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CMS Comprehensive Care for Joint Replacement Model: Performance Year 5 Evaluation Report

Fifth Annual Report

HEALTH CARE AND HUMAN SERVICES POLICY, RESEARCH, AND ANALYTICS — WITH REAL-WORLD PERSPECTIVE.

Prepared for: **Centers for Medicare & Medicaid Services**

Submitted by: **The Lewin Group, Inc. with our partners: Abt Associates, GDIT, and Telligen**

April 2023

CMS Comprehensive Care for Joint Replacement (CJR) Model: Performance Year 5 Evaluation Report

Fifth Annual Report

Prepared for:

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Table of Contents

List of Appendices

I. Introduction

The Comprehensive Care for Joint Replacement (CJR) model tests whether episode-based payment and quality measurement for lower extremity joint replacements (LEJR) can lower payments and improve quality.[1] Implemented on April 1, 2016 by the Centers for Medicare & Medicaid Services' (CMS) Innovation Center, this mandatory model is an important component of CMS' strategy to use alternative payment models (APMs) to slow Medicare spending growth by rewarding value rather than volume.[2]

The fifth annual CJR model evaluation report presents findings from the first five performance years, which include episodes initiated on or after April 1, 2016 that ended by September 30, 2021.

A. The CJR Model

CJR participant hospitals are financially accountable for the cost and quality of health care services for LEJR episodes of care. The CJR model rewards participant hospitals for reducing episode payments and improving quality and provides hospitals with incentives to coordinate care with the physicians, post-acute care (PAC) providers, and other providers and clinicians involved in the episode.[3] Through an annual reconciliation process, participant hospitals may earn reconciliation payments if they achieve cost and quality metrics or face repayments to Medicare if they do not. The CJR model originally required hospitals in 67 randomly selected geographic areas, defined by metropolitan statistical areas (MSAs), to participate.[4] In the third performance year, CMS changed the CJR model so that only hospitals located in the 34 MSAs with the highest historical episode payments were required to continue their participation for the remainder of the model. This report

[1] The term LEJR refers to all discharges under Medicare Severity-Diagnosis Related Groups (MS-DRG) 469: Major Joint Replacement or Reattachment of Lower Extremity with major complications and comorbidities and 470: Major Joint Replacement or Reattachment of Lower Extremity without major complications and comorbidities. MS-DRGs specific to LEJRs performed due to hip fracture were implemented in October 2020 and include 521: Hip replacement with principal diagnosis of hip fracture with MCC and 522: Hip replacement with principal diagnosis of hip fracture without MCC. Starting in 2018, Medicare began covering total knee arthroplasty (TKA) procedures performed in a hospital outpatient department (Current Procedural Terminology (CPT) code 27447); Medicare began covering total hip arthroplasty (THA) procedures in hospital outpatient departments (CPT 27130) in 2020. Outpatient TKAs and THAs will be episodes under the CJR model beginning in October 2021. Appendix A includes an acronym list and glossary for terms used through this report.

[2] Press MJ, Rajkumar R, Conway PH. Medicare's new bundled payments: design, strategy, and evolution [published online December 17, 2015]. JAMA. doi:10.1001/jama.2015.18161.

[3] The CJR model waives certain Medicare payment rules and fraud and abuse laws so participant hospitals have more flexibility to collaborate with clinicians and PAC providers. Appendix B includes more information about the CJR model waivers.

[4] MSAs are counties associated with a core urban area that has a population of at least 50,000. Non-MSA counties (no urban core area or urban core area of less than 50,000 population) and MSAs with a volume of LEJR cases below 400 were not eligible for selection. Hospitals are required to participate in the CJR model if they are acute care hospitals actively engaged in Medicare and paid under the Inpatient Prospective Payment System. Hospitals are excluded if they are currently participating in a Bundled Payments for Care Improvement LEJR model or are cancer hospitals.

Return to Table of Contents

primarily focuses on the hospitals in the 34 MSAs that were required to participate in the CJR model throughout the intervention period (mandatory CJR hospitals).

Episode definition. Under the CJR model, an LEJR episode of care begins with the hospitalization for the surgery and extends through the 90 days after hospital discharge (including the date of discharge). All Medicare-covered items and services provided during this period, with some exclusions, are in the episode bundle.[5] All providers and suppliers involved in the episode continue to be paid under Medicare's fee-for-service (FFS) payment systems.

Annual reconciliation. After the end of each model performance year, CMS reconciles each participant hospital's LEJR episode payments against the hospital's quality-adjusted target price. The quality-adjusted target price is based on a discounted blend of the hospital's average historical episode payments and the region's average historical episode payments in the first three years of the CJR model. Beginning in performance year (PY) 4, all quality-adjusted target prices were based on the regional average. The quality-adjusted target price is based on a rolling three-year historical period, and in PY5 the historical period included the first three years of the CJR model (2016-2018). Exhibit 1 outlines how the target price composition changed across years and details other changes to the reconciliation process in the first five performance years.

Exhibit 1: Changes to the CJR model reconciliation process over time

	2016 Performance Year 1	2017 Performance Year 2	2018 Performance Year 3	2019 Performance Year 4	2020 Performance Year 5.1	2021 Performance Year 5.2
Changes to the composition of the target price (regional average and hospital-specific average)	1/3 regional 2/3 hospital	1/3 regional 2/3 hospital	2/3 regional 1/3 hospital	100% regional	100% regional	100% regional
Three years of historical data used to set the target price	2012-2014	2012-2014	2014-2016	2014-2016	2016-2018	2016-2018
Stop gain limit used at reconciliation	5%	5%	10%	20%	20%	20%
Stop loss limit used at reconciliation	0%	5%	10%	20%	20%	20%
Changes to how CMS waived downside risk at reconciliation	Hospitals not required to make repayments	Payments for episodes occurring during natural disasters capped at target price	Payments for episodes occurring during natural disasters capped at target price	Payments for episodes occurring during natural disasters capped at target price	Starting January 31, all episode payments capped at target price during the COVID-19 public health emergency	All episode payments capped at target price until March 31; after April 1, only episodes with a COVID-19 diagnosis capped

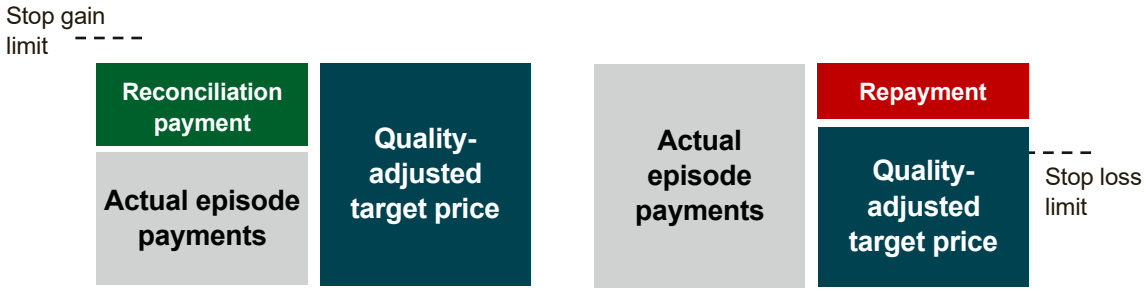
[5] Excluded items, services, and payments include: hemophilia clotting factors; new technology add-on payments; transitional pass-through payments for medical devices; items and services unrelated to the anchor hospitalization as specified by CMS on the CJR website, including (i) inpatient hospital admissions for oncology, trauma medical, chronic disease surgical, and acute disease surgical diagnoses, (ii) Medicare Part B services for acute disease and certain chronic disease diagnoses, (iii) certain per beneficiary per month payments; certain incentive programs and add-on payments under existing Medicare payment systems; and payments for otherwise included items and services in excess of two standard deviations above the mean regional episode payment.

Return to Table of Contents

The discount to the quality-adjusted target price is intended to ensure savings to the Medicare program are achieved under the model. At reconciliation, the discount is adjusted based on the participant hospital's composite quality score. A lower discount is applied to the target price for participant hospitals with a higher quality score, thus rewarding higher quality through a higher quality-adjusted target price.

Hospitals with LEJR episode payments *below* their quality-adjusted target price and an "acceptable" or higher composite quality score receive a reconciliation payment (Exhibit 2). The reconciliation payment equals the difference between the quality-adjusted target price and actual episode payments, up to a stop-gain limit. Starting in PY2, hospitals with episode payments *above* their quality-adjusted target price repay Medicare the difference, subject to a stop-loss limit. Both opportunity and risk increase over time as stop-gain and stop-loss limits increase. The stop-gain limit increased from 5% in PY1 to 20% in PY4 and the stop-loss limit increased from 0% to 20% over the same period.

Exhibit 2: Hospitals with LEJR episode payments below their quality-adjusted target price receive a reconciliation payment; hospitals with episode payments above their quality-adjusted target price repay Medicare a portion of the difference



Mandatory, randomized design of the original CJR model. The original mandatory, randomized design of the CJR model resulted in a diverse group of CJR participant hospitals, including hospitals that might not voluntarily participate in an episode-based payment model, which allowed a broad test of the CJR model. For the first two performance years, all acute care hospitals paid under the Medicare Inpatient Prospective Payment System (IPPS), with few exceptions, in 67 randomly selected MSAs were required to participate. The original 67 mandatory MSAs were identified from 171 MSAs that were eligible for participation when the model design was finalized. MSAs were selected for participation using eight sampling strata based on a median split of MSA population size and quartiles of average MSA historical episode payments.[6] An MSA's probability of selection increased with the payment quartiles to oversample high-payment MSAs for participation in the CJR model. The designers hypothesized that there is greater need

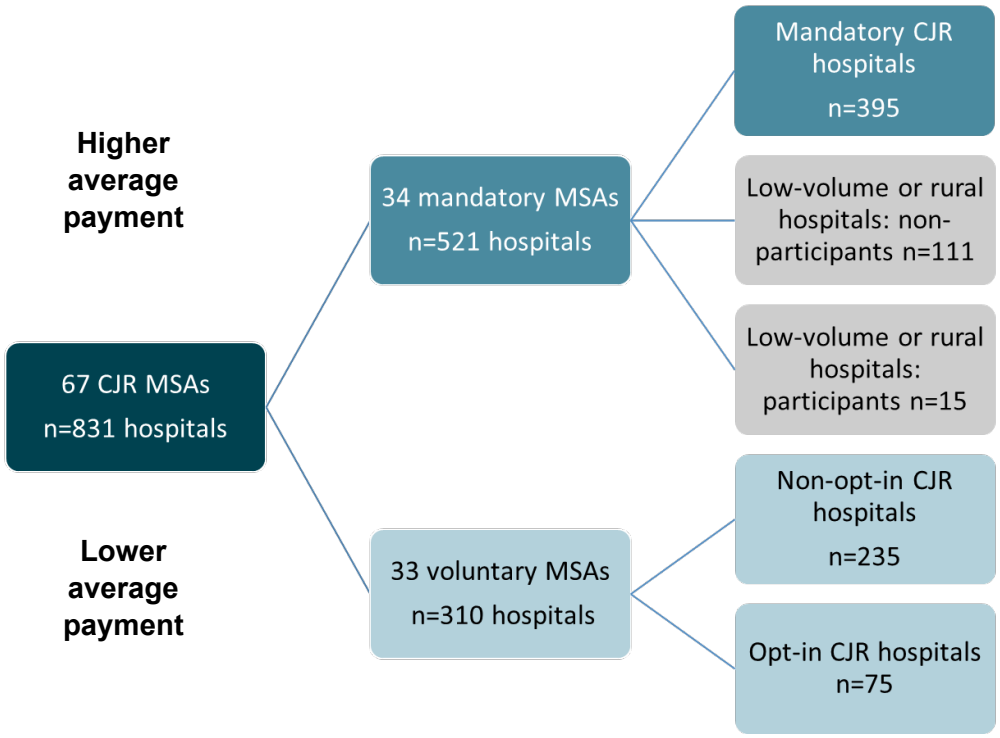
[6] Originally, 196 MSAs were identified as eligible for participation in the CJR model and the mandatory MSAs were randomly selected from this pool. CMS later identified 25 MSAs that were ineligible for selection after accounting for participation in the Bundled Payments for Care Improvement (BPCI) Initiative by physician group practices.

Return to Table of Contents

and more opportunities for payment reductions in higher payment areas. Eligible MSAs that were not selected are a natural control group for evaluating the impact of the CJR model.

Changes to CJR model participation in 2018. Effective January 2018, CMS scaled back the CJR model to the 34 MSAs with the highest historical episode payments (mandatory MSAs). Hospitals in these mandatory MSAs that were not designated as low-volume or rural were required to continue their participation in the CJR model. In January 2018 the number of hospitals required to participate in the CJR model was reduced from 831 hospitals to 395 hospitals. CMS allowed the remaining hospitals in the 33 lower payment MSAs (voluntary MSAs) and all hospitals that were designated as low-volume or rural a one-time opportunity to opt-in to the CJR model for PY3-5. Of the 310 hospitals in the 33 voluntary MSAs, 75 opted to continue their participation in the model (opt-in hospitals) and 235 stopped participating in the model (non-opt-in hospitals) (Exhibit 3).

Exhibit 3: The CJR model originally required hospitals in 67 metropolitan statistical areas (MSAs) to participate; hospitals in the 33 voluntary MSAs had an opportunity to opt-out for performance years 3-5



Note: Performance year5 was extended by three quarters due to the public health emergency. Participant low-volume or rural hospitals (n=15) and opt-in CJR hospitals (n=75) were given an opportunity to continue participating in the model for the three-quarter extension (PY5.2) and 22 of these hospitals chose not to participate in PY5.2.

The randomized design of the CJR model was not completely preserved when the model was scaled back in PY3 because the 34 mandatory MSAs were identified using a median split based on historical payments rather than random selection. Most, but not all, of the MSAs in the top two payment quartiles were categorized in the mandatory MSA group. The characteristics of mandatory CJR hospitals reflect their location in higher payment markets; nonetheless, the

Return to Table of Contents

mandatory CJR hospitals remain a diverse group with variation in terms of LEJR volume, patient complexity, and institutional characteristics.[7] Hospitals in high-payment MSAs that were eligible but not selected for the CJR model serve as the control group for mandatory CJR hospitals.

Medicare coverage of LEJRs in outpatient settings. CMS implemented broad changes to Medicare coverage that affect the evaluation of the CJR model. The CJR model implemented episode-based payments for inpatient LEJRs, which are primarily knee replacements (TKA) and hip replacements (THA). CMS removed TKA and THA from Medicare's inpatient only list, effective January 2018 and January 2020, respectively. These policy changes allowed Medicare coverage of LEJRs performed in the hospital outpatient department. When an LEJR is performed on an inpatient, the hospital's payment is made under the IPPS and the surgery triggers an episode if the hospital is participating in the CJR model. When an LEJR is performed on an outpatient, the hospital's payment is made under the outpatient payment system and the surgery does not trigger an episode. Beginning in PY6, however, outpatient LEJRs will be included in the CJR model. Although the outpatient policy change was independent of the CJR model, CJR participant hospitals responded to it differently than non-CJR hospitals. CJR participant hospitals shifted a smaller proportion of LEJR surgeries to the outpatient setting than control group hospitals. The third and fourth annual reports describe the impact of this policy change in more detail and our refined methodology to account for this differential response.[8,9]

Additionally, Medicare allowed coverage of TKAs in ambulatory surgical centers (ASC) in January 2020 and THAs in ASCs in January 2021. ASCs are healthcare facilities that provide outpatient surgical procedures not requiring hospital overnight stays. There are nearly 6,000 ASCs in the United States, and the majority have at least partial physician ownership.[10] ASC LEJRs are not included as episodes in the CJR model. Physician-ownership of ASCs and CJR model incentives may motivate physicians to shift care to ASCs for certain beneficiaries, which could impact the case mix of beneficiaries receiving inpatient LEJR procedures included in the CJR model. At the time of this report, the number of Medicare-covered LEJRs performed in ASCs is small and similar across CJR and control groups. We have not adjusted our methods in response to this policy change but will continue to monitor it.

Changes to SNF and HH payment systems. Changes to the SNF and HH payment systems were recently implemented across the United States, changing incentives for all providers. The SNF Patient Driven Payment Model (PDPM) was adopted in October 2019, and the changes were designed to reduce the incentive to overprovide SNF care. Under the new PDPM, case mix

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7 Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - third annual report. https://innovation.cms.gov/data-and-reports/2020/cjr-thirdannrpt. 2020: 21-31.

8 Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - third annual report. https://innovation.cms.gov/data-and-reports/2020/cjr-thirdannrpt. 2020: 31-37.

9 Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - fourth annual report. https://innovation.cms.gov/data-and-reports/2021/cjr-py4-annual-report.

10 Badlani N. (2019). Ambulatory surgery center ownership models. *Journal of spine surgery (Hong Kong)*, *5*(Suppl 2), S195–S203. https://doi.org/10.21037/jss.2019.04.20.

Return to Table of Contents

adjustments are based on patient characteristics instead of quantity of therapy provided. Further, PDPM includes a variable per-diem payment adjustment, so payments decrease for days later in the SNF stay, discouraging longer SNF stays.

