;319(9):930–2.
15. Finkelstein A, Ji Y, Mahoney N, Skinner J. Mandatory medicare bundled payment program for lower extremity joint replacement and discharge

to institutional postacute care: interim analysis of the first year of a 5-year randomized trial. JAMA. 2018;320(9):892–900.
16. Ko H, Martin BI, Nelson RE, Pelt CE. Patient selection in the Comprehensive Care for Joint Replacement model. Health Serv Res. 2022;57(1):72–90.
17. Haas DA, Zhang X, Kaplan RS, Song Z. Evaluation of economic and clinical outcomes under centers for medicare & medicaid services mandatory bundled payments for joint replacements. JAMA Intern Med. 2019;179(7):924–31.
18. Plate JF, Ryan SP, Black CS, Howell CB, Jiranek WA, Bolognesi MP, et al. No changes in patient selection and value-based metrics for total hip arthroplasty after comprehensive care for joint replacement bundle implementation at a single center. J Arthroplasty. 2019;34(8):1581–4.
19. Kim H, Meath THA, Tran FW, Quiñones AR, McConnell KJ, Ibrahim SA. Association of medicare mandatory bundled payment system for hip and knee joint replacement with racial/ethnic difference in joint replacement care. JAMA Netw Open. 2020;3(9):e2014475.
20. Kim N, Jacobson M. Outcomes by race and ethnicity following a medicare bundled payment program for joint replacement. JAMA Netw Open. 2024;7(9):e2433962.
21. California Department of Health Care Access and Information. Department of Health Carae Access and Information California inpatient data reporting manual, eight edition. 2021.
22. California Department of Health Care Access and Information. 2017 patient discharge data dictionary. 2017.
23. Duggan M, Gupta A, Jackson E, Templeton ZS. The impact of privatization: evidence from the hospital sector. National Bureau of Economic Research; 2023. (Working Paper Series). Available from: https://www.nber.org/papers/w30824 . Cited 8 Feb 2024.
24. Miller GD, Singh JA. Challenges of practicing rheumatology in a government setting. Rheum Dis Clin N Am. 2019;45(1):39–51.
25. Kishore S, Johnson M, Nayak R. Characteristics of public vs. private federally qualified health centers. J Gen Intern Med. 2022;37(4):987–9.
26. Wright DJ. Soft budget constraints in public hospitals. Health Econ. 2016;25(5):578–90.
27. Shen YC, Eggleston K. The effect of soft budget constraints on access and quality in hospital care. Int J Health Care Finance Econ. 2009;9(2):211–32.

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