The HH Patient Driven Groupings Model (PDGM) was implemented January 2020. Originally, Medicare reimbursed for a 60-day HH episode of care and providers were incentivized to provide more visits to their patients to receive additional payments. For example, HH episodes of care with less than seven visits did not receive an additional payment, while episodes with 20 or more visits received the highest level of additional payment. Under PDGM, an HH episode of care is now 30 days, and the therapy thresholds were eliminated, reducing the incentive to provide additional visits.

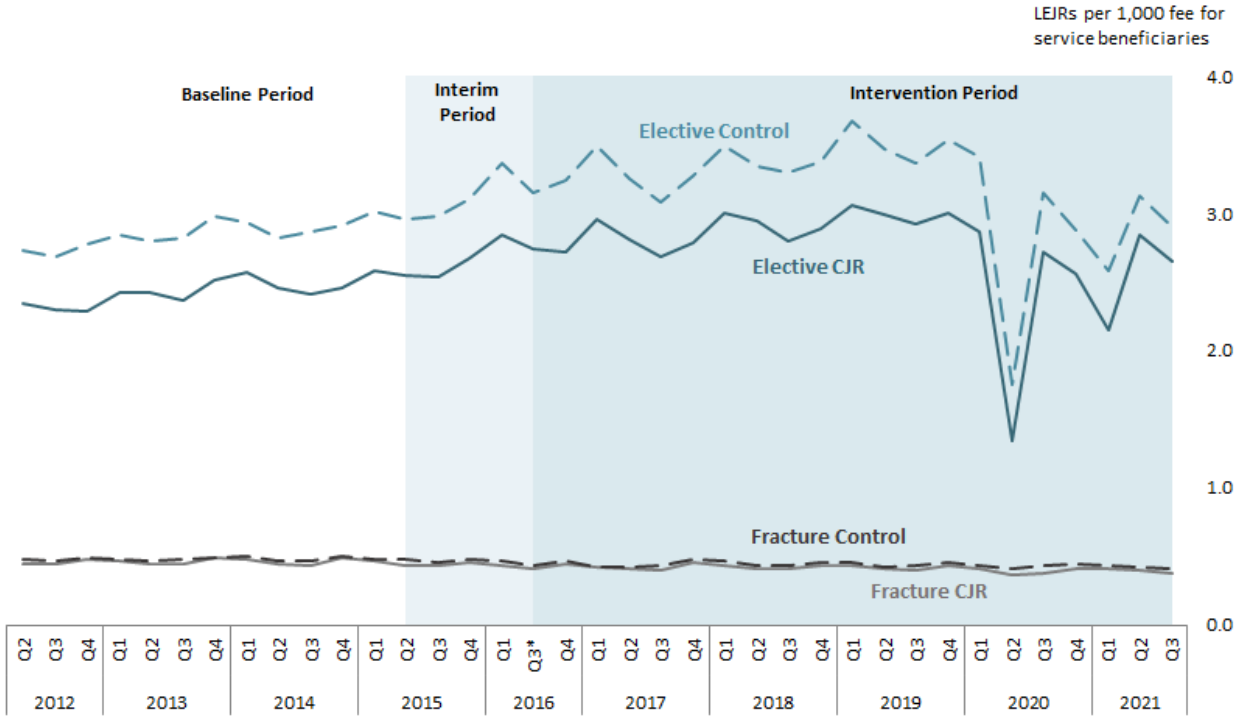
COVID-19 PHE. On March 13, 2020, the President declared the Coronavirus Disease 2019 (COVID-19) pandemic a national public health emergency (PHE).[11] To conserve critical health care resources and limit exposure to patients and staff, CMS provided recommendations to temporarily limit non-essential elective procedures, including hip and knee replacements.[12] Consequently, the elective LEJR rate sharply declined in early 2020 and was half the rate observed in 2019 in mandatory CJR and control markets and had not returned to pre-pandemic levels by the end of PY5 (Exhibit 4). In contrast, the LEJR due to hip fracture rate remained relatively stable throughout the PHE, and most episodes included in the CJR model in early 2020 were LEJR due to hip fracture. In prior annual reports, we evaluated the impact of the CJR model on elective LEJR volume in CJR and control markets. Because the COVID-19 PHE had a substantial impact on LEJR volume and episode mix in 2020, we did not update the market volume analysis for this annual report.

[11] FEMA. COVID-19 Emergency Declaration. https://www.fema.gov/print/pdf/node/468818. 2020.

[12] CMS. Non-Emergent, Elective Medical Services, and Treatment Recommendations (cms.gov). https://www.cms.gov/files/document/cms-non-emergent-elective-medical-recommendations.pdf. 2020.

Return to Table of Contents

Exhibit 4: The elective LEJR rate sharply declined in mandatory CJR and control markets during the COVID-19 public health emergency and has not returned to pre-pandemic levels



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated on or after January 2012 that ended by September 2021.

In the past, CMS waived downside risk to support CJR participant hospitals during challenging times (Exhibit 1). To allow hospitals time to acclimate to the model and implement changes, CMS did not require hospitals to make repayments in PY1 if hospital-level spending was greater than target spending. In 2017, CMS published an interim final rule that capped CJR episode payments during a natural disaster (for example, a wildfire) at the quality-adjusted target price ("extreme and uncontrollable circumstances" policy). In 2020, at the onset of the COVID-19 PHE, CMS extended this policy to apply to the COVID-19 PHE. All episodes that began between late January 2020 and March 2021 and had total payments that exceeded their target price were capped at the target price. Because the COVID-19 PHE policy to remove downside risk was applied at the episode level, CJR hospitals continued to receive reconciliation payments for episodes that met cost and quality targets and episodes that did not meet cost and quality targets did not affect reconciliation. CMS changed the policy that removed downside risk for episodes beginning after March 2021 to only cap payments for episodes with a COVID-19 diagnosis during the anchor stay or 90-day post-discharge period.

Return to Table of Contents

Finally, the original end date of the CJR model was December 31, 2020; however, PY5 was extended an additional nine months to September 30, 2021 due to the COVID-19 PHE.[13] For reconciliation, CMS split PY5 into two periods: PY5.1 includes episodes ending in calendar year 2020 (the original PY5 definition); and PY5.2 includes episodes ending during the nine month extension. Results in this report are presented separately for the two PY5 periods. CMS allowed opt-in hospitals in voluntary CJR MSAs and participants in mandatory MSAs designated as low volume or rural to discontinue their participation after December 31, 2020; 22 hospitals chose not to participate in PY5.2.

Appendix C Section III describes how we adjusted our methodology to account for the COVID-19 PHE.

Additional detail about the CJR model is available in prior annual reports and on the CMMI webpage, https://innovation.cms.gov/initiatives/cjr.

B. Evaluation Conceptual Framework

The conceptual framework for the evaluation of the CJR model (Exhibit 5) reflects the fundamental features of the model and is informed by health services research literature, including evaluations of other episode-based payment approaches.[14] The evaluation framework focuses on the hospital where the LEJR episode begins because the hospital has the incentives to control payments and improve quality across the entire episode. The hospital's resources and market conditions will affect its decisions about whether and how to respond to the model.

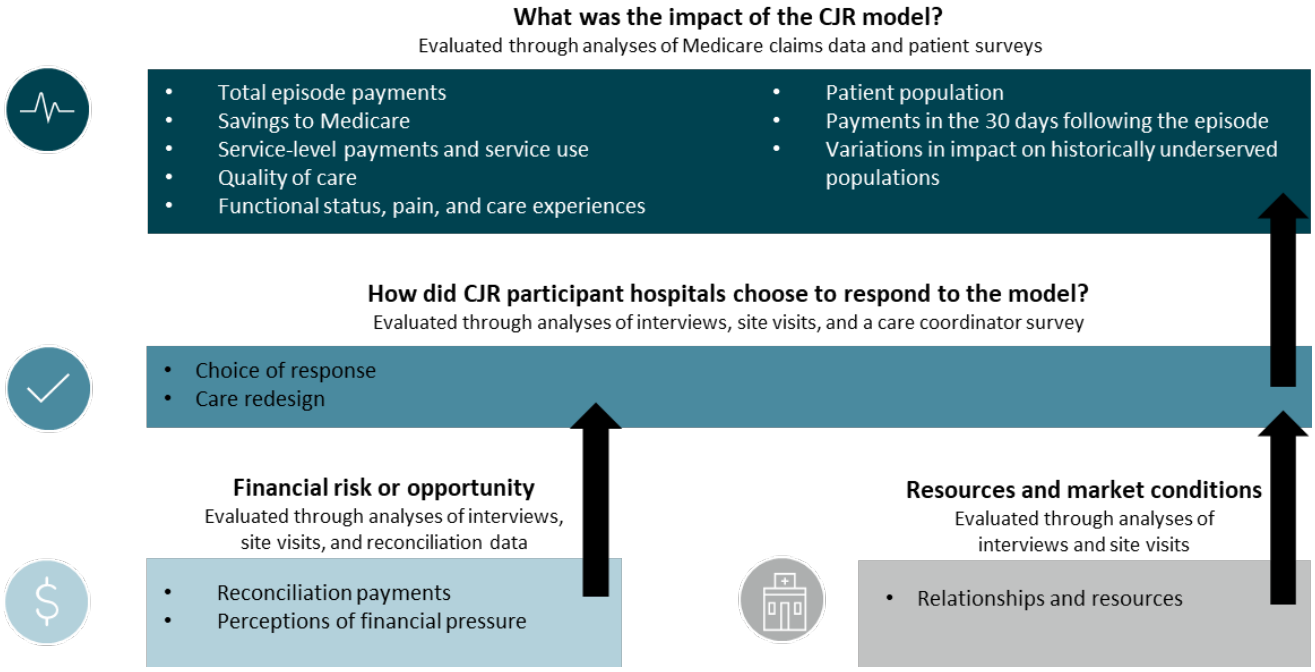
This evaluation draws from a range of data sources, including claims, patient surveys, site visits, interviews, and program information, and relies on various research methods to understand the impact of the CJR model. Together, these provide insights into the relative successes and challenges in reducing episode payments and improving quality and provide evidence on how hospitals in a variety of circumstances achieved these changes.

[13] Federal Register: Additional Policy and Regulatory Revisions in Response to the COVID-19 Public Health Emergency. https://www.federalregister.gov/documents/2020/11/06/2020-24332/additional-policy-and-regulatory-revisions-in-response-to-the-covid-19-public-health-emergency.

[14] Maniya, O. Z., Mather, R. C., Attarian, D. E., Mistry, B., Chopra, A., Strickland, M., & Schulman, K. A. (2017). Modeling the Potential Economic Impact of the Medicare Comprehensive Care for Joint Replacement Episode-Based Payment Model. *The Journal of Arthroplasty*.

Return to Table of Contents

Exhibit 5: Key research questions and domains are based on the evaluation conceptual framework



Impact of the Model. The CJR model is designed to affect episode payments, utilization, and quality outcomes. We use Medicare claims data to determine the impact of the model on Medicare payments (and associated utilization patterns) for LEJR episodes by examining the change in these outcomes relative to the change in the control group. Analyses of Medicare claims demonstrate the magnitude of payment changes due to the CJR model and the source of payment changes by type of service. Relative differences in utilization patterns between the treatment and control group provide further insights into how participant hospitals responded to the model.

The impact of the CJR model on quality of care is evaluated using quality outcomes from Medicare claims and self-reported measures from patient surveys that provide information on functional status, pain, and care experiences. Subgroup analyses shed light on if the impact of the CJR model differed for historically disadvantaged populations.

Whether the model ultimately results in savings to the Medicare program also depends on Medicare reconciliation payments and repayments under the model. The impact of the CJR model on episode payments and volume of episodes, combined with reconciliation data, are used to estimate Medicare program savings for mandatory CJR hospitals. (Section II.A.1 examines the impact on average episode payments, Section II.A.2 examines savings to the Medicare program.)

Choice of response. Hospital leaders must consider multiple organizational factors, in addition to the potential for financial risk or opportunity, and internal and external resources, in making the business case for whether and how to respond to the CJR

Return to Table of Contents

model. Orthopedic surgery is one of multiple service lines that compete for staff and other resources. The CJR model is one initiative that may or may not align with initiatives from other payers, state-specific policies, local labor markets, and other factors. (Section II.A.3 includes information about care coordination under the CJR model, Section II.A.6 discusses care redesign for fracture patients).

Financial risk or opportunity. The distance between the quality-adjusted target price and episode payments varies for each hospital due to its historical average payments and the regional average. Hospitals with lower historical payments that are located in higher payment areas will likely be under the least financial pressure under the model and have the greatest opportunities to earn reconciliation payments. Hospitals in the opposite position, with higher historical payments that are located in lower payment areas will be under the most pressure to implement changes to avoid repaying CMS under the CJR model. The specific situation of each hospital will affect its ability to earn reconciliation payments and its responses to the model. Because of the changes in the calculation of the quality-adjusted target price, the amount of financial pressure on hospitals will shift over time.

Resources and market conditions. A hospital's internal resources and market conditions will provide opportunities or constraints on its responses to the model. Hospitals with more capital and operational resources, such as dedicated care coordination staff or robust health information technology infrastructure, may be better situated to redesign care for LEJR episodes. Other hospital resources – such as leadership support, experience with episode-based payment or similar payment models, ownership of post-acute care (PAC) providers, or employment of surgeons – may also affect their choices as well as their success in reducing payments below their quality-adjusted target price. Market conditions, such as the supply and characteristics of other providers involved in the episode, will affect how and whether hospitals garner support for delivering care more efficiently during the episode.

Return to Table of Contents

II. Results

A. Impact of the Model

1. What was the impact of the CJR model on average episode payments?

a. Key Findings

- The CJR model reduced average episode payments for mandatory CJR hospitals in every performance year.
- The reduction in payments decreased over time due to policy changes that allowed outpatient LEJRs and the public health emergency.

b. Methods

The analysis used a difference-in-differences (DiD) method to estimate the change in average episode payments between the baseline (April 2012 through March 2015) and intervention period (April 2016 through September 2021, or the first five performance years of the CJR model) for all LEJR episodes initiated at mandatory CJR hospitals[15] relative to those initiated at control group hospitals. We risk-adjusted estimates for beneficiary, market, and hospital characteristics that can vary over time and between the CJR and control group. We weighted the control group MSAs to be representative of the distribution of the mandatory CJR MSAs.

Acronyms	
DiD	difference-in-differences
LEJR	lower extremity joint replacement
MSA	metropolitan statistical area
PAC	post-acute care
PHE	public health emergency
pp	percentage point
PY	performance year
THA	total hip arthroplasty
TKA	total knee arthroplasty

Average episode payments = the average sum of Medicare fee-for-service payments for all services and items included in the episode. We define payments as **standardized allowed amounts**, which include beneficiary cost sharing and do not include wage adjustments and other Medicare payment adjustments.

Our methodology accounts for Medicare policy changes that allowed Medicare coverage for TKAs and THAs provided in the hospital outpatient setting, which affect our analysis beginning in the third performance year. Our methodology also accounts for the COVID-19 public health emergency, which affects our analysis of the fifth performance year. Details about the methodology are available in Appendix C.

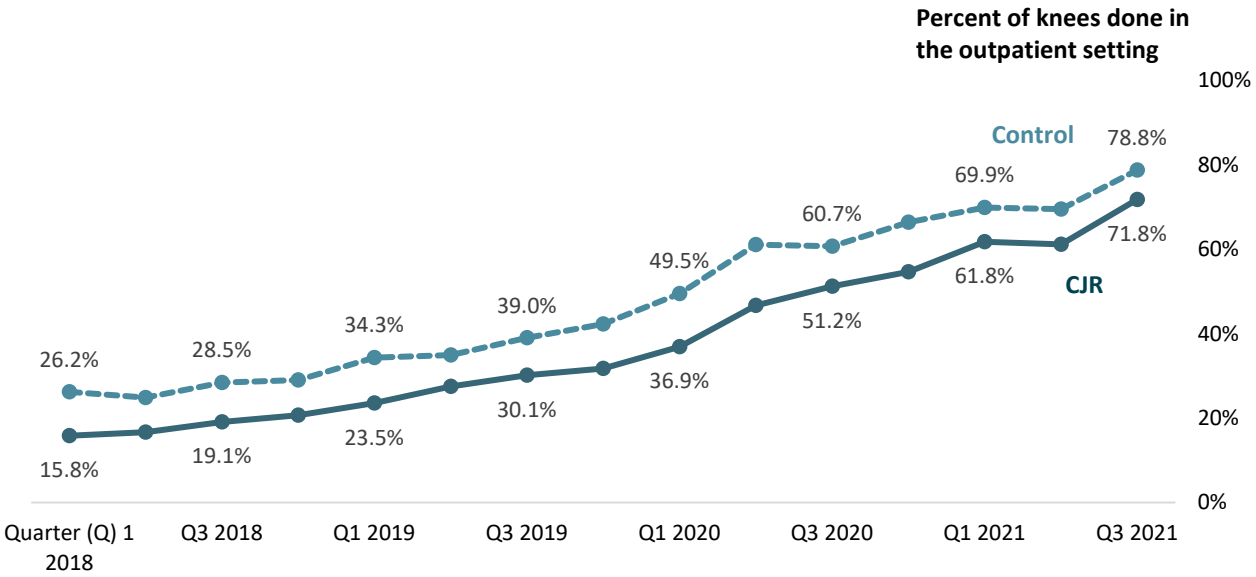
[15] This hospital population excludes low-volume and rural hospitals in the mandatory CJR MSAs that were not required to continue in the model after PY2.

Return to Table of Contents

The effect of the outpatient TKA and THA policy changes on the CJR model

Medicare removed TKA and THA from the inpatient only list in January 2018 (PY3) and January 2020 (PY5), respectively, allowing coverage for the surgery when performed in the hospital outpatient setting. Following these policy changes, both mandatory CJR and control group hospitals shifted LEJRs to the cheaper outpatient setting. By the end of PY5 the majority of LEJRs were performed in the outpatient setting, resulting in a sharp decline in the volume of episodes included in the CJR model. In addition, the share of outpatient TKAs and THAs in mandatory CJR hospitals remained about 6-7 percentage points (pp) below the share in control group hospitals resulting in average episode payments at CJR hospitals that were higher than they would have been in the absence of the model (Exhibits 6 and 7).

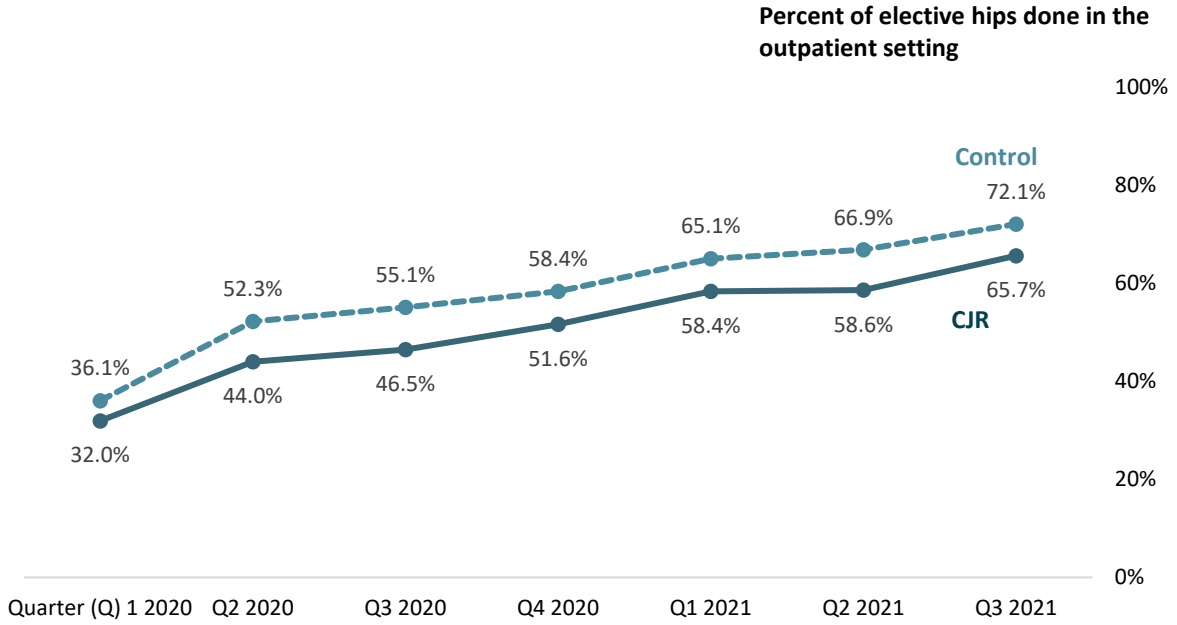
Exhibit 6: Since 2020, the majority of total knee arthroplasties (TKAs) have been outpatient, but mandatory CJR hospitals performed a lower proportion of TKAs in the outpatient setting than control group hospitals



Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR surgeries between January 2018 and September 2021.

Return to Table of Contents

Exhibit 7: Since 2020, the majority of elective total hip arthroplasties (THAs) have been outpatient, but mandatory CJR hospitals performed a lower proportion of THAs in the outpatient setting than control group hospitals



Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR surgeries between January 2020 and September 2021.

An inpatient LEJR episode begins with an inpatient anchor hospitalization that meets CJR episode eligibility requirements and ends 90 days after discharge. Inpatient LEJR episodes are CJR episodes under the CJR model.

Outpatient TKA or THA do not trigger CJR episodes under the CJR model. However, we constructed episodes that began with an outpatient TKA or THA that extended for 90 days after the date of the surgery to use in our impact estimate.

The effect of the COVID-19 pandemic on the CJR model

The COVID-19 public health emergency began in March 2020. During this time, there was federal and regional guidance to pause elective procedures, such as LEJRs. Elective LEJR volume dropped, and LEJRs due to hip fracture became the predominate episode. When elective procedures resumed, control hospitals as well as CJR hospitals reduced institutional PAC use during the height of the PHE. To provide relief to participant hospitals, CMS extended the existing "extreme and uncontrollable circumstances" policy to the COVID-19 PHE (also known as the COVID-19 PHE policy to remove downside risk). For episodes starting between January 31, 2020 and March 31, 2021, CMS capped episode payments at the quality-adjusted target price for the purposes of calculating reconciliation. This means that no episode could generate repayments, episodes could only generate positive reconciliation payments, weakening the financial incentives of the CJR model.

Return to Table of Contents

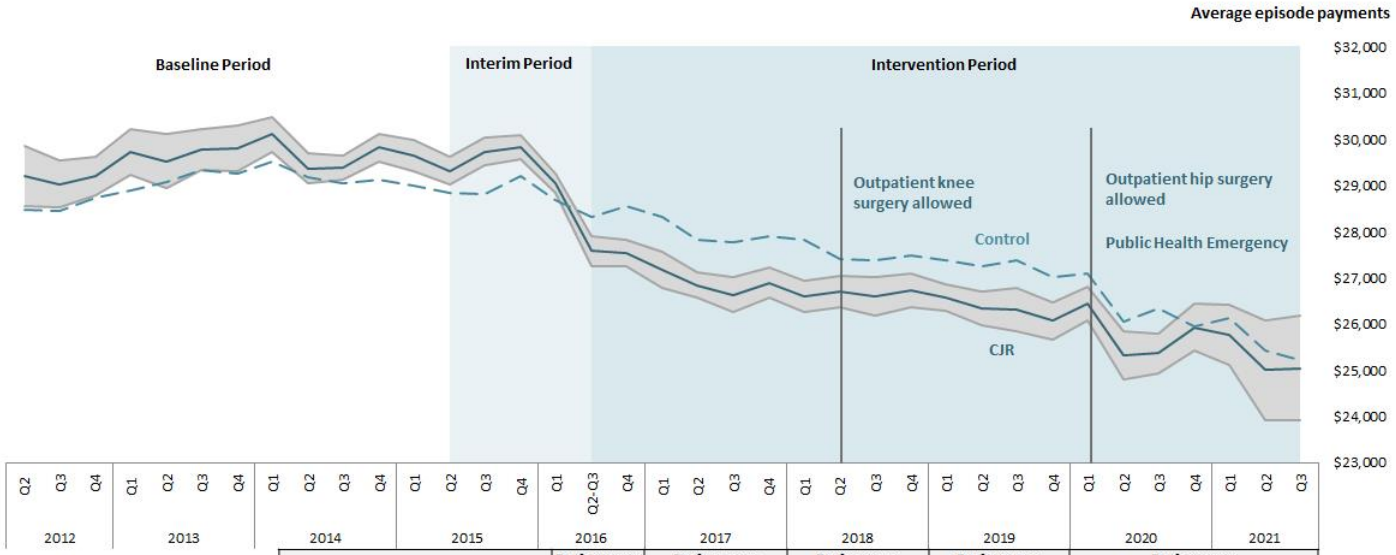
c. Results

Note, the analysis of average episode payments does not incorporate reconciliation payments made to CJR participant hospitals; therefore, the results do not represent savings to the Medicare program. An analysis of Medicare savings is presented in Section II.A.2.

Average payments for LEJR episodes declined for both mandatory CJR hospitals and control group hospitals during the first five performance years, although payments declined more for LEJR episodes initiated at mandatory CJR hospitals. As illustrated in Exhibit 8, the difference in average payments between CJR and control episodes narrowed during the public health emergency, when control hospitals as well as CJR hospitals reduced institutional PAC use, and CMS removed the risk of repayment responsibility (see the Introduction for more discussion about policy changes that affect the evaluation). There was also more variation in average payments during the public health emergency.

Return to Table of Contents

Exhibit 8: Average episode payments declined more for CJR episodes than control group episodes, although the reduction slowed during the public health emergency



	Performance year 1	Performance Year 2	Performance Year 3	Performance Year 4	Performance Year 5
Changes to the composition of the target price (regional average and hospital-specific average)	1/3 regional 2/3 hospital	1/3 regional 2/3 hospital	2/3 regional 1/3 hospital	100% regional	100% regional
Three years of historical data used to set target price	2012-2014	2012-2014	2014-2016	2014-2016	2016-2018
Stop gain and stop loss limits used at reconciliation	5% and no repayment	5%	10%	20%	20%
Other policies that potentially affect payment trends				Skilled nursing facility payment policy changes	Home health payment policy changes; Medicare coverage of knee surgery in ASCs; outpatient knee surgery included in BPCI-A

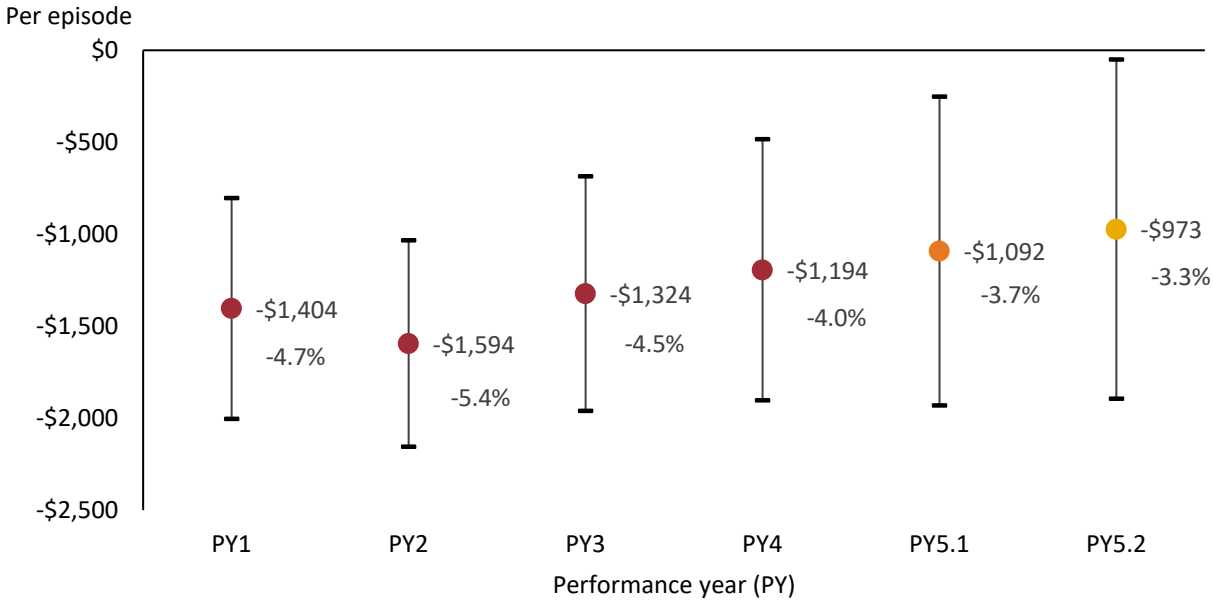
Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated on or after January 2012 that ended by September 2021.

Notes: Episodes that ended between April 1, 2015 and March 31, 2016 (the interim period) were excluded from our baseline because the CJR model was announced in July 2015 and hospitals were likely preparing for their future participation in the CJR model during that time. The gray shading represents the 90% confidence interval for the CJR estimate. Per CJR model rules, the quarter and year correspond to the episode end date. The graph illustrates when policies or events affect CJR episodes. Policies or events may have started in the prior quarter.

Return to Table of Contents

For mandatory CJR hospitals, average payments for LEJR episodes decreased in each performance year — reductions ranged from $973 (in PY5.2) to $1,594 (in PY2) — but the magnitude of the reduction decreased due to the outpatient policy changes, which began in PY3 and PY5.1, and the public health emergency, which began in PY5.1. As a result, the reduction in average episode payments was smallest in PY5.1 and PY5.2. The CJR model decreased average payments for LEJR episodes by $1,092 at mandatory CJR hospitals in PY5.1 (p=0.03) and by $973 in PY5.2 (p=0.08) (Exhibit 9).

Exhibit 9: Average payments for lower extremity joint replacement episodes at mandatory CJR hospitals decreased in all performance years, but the magnitude of the reduction decreased due to the outpatient policy changes and the public health emergency



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded circles, respectively. The whiskers represent 90% confidence intervals.

Cumulatively, over the first five performance years, the CJR model decreased average payments by $1,437 for LEJR episodes initiated at mandatory CJR hospitals (p<0.01). This relative reduction equates to a 4.9% decrease from the CJR baseline.

d. Conclusion

Over the first five performance years, the CJR model resulted in relative reductions in average episode payments for mandatory CJR hospitals. Medicare coverage of outpatient LEJRs and the COVID-19 PHE contributed to smaller payment reductions; nevertheless, the CJR model reduced episode payments every year.

Return to Table of Contents

The reduction in payments shrunk with Medicare coverage of outpatient LEJRs because CJR participant hospitals shifted fewer LEJRs to the cheaper outpatient setting than control hospitals. Starting in PY6, outpatient episodes are included in the CJR model, and the target price is site neutral (i.e., the target price does not depend on outpatient or inpatient setting). [16] These changes to the model design could increase the share of CJR LEJRs in the less costly outpatient setting which could affect future estimates of the impact of the model on average episode payments.

The impact of the CJR model on average episode payments continued to shrink in PY5 as the health care system faced the COVID-19 public health emergency. During the height of the public health emergency, control hospitals as well as CJR hospitals reduced institutional PAC use, weakening one of the main mechanisms by which CJR hospitals reduced average episode payments. Financial incentives under the CJR model were also weakened during the public health emergency due to the COVID-19 PHE policy to remove downside risk. After March 2021, CMS implemented a more fiscally conservative PHE policy that capped only episodes with a COVID diagnosis, restrengthening financial incentives under the model.[17]

Although the magnitude of the reduction in payments fluctuated, the CJR model reduced payments every year, demonstrating resilience to external forces.

2. How much did the Medicare program save or lose due to the CJR model after accounting for reconciliation payments?

Medicare achieves savings under the CJR model when reductions in episode payments are greater than the net reconciliation payments made to hospitals. This section presents estimated Medicare savings, separately for mandatory CJR hospitals and opt-in CJR hospitals.

a. Key Findings

- For mandatory CJR hospitals, the savings trend observed in the first four performance years reversed in performance year 5 because of increased reconciliation payments. There were statistically significant losses in performance year 5, which were large enough to offset savings from prior performance years.
- Opt-in CJR hospitals generated statistically significant losses in every performance year except performance year 1. Opt-in hospitals contributed to over 70% of the cumulative losses to Medicare under the model

[16] Centers for Medicare & Medicaid Services. Medicare Program: Comprehensive Care for Joint Replacement Model Three-Year Extension and Changes to Episode Definition and Pricing; Medicare and Medicaid Programs; Policies and Regulatory Revisions in Response to the COVID–19 Public Health Emergency; Final Rule 2021:1-81.

[17] For episodes initiated after March 31, 2021, CMS applied a more targeted financial relief from COVID-19 by capping payments at the quality-adjusted target price for episodes with a COVID-19 diagnosis on a claim.

Return to Table of Contents

b. Methods

The change in non-standardized paid amounts is estimated using our DiD methodology, which is explained fully in the Methods appendix (Appendix C).

Acronyms	
DiD	difference-in-differences
LEJR	lower extremity joint replacement
MSA	metropolitan statistical area
PAC	post-acute care
PHE	public health emergency
PY	performance year

Medicare savings = change in non-standardized paid amounts – net reconciliation payments

To calculate Medicare savings, we use non-standardized paid amounts instead of the standardized allowed amounts used in the average episode and service-level payments impact analyses (Sections II.A.1 and II.A.3). Non-standardized paid amounts are the actual payments from Medicare to providers, incorporating geographic and other payment adjustments and excluding beneficiary cost-sharing. Using non-standardized paid amounts aligns with how reconciliation payments are calculated and measured. The change in paid amounts reported in this section is different from the change in allowed amounts reported in Section II.A.1. In general, the change in paid amounts is smaller because it does not include the change in beneficiary cost-sharing.

Net reconciliation payments are the sum of payments made to CJR participant hospitals by Medicare for meeting cost and quality targets, less summed repayments from CJR participant hospitals to Medicare for failing to meet cost and quality targets.

At the start of PY3, the number of mandatory MSAs was scaled back to the 34 MSAs with the highest historical average episode payments. This evaluation report focuses on those MSAs and the hospitals that were always required to participate (mandatory CJR hospitals), excluding low-volume and rural hospitals.[18] We also calculated Medicare savings for hospitals in voluntary MSAs that opted to remain in the CJR model (opt-in CJR hospitals).

Medicare savings results are also available in Appendix E.

[18] Our analysis excluded low volume and rural hospitals because CMS made their participation voluntary after the first two years of the model. As described in the fourth annual evaluation report, low-volume and rural hospitals differ in important ways from mandatory or opt-in CJR hospitals that would make them less comparable to our control groups. In the fourth annual evaluation report, we presented a sensitivity analysis, which indicated that excluding low volume and rural hospitals from our Medicare program savings did not affect our conclusions about the impact of the CJR model.

Return to Table of Contents

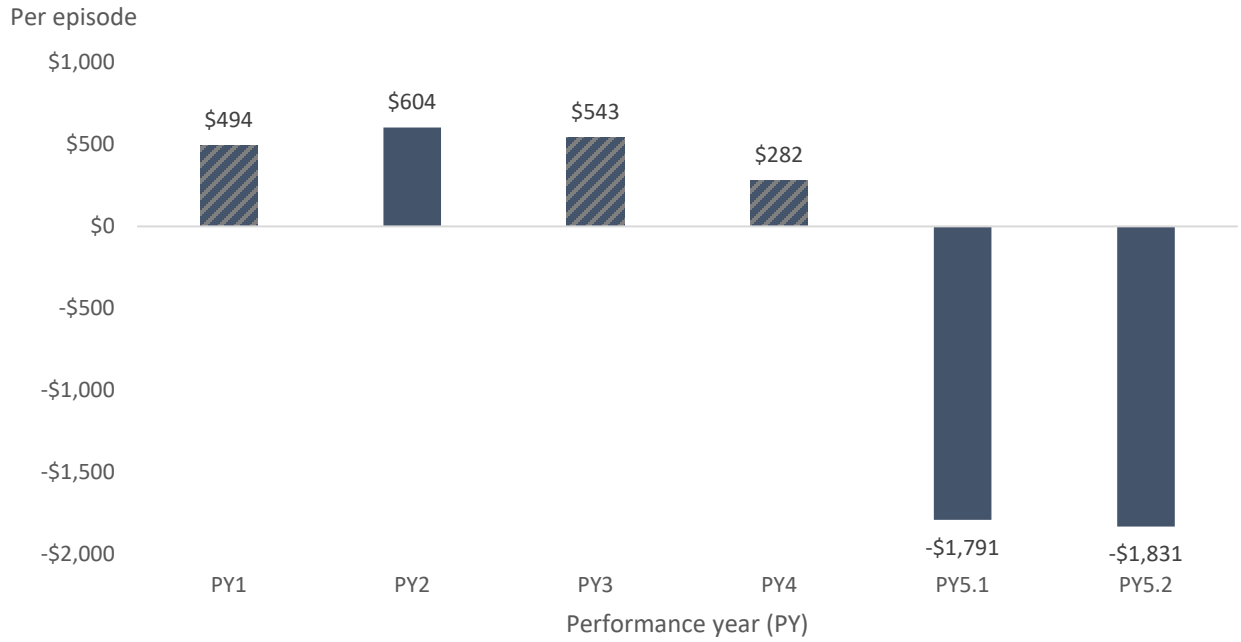
c. Results

Mandatory hospitals

Medicare savings. For mandatory hospitals, the CJR model resulted in Medicare savings in the first four performance years, although the savings were only statistically significant in PY2. In PY5, the CJR model resulted in Medicare losses (Exhibit 10).

- Medicare ***savings*** ranged from $282-$604 per episode in the first four performance years, although only the savings estimate for PY2 was statistically significant.
- In PY5.1, Medicare ***losses*** were $1,791 per episode. The 90% confidence interval ranged from losses of $933 to losses of $2,649 per episode.
- In PY5.2, Medicare ***losses*** were $1,831 per episode. The 90% confidence interval ranged from losses of $2,815 to losses of $847 per episode.

Exhibit 10: For mandatory hospitals, the savings trajectory observed in the first four performance years reversed in performance years 5.1 and 5.2



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Notes: Reductions in non-standardized paid amounts are based on a DiD model of per-episode standardized paid amounts that have been multiplied by negative one and converted to non-standardized amounts. Hashing indicates that the estimate is not statistically significant at the 10% level.

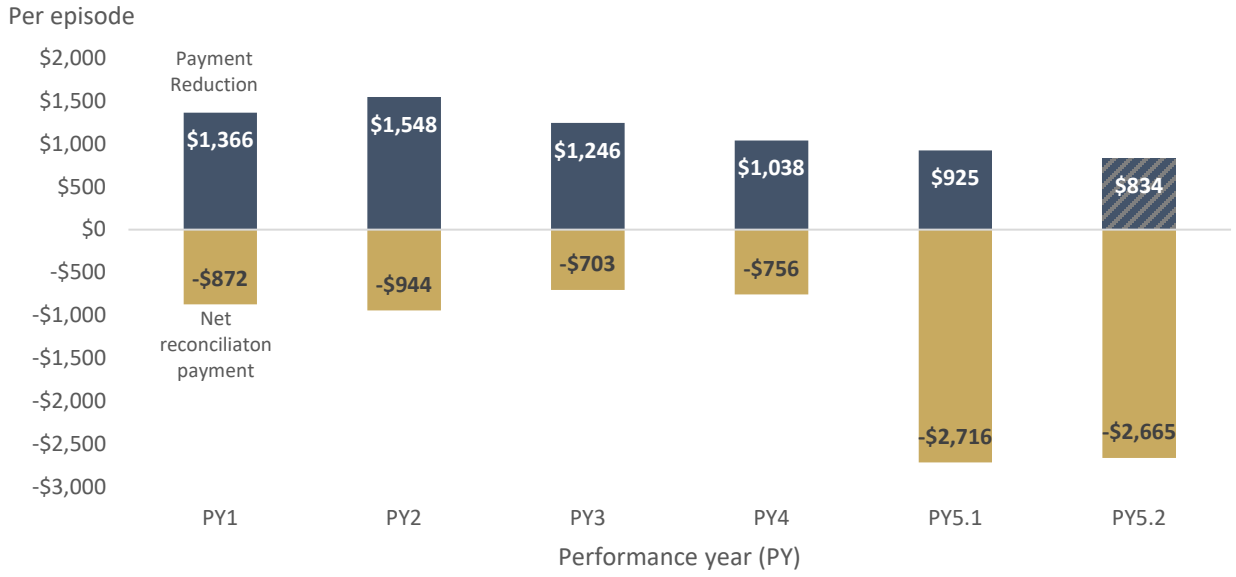
Understanding the savings components: reductions in payments. The CJR model resulted in statistically significant reductions in episode payments at mandatory hospitals in every year except PY5.2, in which the reduction was close to statistically significant. The reduction in payments

Return to Table of Contents

lessened due to the outpatient policy changes, which began in PY3 and PY5.1, and the public health emergency, which began in PY5.1 (Exhibit 11).

Understanding the savings components: net reconciliation payments. On average, mandatory hospitals received reconciliation payments for meeting cost and quality targets under the CJR model in each year. **Reconciliation payments increased due to the COVID-19 PHE policy to remove downside risk in PY5.1 and PY5.2, which drove Medicare losses from mandatory hospitals.** Average reconciliation payments per episode in PY5.1 and PY5.2 were about three times the average reconciliation payments in performance years 1-4 (Exhibit 11).

Exhibit 11: Losses in performance year 5 were driven by substantially larger reconciliation payments to mandatory hospitals



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Notes: Reductions in non-standardized paid amounts are based on a DiD model of per-episode standardized paid amounts that have been multiplied by negative one and converted to non-standardized amounts. Hashing indicates that the estimate is not statistically significant at the 10% level.

In the fourth annual evaluation report, we estimated mandatory hospitals generated net savings to Medicare during the first four performance years (although that estimate was not statistically significant at the 10% level). Losses in PY5 were large enough to offset the savings generated in the first four performance years. These losses were driven by the substantial increase in net reconciliation payments received in PY5 because of the COVID-19 PHE policy to remove downside risk. Of the $266.9 million in net reconciliation payments received by mandatory hospitals over the life of the model, $142.6 million (53%) was received in PY5.

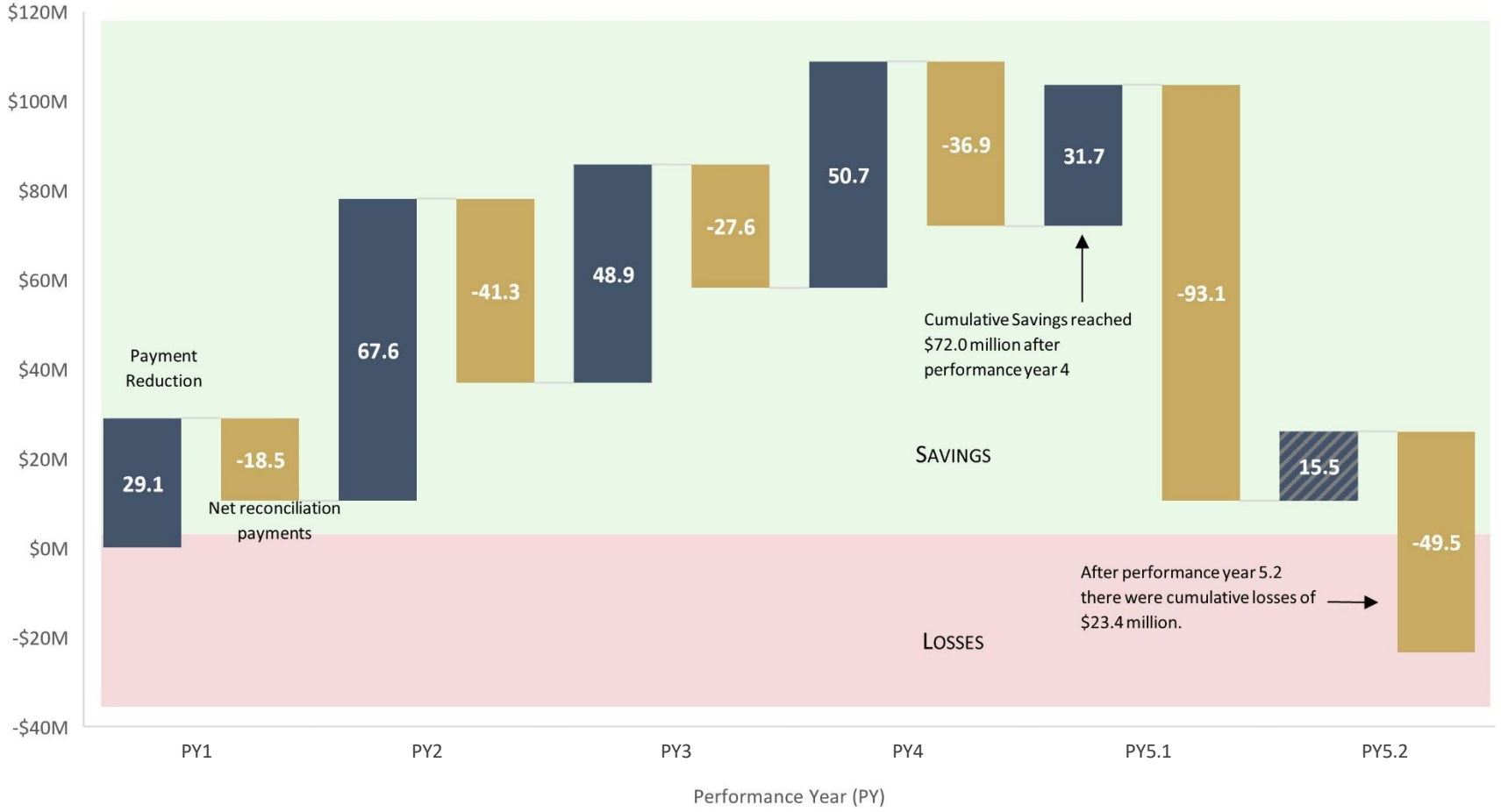
Cumulatively, at mandatory hospitals, the CJR model is estimated to have generated Medicare losses, although the estimate is not statistically significant (Exhibit 12). In total, mandatory CJR hospitals reduced episode payments by $243.5 million and received $266.9 million in net

Return to Table of Contents

reconciliation payments. Thus, mandatory CJR hospitals generated an estimated $23.4 million in losses during the first five performance years. The 90% confidence interval for the estimated losses ranges from losses of $155.2 million to savings of $108.4 million. This equates to losses of $114 per episode, ranging from losses of $754 to savings of $527, or approximately 0.4% of the baseline average episode payment.

Return to Table of Contents

Exhibit 12: During performance year 5, mandatory CJR hospitals were estimated to have generated losses to Medicare for the first time, reversing a trajectory of savings seen in the first four performance years. Estimated losses to Medicare from mandatory CJR hospitals totaled to $23.4 million through performance year 5, or $114 per episode.



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

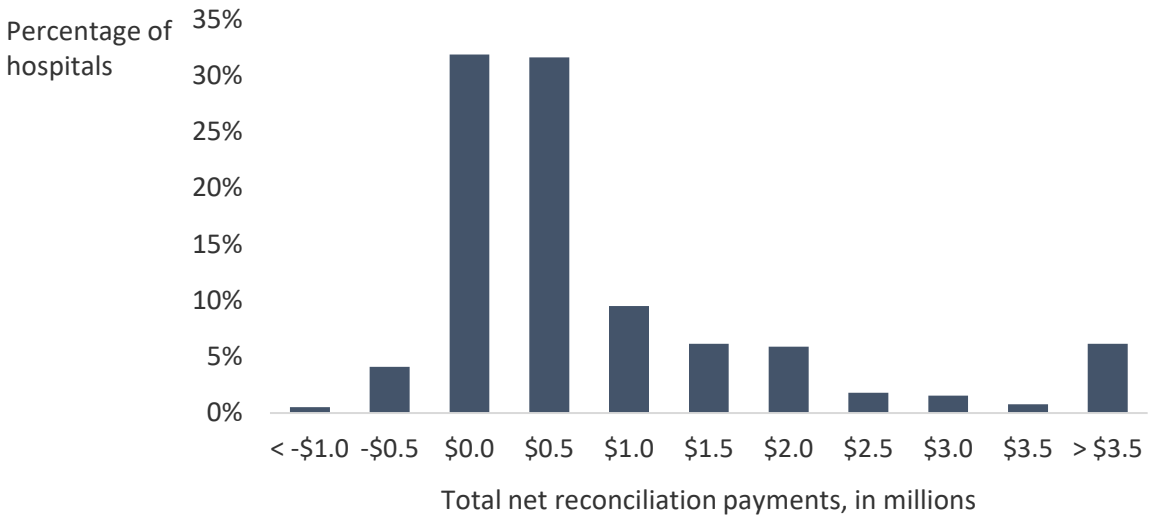
Notes: Hashing indicates that the estimate is not statistically significant at the 10% level.

Return to Table of Contents

Distribution of Reconciliation Payments

To better understand how reconciliation payments affected savings, we analyzed how reconciliation payments were distributed among hospitals. In total, mandatory hospitals received $266.9 million in reconciliation payments over the first five years of the CJR model. In that time, most mandatory hospitals (68%) repaid or received between -$500,000 and $500,000 in total net reconciliation payments (Exhibit 13). A small minority of mandatory hospitals (6%) received more than $3.5 million in total reconciliation payments. The top 10% of mandatory hospitals in terms of reconciliation receipts collected more in total reconciliation than the remaining 90% of mandatory hospitals combined (Exhibit 14).

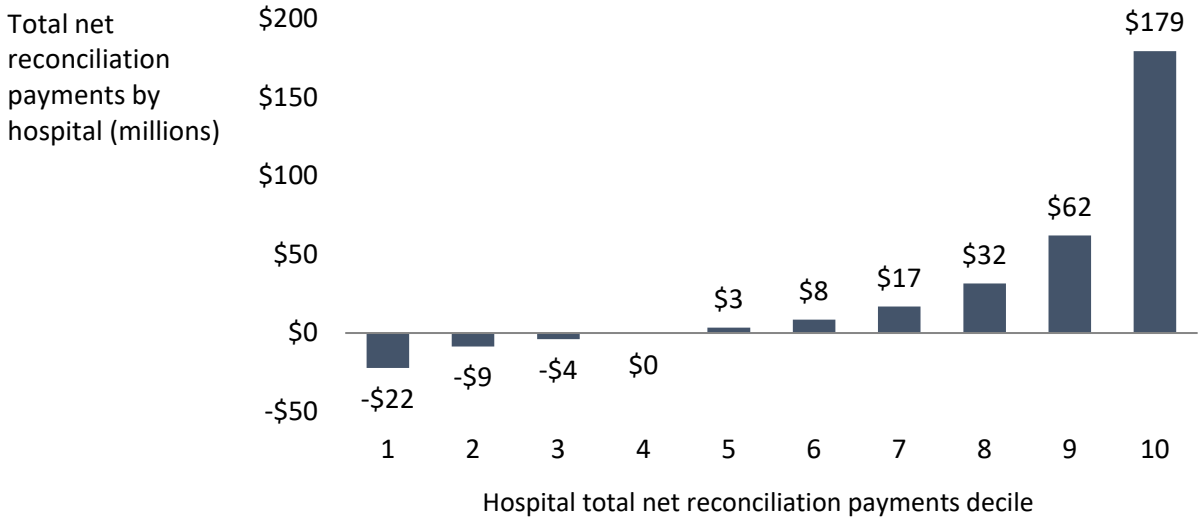
Exhibit 13: The majority of mandatory hospitals repaid or received between -$0.5 million and $0.5 million in total net reconciliation payments



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Return to Table of Contents

Exhibit 14: The top 10% of mandatory hospitals received more total net reconciliation payments than the remaining 90%



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Notes: Each decile contains 39 hospitals.

Opt-in hospitals

Medicare savings. For opt-in hospitals, the CJR model resulted in Medicare losses in all performance years, although the losses were not statistically significant in PY1 (Exhibit 15).

- Medicare ***losses*** ranged from $407-$1,517 per episode in the first four performance years, although losses in PY1 were not statistically significant.
- In PY5.1, Medicare ***losses*** were $3,183 per episode. The 90% confidence interval ranged from losses of $2,669 to losses of $3,697 per episode.
- In PY5.2, Medicare ***losses*** were $2,731 per episode. The 90% confidence interval ranged from losses of $1,913 to losses of $3,548 per episode.

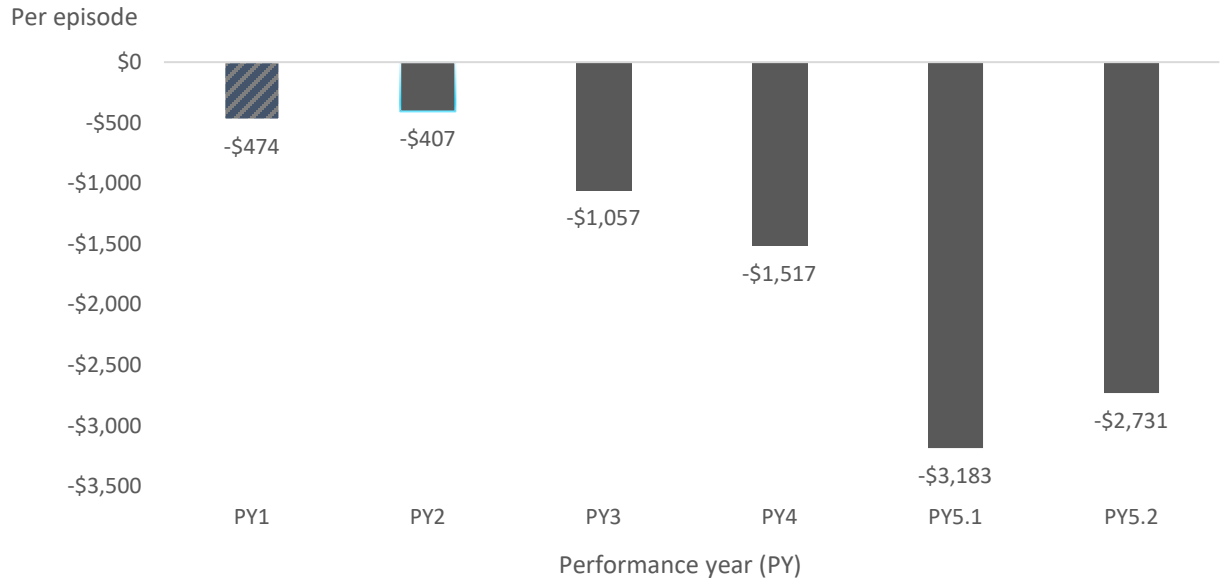
Understanding the savings components: reductions in payments. The CJR model resulted in statistically significant reductions in episode payments at opt-in hospitals in PY2 and PY4. The reductions in PY1 and PY3 were close to statistically significant. Estimated payment reductions were slightly lower in PY5 than in prior years. Opt-in hospitals achieved reductions in episode payments despite having already low average episode payments in the baseline. (In the baseline, the average episode payment at opt-in hospitals was 26% lower than the average episode payment at mandatory hospitals.)[19]

[19] Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - third annual report. https://innovation.cms.gov/data-and-reports/2020/cjr-thirdannrpt: 26-30.

Return to Table of Contents

Understanding the savings components: net reconciliation payments. Most opt-in hospitals received reconciliation payments for meeting cost and quality targets under the CJR model in each year. **Reconciliation payments increased due to the COVID-19 PHE policy to remove downside risk in PY5.1 and PY5.2, which increased Medicare losses from opt-in hospitals.** Average reconciliation payments per episode in PY5.1 and PY5.2 were about twice the average reconciliation payments in PYs 1-4 (Exhibit 16).

Exhibit 15: For opt-in hospitals, the CJR model resulted in Medicare losses

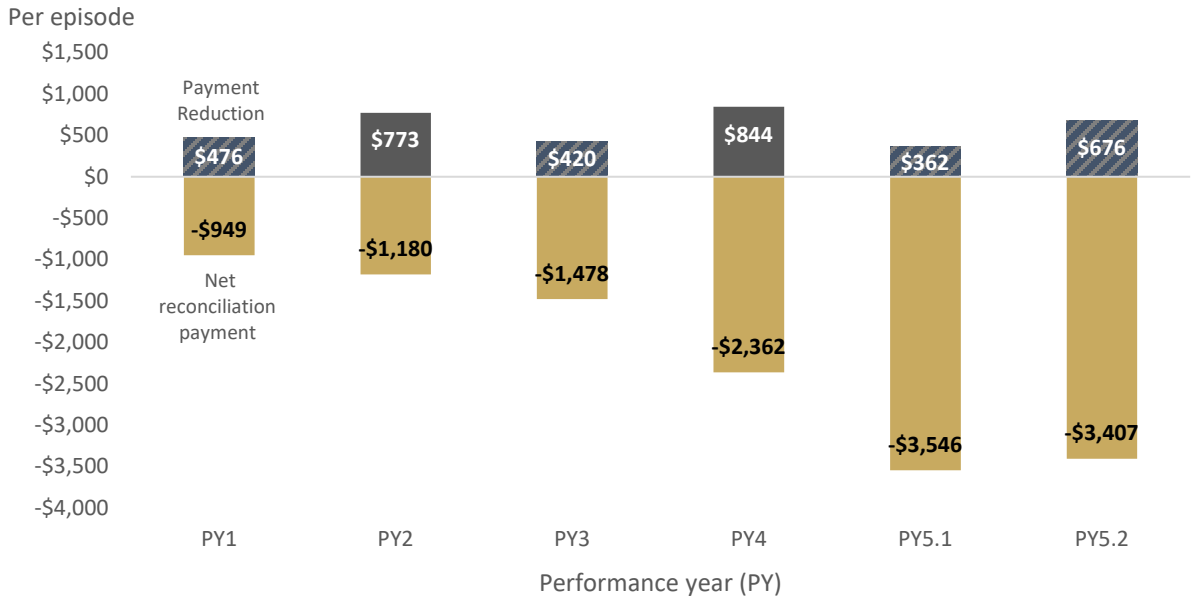


Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Notes: Reductions in non-standardized paid amounts are based on a DiD model of per-episode standardized paid amounts that have been multiplied by negative one and converted to non-standardized amounts. Hashing indicates that the estimate is not statistically significant at the 10% level.

Return to Table of Contents

Exhibit 16: For opt-in hospitals, larger reconciliation payments in performance year 5 increased losses



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2

Notes: Reductions in non-standardized paid amounts are based on a DiD model of per-episode standardized paid amounts that have been multiplied by negative one and converted to non-standardized amounts. Hashing indicates that the estimate is not statistically significant at the 10% level.

Cumulatively, at opt-in hospitals, the CJR model is estimated to have generated statistically significant Medicare losses (Exhibit 17). In total, opt-in CJR hospitals reduced episode payments by $40.2 million and received $126.2 million in net reconciliation payments. Thus, opt-in CJR hospitals generated an estimated $85.9 million in losses during the first five performance years. The 90% confidence interval for the estimated losses ranges from losses of $109.7 million to losses of $62.2 million. This equates to losses of $1,312 per episode, ranging from losses of $1,674 to losses of $949, or approximately 6% of the average baseline episode cost.

Return to Table of Contents

Exhibit 17: During performance years 1-5, opt-in CJR hospitals generated an estimated $85.9 million in total losses, or $1,312 per episode

Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

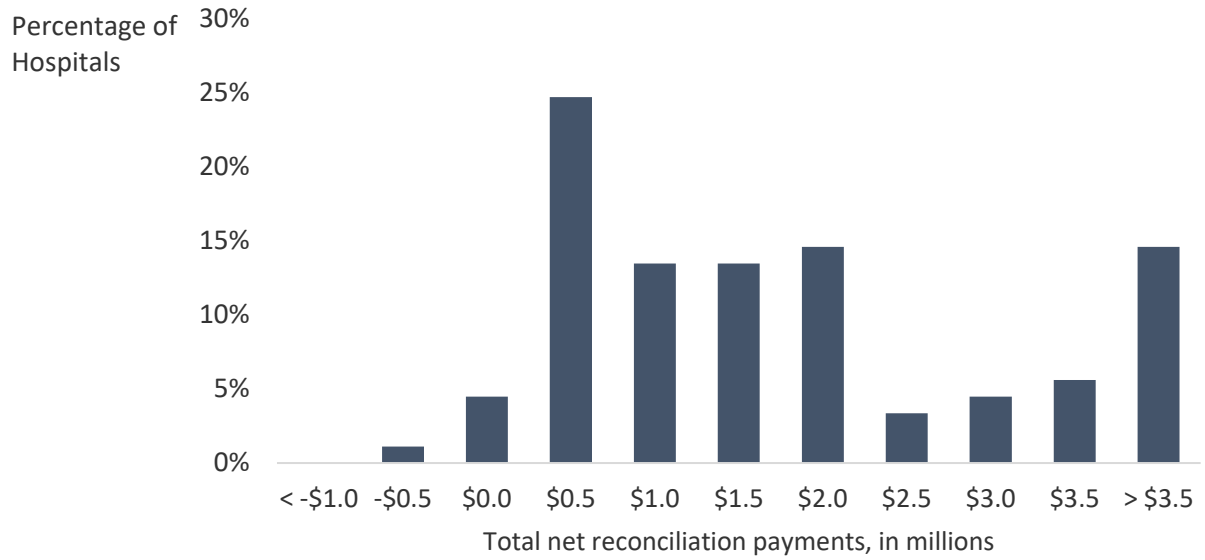
Notes: Hashing indicates that the estimate is not statistically significant at the 10% level.

Return to Table of Contents

Distribution of Reconciliation Payments

In total, opt-in hospitals received $126.2 million in net reconciliation payments over the first five years of the CJR model. In that time, most opt-in hospitals (72%) received more than $500,000 in total net reconciliation payments, and nine opt-in hospitals (12%) received more than $3.5 million in reconciliation payments (Exhibit 18). The top 10% of opt-in hospitals received 38% of the total net reconciliation payments distributed to opt-in hospitals (Exhibit 19).

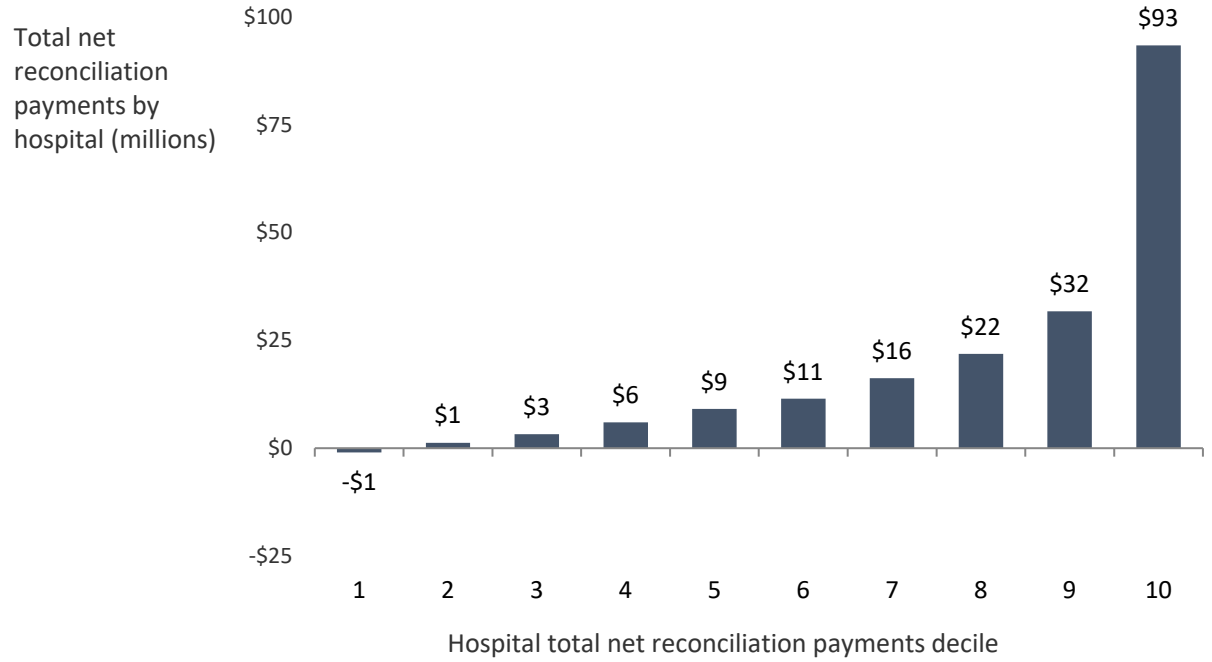
Exhibit 18: Almost all opt-in hospitals received more than $0.5 million in total net reconciliation payments



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Return to Table of Contents

Exhibit 19: The top 10% of opt-in hospitals received 38% of total net reconciliation payments distributed to opt-in hospitals



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Notes: Each decile contained 7-8 hospitals. The deciles were not equally sized because the total number of opt-in hospitals (74) was not divisible by 10.

Non-opt-in hospitals

Cumulative and performance-year specific estimates for non-opt-in hospitals can be found in Annual Report 4.[20] Non-opt-in hospitals stopped participating in the CJR model at the end of PY2. For the purposes of estimating Medicare program savings, we consider these hospitals only during performance years 1 and 2. There are no new data for non-opt-in hospitals so the estimates for this hospital group did not change.

Medicare savings under alternative policy responses to the COVID-19 PHE

As reported above, large increases in net reconciliation payments in PY5 drove losses for mandatory hospitals and increased losses for opt-in hospitals. The larger reconciliation payments were due to changes to model rules made in response to the COVID-19 PHE.

CMS implemented two policies to protect hospitals from downside risk and avoid creating incentives that placed cost considerations over patient safety. The first change to model rules was

[20] Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - fourth annual report. https://innovation.cms.gov/data-and-reports/2021/cjr-py4-annual-report: 31-33.

Return to Table of Contents

published in April of 2020.[21] The COVID-19 PHE policy to remove downside risk expanded the existing CJR extreme and uncontrollable circumstances policy to apply to CJR episodes initiated on or after January 31, 2020. Specifically, it meant that episodes initiated after that date had episode payments capped at the quality adjusted target price for the purposes of calculating reconciliation. In a subsequent rule published in November of 2020, the COVID-19 PHE policy to remove downside risk was set to end on March 31, 2021 and replaced with a more targeted episode payment policy to remove downside risk, capping payments only for episodes with a COVID-19 diagnosis.[22]

To understand the impact of these policies, we calculated Medicare savings under two different hypothetical policy responses, as a possible range of savings or losses based on CMS' response:

1. A hospital-level downside risk waiver during the COVID-19 PHE
2. No policy response to the COVID-19 PHE

For the hospital-level downside risk waiver scenario, for episodes initiated on or after January 31, 2020, we capped *hospital-level* payments at the target price, as was done in PY1.

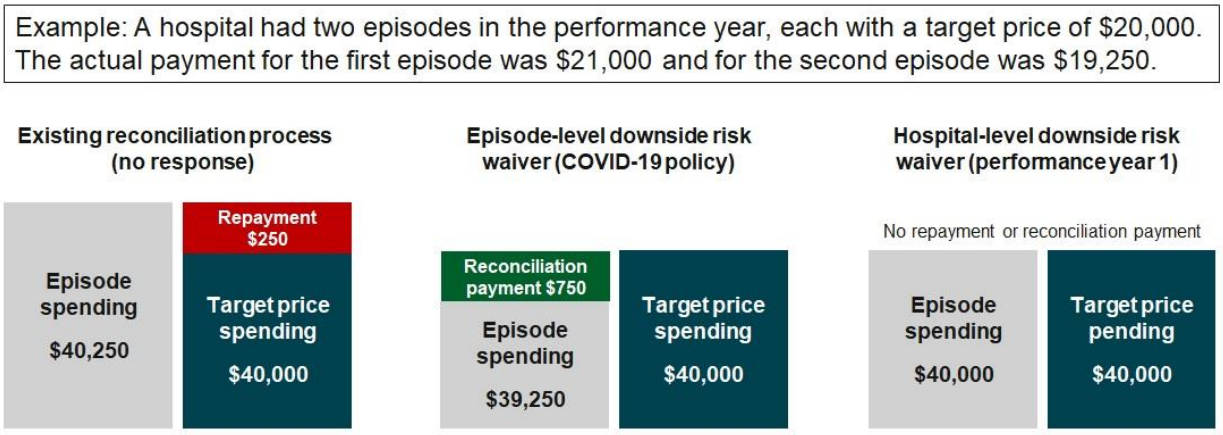
It is worth noting that waiving downside risk at the *hospital* level is quite different from the actual PY5 policy, which waived downside risk at the *episode* level. An example of how the level at which downside risk is waived results in different reconciliation results is provided in Exhibit 20. Because the COVID-19 PHE policy to remove downside risk was applied at the episode level, CJR hospitals received reconciliation payments for episodes that met cost and quality targets, while episodes that did not meet cost and quality targets did not affect reconciliation payments.

[21] 85 FR 19230 (Federal Register :: Medicare and Medicaid Programs; Policy and Regulatory Revisions in Response to the COVID-19 Public Health Emergency).

[22] 85 FR 71142 (Federal Register :: Additional Policy and Regulatory Revisions in Response to the COVID-19 Public Health Emergency).

Return to Table of Contents

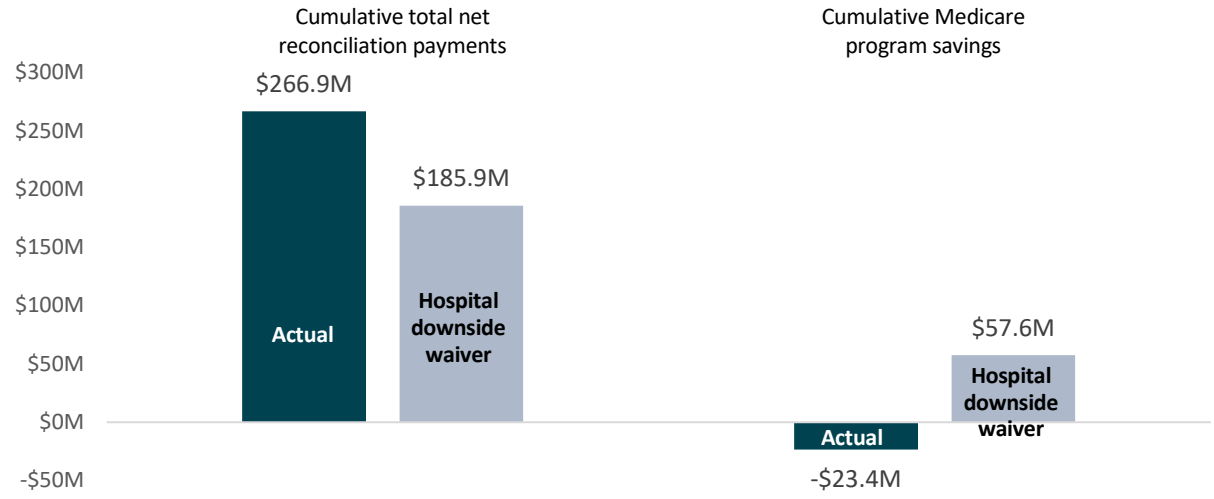
Exhibit 20: Waiving downside risk at the episode level can result in reconciliation payments even if the hospital exceeds its quality-adjusted target payments on average



To calculate total net reconciliation payments under the "no response" scenario, we removed the capping of episode payments at the target price and used actual payments.

Under a hospital downside risk waiver, mandatory hospitals would have received $185.9 million in cumulative total net reconciliation payments, $81 million less than they actually received (Exhibit 21). This would have resulted in cumulative savings of $57.6 million, instead of cumulative losses of $23.4 million from mandatory hospitals. Opt-in hospitals would have received $109.8 million, $16.3 million less than they actually received (Exhibit 22). This would have resulted in cumulative losses of $69.6 million, rather than cumulative losses of $85.9 million from opt-in hospitals.

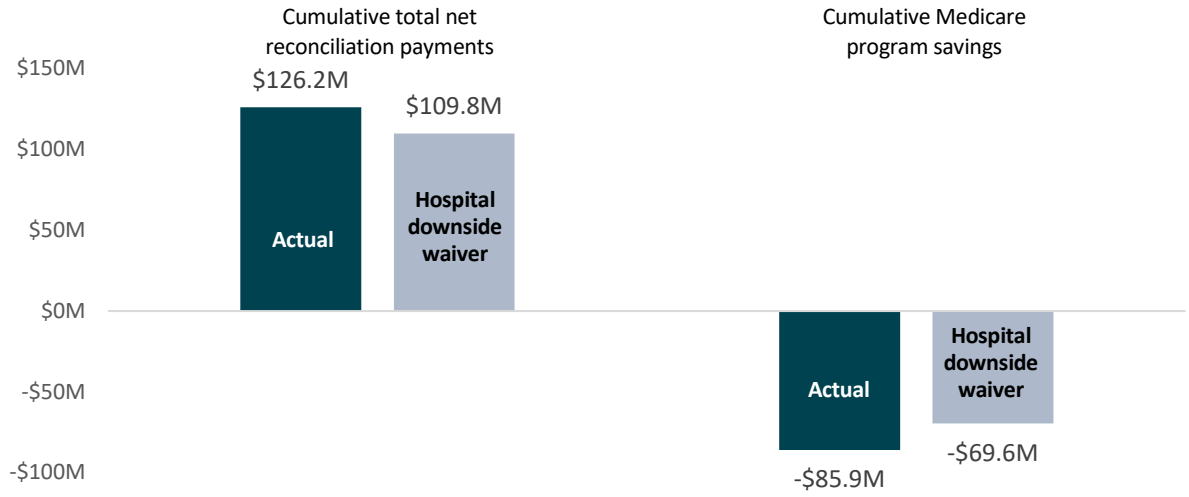
Exhibit 21: A hospital downside risk waiver would result in $81 million more savings from mandatory hospitals



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Return to Table of Contents

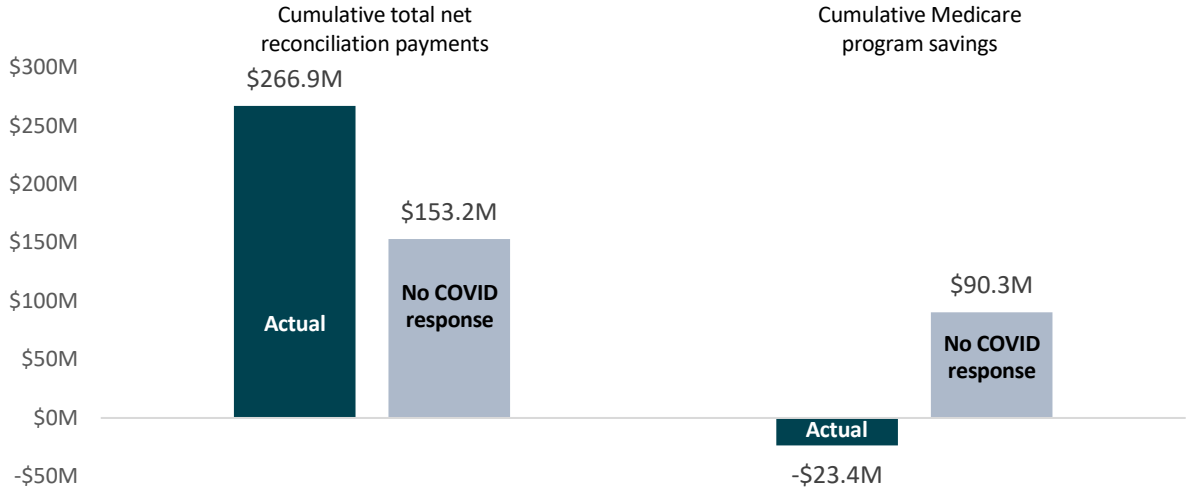
Exhibit 22: A hospital downside risk waiver would result in $16.3 million more savings from opt-in hospitals



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

If there had been no policy response to the COVID-19 pandemic, mandatory hospitals would have received a cumulative $153.2 million of total net reconciliation payments, $113.7 million less than they actually received (Exhibit 23). This would have resulted in cumulative savings of $90.3 million instead of losses of $23.4 million. Opt-in hospitals would have received $107.4 million in cumulative total net reconciliation payments, $18.8 million less than they actually received (Exhibit 24). This would have resulted in cumulative losses of $67.2 million rather than $85.9 million.

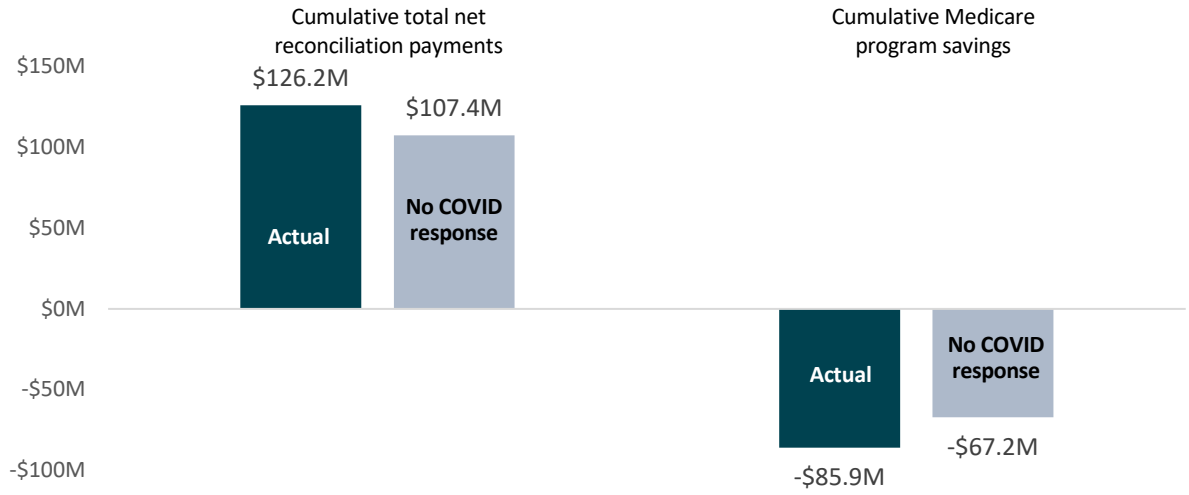
Exhibit 23: Absent a COVID-19 policy response, mandatory hospitals would have generated $113.7 million more savings



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

Return to Table of Contents

Exhibit 24: Absent a COVID-19 policy response, opt-in hospitals would have generated $18.8 million more savings



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention) and CJR payment contractor data for CJR participant hospitals in PY1-5.2.

d. Conclusion

Overall, mandatory participation in the CJR model is a promising approach for generating Medicare savings. However, CJR and Medicare policy changes, such as the COVID-19 PHE policy to remove downside risk, as well as outpatient policy changes, can interact with model rules and dampen or reverse savings. During the first four performance years, mandatory hospitals were on trend to potentially save Medicare money, with estimated cumulative savings of $72 million at the end of PY4. The losses in PY5 were large enough to offset this, resulting in estimated losses of $23.4 million.

The losses in PY 5 were driven by two factors, larger reconciliation payments and smaller impacts. Losses in PY5 were driven by large increases in reconciliation payments due to the generous COVID-19 PHE policy to remove downside risk. In addition, the PHE reduced the volume of elective joint replacements, making LEJRs due to hip fracture the predominant episode, and reduced the use of institutional PAC for control hospitals as well as CJR hospitals. These shifts made it more difficult for CJR hospitals to reduce episode payments relative to control hospitals. We do not know if the trend for reduced institutional PAC use will persist and continue to reduce impacts from the CJR model. Even prior to the PHE, the reductions in payments at mandatory hospitals lessened due to the outpatient policy changes because CJR hospitals shifted a smaller share of LEJRs to the less expensive outpatient setting. The smaller payment reductions contributed to lower savings estimates.

Opt-in hospitals, by contrast, generated estimated losses to Medicare in every performance year, although losses in PY1 were not statistically significant. As reported in the third annual report, 73% of opt-in hospitals started the CJR model with historical episode payments below their PY1

Return to Table of Contents

quality-adjusted target price.[23] These hospitals did not need to reduce payments to the same extent as mandatory hospitals to bring payments below their target prices. Also, opt-in hospitals received substantially more per episode in net reconciliation payments from Medicare than mandatory hospitals. Losses from opt-in hospitals comprise roughly 72% of total losses from the model.

As noted above, if there had been no policy response to the COVID-19 PHE, we estimated that the model would have generated approximately $23.1 million in cumulative savings from mandatory and opt-in hospitals (and approximately $13 million after accounting for losses from non-opt-in hospitals). These two analyses represent potential alternative policy responses to the COVID-19 pandemic that CMS could have implemented. Many further alternatives exist that could have generated savings or losses amounts that fall along the range of estimates produced based on the existing the COVID-19 PHE policy to remove downside risk, the hospital-level downside risk waiver scenario, and the no response scenario.

In the future, Medicare savings are likely to be very different, with the number of future changes to the model. For episodes initiated after March 2021, CMS implemented a more fiscally conservative COVID-19 relief policy which will likely reduce reconciliation payments in future performance years. Additionally, beginning with PY6, opt-in hospitals will not be model participants and outpatient LEJR will be included as episodes in the model. Target prices from PY6 onwards will also be site neutral (i.e., the same target price for LEJR done in either the inpatient or outpatient setting), potentially increasing the share of CJR LEJRs in the less costly outpatient setting.

3. What was the impact of the CJR model on service-level payments and service use?

Changes in service-level payments and use provide insights into how hospitals reduced average episode payments. Payments for PAC, which comprised roughly one-third of LEJR episode payments during the baseline, can be reduced by shifting service use from more to less intensive care settings that receive lower Medicare payments. Generally, average inpatient rehabilitation facility (IRF) payments are higher than average skilled nursing facility (SNF) payments, and Medicare payments for both of these institutional PAC settings tend to be higher than payments for home health (HH) care. Prior to the outpatient TKA and THA coverage changes, hospital payments for the LEJR surgery were unlikely to change under the CJR model because hospitals received a per-discharge payment for inpatient LEJRs that typically was not

Acronyms	
DiD	difference-in-differences
HH	home health
HHA	home health agency
IPPS	inpatient prospective payment system
IRF	inpatient rehabilitation facility
LEJR	lower extremity joint replacement
PAC	post-acute care
PHE	public health emergency
pp	percentage point
PY	performance year
SNF	skilled nursing facility
THA	total hip arthroplasty
TKA	total knee arthroplasty

[23] Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - third annual report. https://innovation.cms.gov/data-and-reports/2020/cjr-thirdannrpt. 2020: 29.

Return to Table of Contents

affected by length of stay or services provided during the hospitalization. The Medicare payment for a TKA and THA performed in the outpatient setting, however, is lower than the inpatient payment. Because the CJR model affected the distribution of inpatient versus outpatient procedures, hospital payments could change in response to the CJR model.

a. Key Findings

- The relative decrease in average episode payments was driven by relative decreases in inpatient rehabilitation facility (IRF) and skilled nursing facility (SNF) payments. The reduction in IRF payments was due to a reduction in the proportion of patients discharged from the hospital to an IRF, and the reduction in SNF payments was primarily due to a reduction in number of days spent in a SNF. However, the impact of the CJR model on SNF payments and use, and to a lesser extent IRF payments and use, diminished over time.
- Under the CJR model, patients likely used home health services earlier in their episode than they would have absent the CJR model.

b. Methods

This analysis uses a DiD design (described in Section II.A.1.b) to estimate the differential change in average standardized allowed amounts (payments) and average utilization by service during the 90 days following discharge from the hospital for mandatory CJR hospitals.[24,25] Average payments by service are calculated across all episodes, including episodes that did not receive the particular service, while average length of stay and number of visits are based only on the episodes that used that particular service.

c. Results

In each of the first five performance years, the relative reduction in average episode payments was driven by reductions in IRF and SNF payments. The reduction in IRF payments was due to a reduction in the proportion of patients discharged from the hospital to an IRF, and the reduction in SNF payments was primarily due to a reduction in number of days spent in a SNF. The impact of the CJR model on SNF payments and use, and to a lesser extent IRF payments and use, diminished over time. Concurrent with the reductions in institutional PAC use, a greater proportion of patients were discharged from the hospital to an HHA under the CJR model. There were also relative

[24] Appendix F contains additional detail about how outcomes are defined.

[25] We used standardized payments to ensure that observed payment differences reflect actual differences in billed services rather than Medicare payment policies. We used allowed amounts to eliminate variation in payments due to whether beneficiaries have met their deductible when they had the LEJR surgery. The change in standardized allowed amounts reported here is different from the change in non-standardized paid amounts reported in the prior chapter. In general, the change in standardized allowed amounts is greater because it includes the change in beneficiary cost-sharing.

Return to Table of Contents

reductions in readmission payments. In later years of the CJR model, reductions in payments were offset by small increases in payments for the LEJR surgery (anchor hospitalization).

Exhibit 25: Reductions in inpatient rehabilitation facility and skilled nursing facility payments and use drove the reduction in episode payments, but this waned over time

Domain	Outcome	Performance Year (PY) PY1	PY2	PY3	PY4	PY5.1	PY5.2	Cumulative PY1-PY5
Payment	Average episode payments	-$1,404	-$1,594	-$1,324	-$1,194	-$1,092	-$973	-$1,437
	IRF	-$595	-$541	-$553	-$753	-$573	-$427	-$594
	SNF	-$711	-$973	-$820	-$460	-$282	-$325	-$747
	HHA[a]	$124	$41	$84	$40	$93	$231	$76
	Readmission	-$118	-$158	-$159	-$167	-$102	-$137	-$146
	Anchor hospitalization	$11	$34	$101	$163	$60	$42	$52
Utilization	First discharged to IRF (pp)	-3.7	-3.6	-3.5	-4.8	-3.4	-2.7	-3.8
	First discharged to SNF (pp)	-2.1	-3.3	-2.5	1.2	-0.7	-2.6	-2.5
	First discharged to HHA (pp)	7.7	7.5	7.7	4.3	6.7	11.3	7.5
	First discharged home without HHA (pp)	-1.9	-0.6	-1.7	-0.6	-2.6	-6.0	-1.2
	SNF days	-2.0	-2.6	-2.6	-2.6	-1.3	-0.4	-2.3
	Any HHA use (pp)	5.1	4.2	4.8	2.9	5.0	9.4	4.6

Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

[a] CJR and control group hospitals may have had different home health payment trends in the baseline, which means we cannot be certain that we isolated the impact of the CJR model on this outcome. Additional details about baseline trends are included in Appendix C Section III.

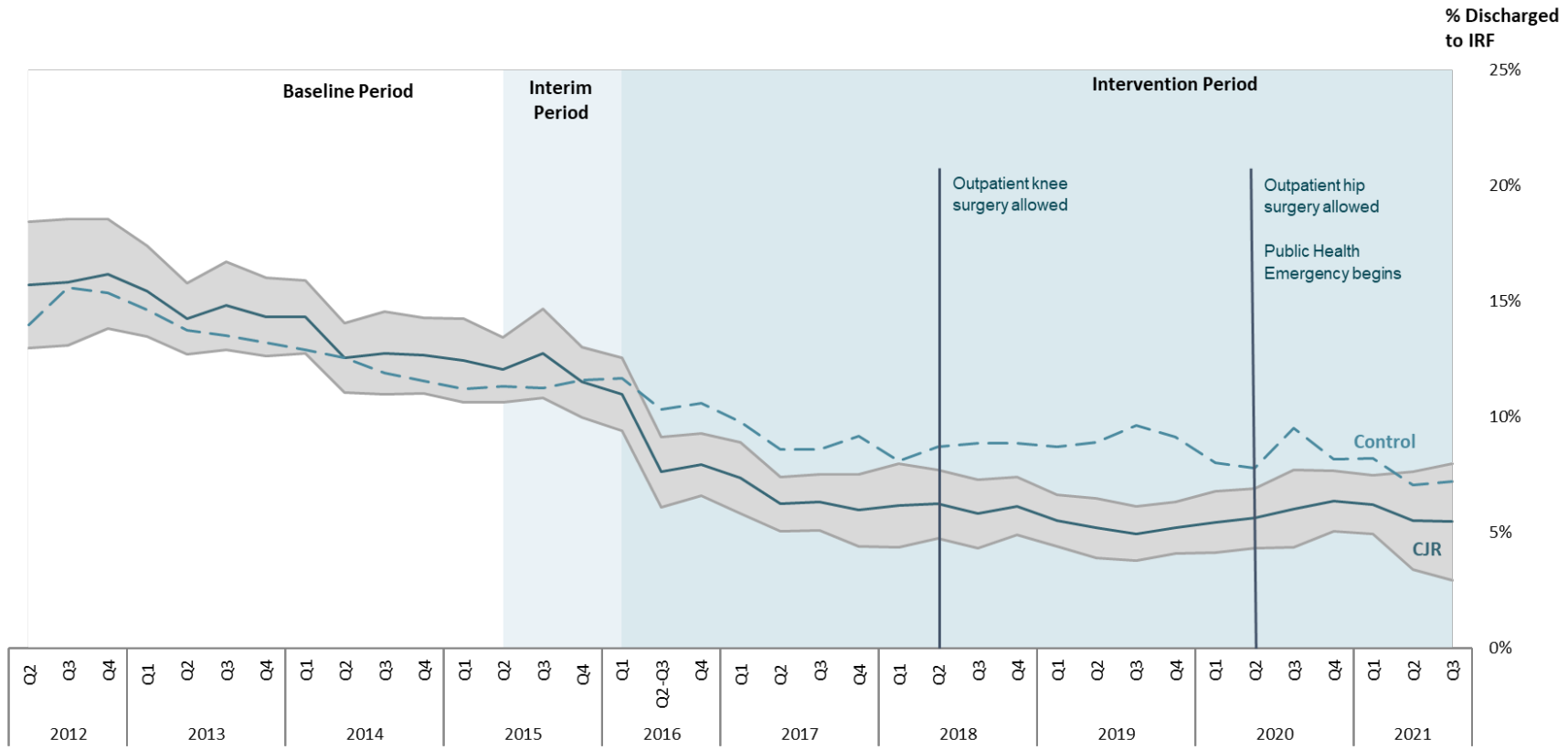
IRF. The CJR model reduced IRF payments in each year, except the reduction was smaller and not statistically significant in PY5.2. From PY1 to PY5.1, the reduction in average IRF payments was between $541 and $753 per episode ($p<0.08$ for each year, Exhibit 25). The estimated reduction of $427 per episode in PY5.2 was not statistically significant. The reductions in IRF payments were due to relative decreases in the proportion of CJR patients discharged from the hospital to an IRF. From the baseline to the intervention, the proportion of patients first discharged to an IRF decreased more for CJR episodes than control episodes (Exhibit 26). The CJR model reduced the proportion of patients discharged from the hospital to an IRF by between 3.4pp and 4.8pp in PY1-5.1 ($p<0.08$ for each year). In PY5.2, consistent with the shrinking reduction in IRF payments, there was no statistically significant change in the proportion of

Return to Table of Contents

patients first discharged to an IRF. Cumulatively, for the first five performance years, the CJR model reduced average IRF payments by $594 (p=0.01) or 25.0% from the CJR baseline, due to a 3.8pp (p=0.02) relative reduction in the percent of patients discharged from the hospital to an IRF.

Return to Table of Contents

Exhibit 26: The proportion of patients first discharged to an inpatient rehabilitation facility (IRF) decreased more for CJR than control episodes



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated on or after January 2012 that ended by September 2021.

Notes: Episodes that ended between April 1, 2015 and March 31, 2016 (the interim period) were excluded from our baseline because the CJR model was announced in July 2015 and hospitals may have been preparing for their future participation in the CJR model during that time.

The gray shading represents the 90% confidence interval for the CJR estimate.

Return to Table of Contents

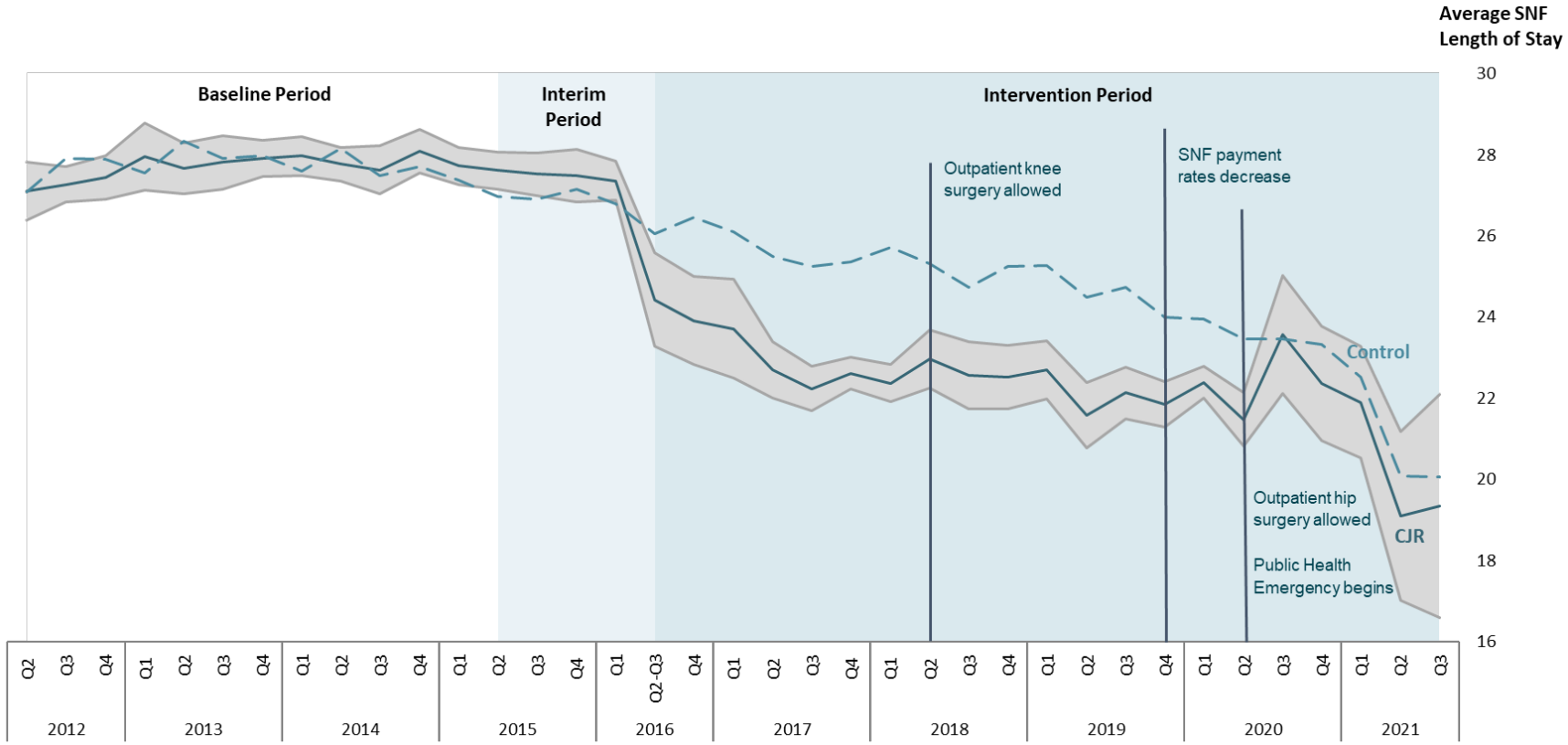
SNF. The CJR model reduced average SNF payments in each of the first four performance years, but the impact started to lessen in PY4 and ultimately was not statistically significant in either PY5.1 or PY5.2. In the first three performance years the reduction in SNF payments was between $711 and $973 per episode ($p<0.01$ for each year). The impact was reduced by nearly half in PY4 (-$460, $p=0.09$). The estimated reductions in average per-episode SNF payments of $282 in PY5.1 and $325 in PY5.2 were not statistically significant.

The reductions in SNF payments were driven by reductions in the number of days spent in a SNF. Medicare pays SNFs for each day of care so reducing the number of SNF days reduces the payment to the SNF and, in turn, lowers episode payments. The number of days spent in a SNF declined more for CJR than control episodes under the CJR model, although the number of SNF days dropped precipitously for both groups during the PHE (Exhibit 27). Consistent with the shrinking reduction in SNF payments, the reduction in the number of days spent in a SNF diminished in PY5. In each of the first four performance years, under the CJR model, patients spent between 2.0 and 2.6 fewer days in a SNF ($p=0.01$ in PY1 and $p<0.01$ in PY2-4). The reduction in the number of days spent in a SNF was nearly halved in PY5.1 (-1.3 days, $p=0.05$) and by PY5.2 the impact was not statistically significant. In PY1 and PY2, the CJR model also reduced the proportion of patients discharged from the hospital to a SNF, which contributed to the SNF payment reductions in those years. Thereafter, there were no statistically significant changes in the proportion of patients discharged to a SNF. Several overlapping events likely contributed to the diminished impact of the CJR model on SNF payments and use, including the outpatient policy changes, Medicare SNF payment policy changes, and the PHE (Exhibits 27 and 28).

Cumulatively, for the first five performance years, the CJR model reduced average SNF payments by $747 ($p<0.01$) or 11.9% from the CJR baseline, which was primarily driven by a 2.3 day ($p<0.01$) reduction in the number of days spent in a SNF.

Return to Table of Contents

Exhibit 27: The number of skilled nursing facility (SNF) days drops during the public health emergency for both CJR and control episodes



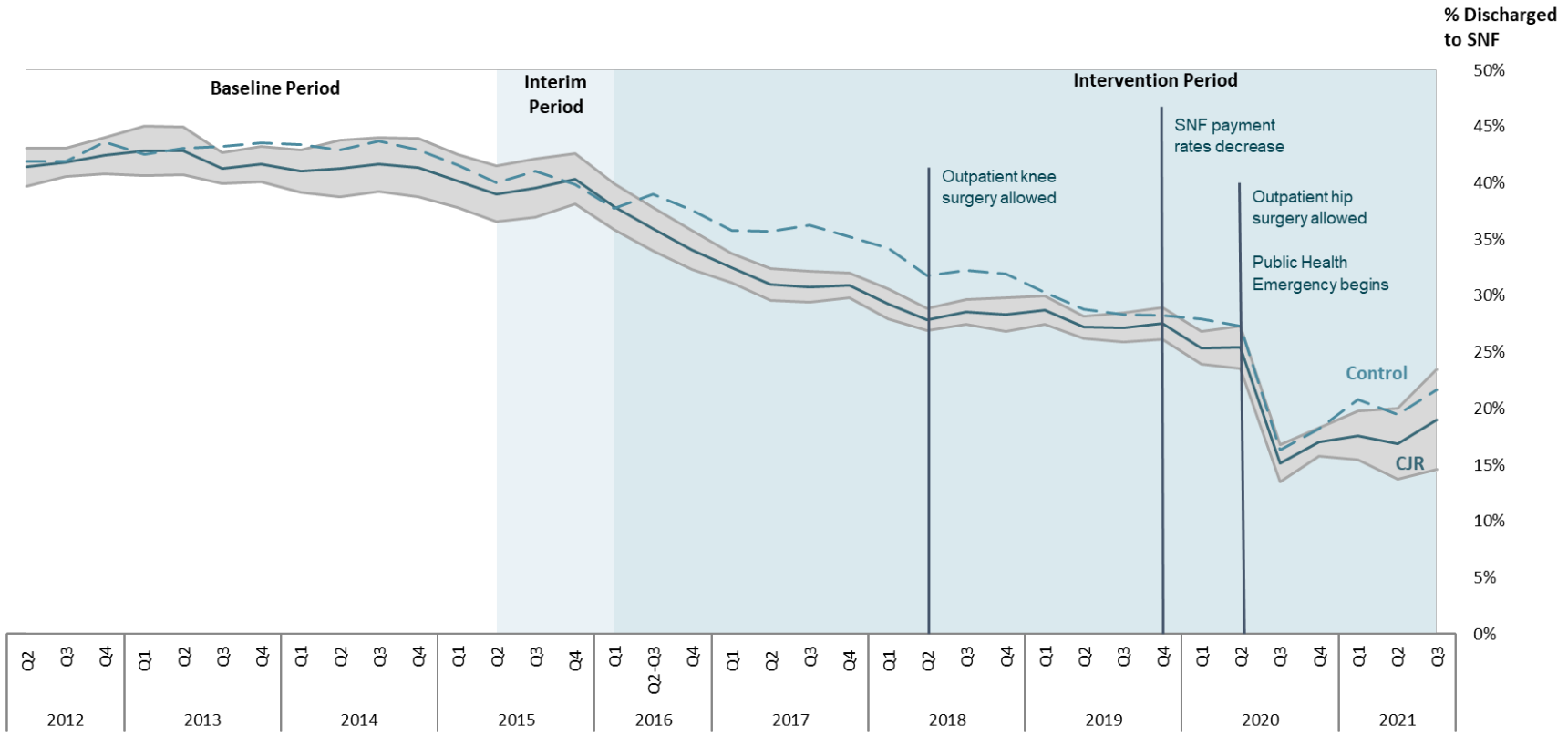
Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated on or after January 2012 that ended by September 2021.

Notes: Episodes that ended between April 1, 2015 and March 31, 2016 (the interim period) were excluded from our baseline because the CJR model was announced in July 2015 and hospitals may have been preparing for their future participation in the CJR model during that time.

The gray shading represents the 90% confidence interval for the CJR estimate.

Return to Table of Contents

Exhibit 28: After the outpatient knee policy change, CJR and control hospitals had increasingly similar proportions of patients first discharged to a skilled nursing facility (SNF)



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated on or after January 2012 that ended by September 2021.

Notes: Episodes that ended between April 1, 2015 and March 31, 2016 (the interim period) were excluded from our baseline because the CJR model was announced in July 2015 and hospitals may have been preparing for their future participation in the CJR model during that time.

The gray shading represents the 90% confidence interval for the CJR estimate.

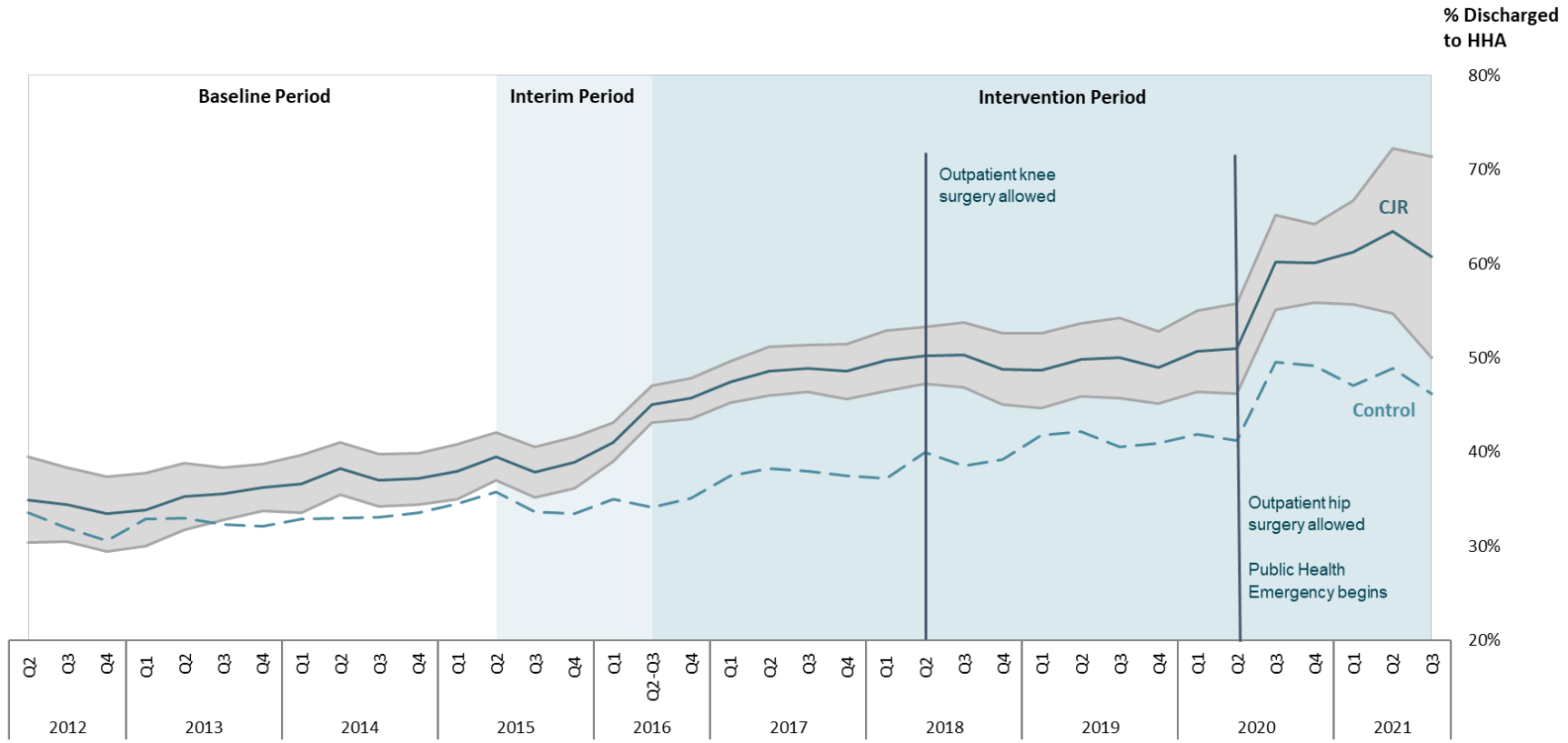
Return to Table of Contents

HHA. Consistent with the reductions in institutional PAC use, the CJR model increased the proportion of patients discharged from the hospital to an HHA, but it generally did not change the proportion of patients using home health at any point during the episode so there was no change in HHA payments. From the baseline to the intervention, the proportion of patients discharged from the hospital to an HHA increased for both the CJR and control groups (Exhibit 29). In each year of the CJR model, the proportion of patients discharged from the hospital to an HHA increased more for CJR episodes than control episodes. The relative increases were statistically significant in PY1 (7.7pp, $p<0.01$), PY2 (7.5pp, $p=0.01$), PY3 (7.7pp, $p=0.05$), and PY5.2 (11.3pp, $p=0.03$). Cumulatively, for the first five performance years, the CJR model increased the proportion of patients discharged from the hospital to an HHA by 7.5pp ($p=0.04$). The CJR model increased the proportion of patients using home health at *any point* during the episode in PY1 and PY5.2, but the impacts in the other years were not statistically significant, nor was the cumulative impact.

Together, these results indicate that under the CJR model patients used home health care services earlier in their episode than they would have absent the CJR model. It should be noted that CJR and control group hospitals may have had different HHA payment trends in the baseline, which means we cannot be certain that we isolated the impact of the CJR model on this outcome. Additional details about baseline trends are included in Appendix C Section III and Appendix K. These results, however, are consistent with other estimates of reduced institutional PAC use, lending credence to our conclusions.

Return to Table of Contents

Exhibit 29: The proportion of patients discharged to a home health agency (HHA) increased more for CJR than control episodes



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated on or after January 2012 that ended by September 2021.

Notes: Episodes that ended between April 1, 2015 and March 31, 2016 (the interim period) were excluded from our baseline because the CJR model was announced in July 2015 and hospitals may have been preparing for their future participation in the CJR model during that time.

The gray shading represents the 90% confidence interval for the CJR estimate.

Return to Table of Contents

Readmissions. The CJR model reduced average readmission payments in PY2-4 by $158-$167 per episode. Cumulatively, for the first five performance years, the CJR model reduced readmission payments by $146 (p=0.07) or 11.5% from the CJR baseline. As reported in the fourth annual evaluation report, the relative decrease in average readmission payments was primarily due to changes made by a few CJR participant hospitals, rather than a reduction in the overall readmission rate.[26] During the baseline, relatively more CJR patients were discharged to IPPS hospitals for rehabilitation. In the intervention period, this practice mostly stopped, resulting in a relative decrease in readmission payments that was driven by changes made by a few CJR participant hospitals, rather than more widespread decreases in readmission rates.

Anchor payments. Following the outpatient policy change, average anchor hospitalization payments per episode increased because CJR hospitals performed more LEJRs in the more expensive inpatient setting. The CJR model increased per-episode anchor payments by $101 in PY3 (p=0.03), $163 in PY4 (p<0.01), and $60 in PY5.1 (p=0.06) (Exhibit 25). The Medicare payment for an outpatient LEJR is lower than for an inpatient LEJR. Medicare thus paid more for the CJR inpatient LEJRs that would have been outpatient absent the CJR model. These increases in average anchor payments partially offset the relative reductions in institutional PAC payments.

d. Conclusion

CJR participant hospitals decreased LEJR episode payments by reducing the use of more intensive institutional PAC services. Under the CJR model, relatively fewer patients were discharged to an IRF, more were discharged to an HHA, and for patients who received SNF care, the number of days in the SNF went down. However, the effect on SNF care lessened starting in PY4 and the effect on IRF care lessened slightly in PY5. Several overlapping events likely contributed to the diminished impact of the CJR model on SNF payments and use, including the outpatient policy changes, Medicare SNF payment policy changes, and the PHE. When outpatient LEJRs become episodes in the CJR model in PY6, changes in the share of episodes performed in the outpatient setting will likely affect service-level payments and use.

4. What was the impact of the CJR model on quality of care?

The CJR model was designed to reward hospitals that delivered high quality care. CJR hospitals with higher quality scores have higher quality-adjusted target prices, which makes it easier to meet CJR cost targets. The quality score is a composite measure based on rolling, historical data for the elective complication rate (50% of the composite), the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey (40% of the composite), which measures patients' perspectives of hospital care, and the collection and submission of patient reported outcome data (10% of the composite). We evaluated the impact of the CJR model on the elective complication rate, the largest component of the quality score, as well as other key claims-based measures.

[26] Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - fourth annual report. https://innovation.cms.gov/data-and-reports/2021/cjr-py4-annual-report.

Return to Table of Contents

a. *Key* Findings

- The CJR model improved the elective complication rate and otherwise maintained quality of care.

b. Methods

This analysis used the DiD approach described in Section II.A.1.b to estimate the relative change in outcomes for mandatory CJR hospitals. While quality of care can be defined broadly, and we have historically studied a variety of quality indicators under this evaluation, in this annual report we focus our analysis for all episodes on key claims-based quality metrics. Appendix C Section III includes more detailed information about the methodology.

Acronyms	
DiD	difference-in-differences
ED	emergency department
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Systems
LEJR	lower extremity joint replacement
pp	percentage point
PY	performance year

c. Results

For mandatory CJR hospitals, the CJR model reduced the elective complication rate, but did not impact the 90-day unplanned readmission rate, 90-day ED use measure, and the all-cause mortality rate during the anchor hospitalization plus the 90-day post-discharge period.

The complication rate, which is specific to elective LEJRs, decreased more for CJR episodes than control group episodes in every performance year except PY1, although only the relative reduction in PY2 was statistically significant (-0.4pp or 13.2% from the CJR baseline, $p<0.01$, Exhibit 30). Cumulatively, over the first five performance years, the elective complication rate decreased by 0.2pp or 7.4% from the CJR baseline ($p=0.03$).

The impacts of the CJR model on the unplanned readmission rate, ED use, and mortality were generally small and statistically insignificant in each of the first five performance years (Exhibit 30). The one exception is that ED use increased by 0.5pp more for CJR episodes than control episodes in PY3, which equates to a 3.7% increase from the CJR baseline ($p=0.07$). The ED use impacts in the other performance years were mostly small in magnitude, varied in direction, and not statistically significant, suggesting there was no impact on ED use overall.

The unplanned readmission rate decreased by a similar amount from the baseline to the intervention for both the CJR and control groups (Appendix D). In the fourth annual evaluation report, we reported a statistically significant decrease in the cumulative unplanned readmission rate for the first four performance years. The impacts in each of the first four years were negative, but not statistically significant. The direction of the impact reversed in PY5, meaning there was a non-statistically significant relative increase in the unplanned readmission rate. Given the lack of statistical significance cumulatively and in each year, in addition to the change in direction in PY5, we conclude there was no impact on the unplanned readmission rate.

Return to Table of Contents

Exhibit 30: The elective complication rate decreased under the CJR model

		Performance year (PY)						Cumulative
		PY1	PY2	PY3	PY4	PY5.1	PY5.2	PY1-PY5
Unplanned readmissions	DiD (pp)	-0.3	-0.4	-0.1	-0.2	0.2	0.1	-0.2
	DiD % from CJR baseline	-3.2%	-4.6%	-1.5%	-1.9%	2.3%	0.5%	-2.2%
ED use	DiD (pp)	-0.1	-0.3	0.5	0.5	0.0	-0.1	0.1
	DiD % from CJR baseline	-0.4%	-2.0%	3.7%	3.9%	0.3%	-0.7%	0.7%
Mortality	DiD (pp)	0.1	0.0	0.1	0.0	0.1	-0.2	0.0
	DiD % from CJR baseline	1.8%	-0.9%	2.7%	1.5%	2.2%	-6.5%	0.2%
Elective complication rate	DiD (pp)	0.2	-0.4	-0.3	-0.1	-0.1	-0.2	-0.2
	DiD % from CJR baseline	5.6%	-13.2%	-8.7%	-2.5%	-4.1%	-6.6%	-7.4%

Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

d. Conclusion

During the first five performance years, the CJR model lowered the elective complication rate for mandatory CJR hospitals and did not impact the unplanned readmission rate, ED use, or mortality.

5. Did the CJR model result in any unintended consequences?

a. Key Findings

- For the highest volume and least complex episode group, elective LEJRs without major complications or comorbidities (MCC), the CJR patient population was relatively less complex in the intervention period than in the baseline period. Relative changes in complexity occurred in each performance year. A reduction in complexity could help mandatory CJR hospitals meet payment and quality targets and thus receive reconciliation payments.
- For the other episode groups – elective with MCC, hip fracture without MCC, and hip fracture with MCC – the CJR patient population did not change relative to the patient population at control hospitals.
- The CJR model likely had no impact on payments for services provided in the 30 days following the end of the episode.

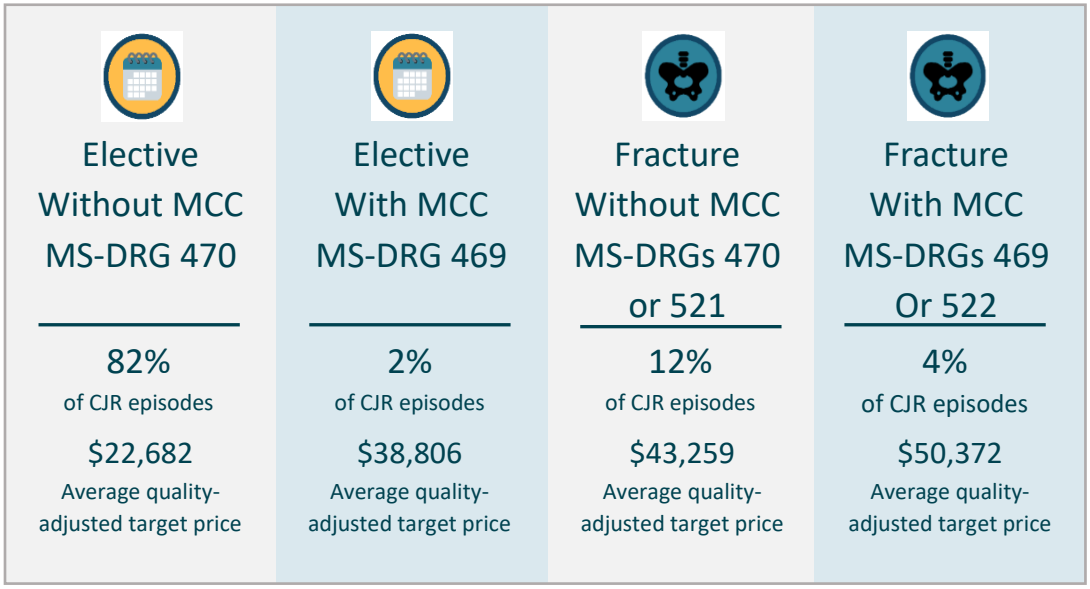
5a. Were there any indications that the CJR patient population was different in the intervention period than in the baseline period?

An unintended consequence of the CJR model would arise if participating hospitals began to see a different mix of patients under the model, which could help them reduce episode payments.

Return to Table of Contents

However, the CJR model was designed to limit patient selection and appropriately account for differences in patient characteristics. First, all hospitals in selected MSAs are participating in the model, which limits the ability to selectively admit patients. Second, target prices differ by four episode groups determined by fracture status (elective or fracture) and presence or absence of a major complication or comorbidity (MCC) (Exhibit 31). Despite the protections in the model's design, if within an episode group, hospitals either selected less complex patients or patients became less complex for other reasons, then it would be easier for hospitals to meet cost and quality targets and receive reconciliation payments, regardless if they implemented care redesign.

Exhibit 31: The four episode target prices account for the higher expected costs for more complex episodes



Source: CJR evaluation team analysis of CJR payment contractor target price data for PY1-5.

***Notes*:** Reported shares and means are averages over the five performance years for mandatory CJR hospitals.

We investigated the unintended consequence of patient selection by evaluating changes in patient mix on characteristics related to patient complexity and average cost. Since 2012, the start of our baseline, there have been numerous changes in the average characteristics of beneficiaries who received an inpatient LEJR in both the CJR and control groups. Some of the changes suggest a more complex population and some suggest a less complex population. Both the removal of TKAs and THAs from the inpatient-only list in 2018 and 2020, respectively, and the COVID-19 pandemic led to further changes in inpatient mix for both CJR and control hospitals. For example, elective LEJR recipients without MCC at both CJR and control hospitals have progressively become more likely to be obese and have higher HCC scores, indicating increased complexity, but less likely to have had SNF use in the six months prior to the episode, indicating decreased complexity. See Appendix J for additional results.

Return to Table of Contents

a. Methods

We analyzed changes in the mix of patients at mandatory CJR hospitals within episode groups in two ways. The first method was designed to analyze changes in specific characteristics (for example, average HCC score) to gauge how CJR patient populations may be changing. The second method was designed to analyze in aggregate how changes in characteristics may be associated with changes in episode payments that could affect reconciliation payouts. Because the CJR model does not risk adjust for specific patient characteristics, if a hospital's underlying population was less complex in the intervention period, then they would be more likely to have average episode payments below their target price. In both methods, we compared changes in CJR hospital patient complexity to changes in patient complexity at control hospitals to determine if any changes are unique to mandatory CJR hospitals, which could signal evidence of patient selection.

Acronyms	
ACH	acute care hospital
Base.	baseline
CI	confidence interval
DiD	difference-in-differences
ED	emergency department
ESRD	end-stage renal disease
HCC	hierarchical condition category
HH	home health
Int.	intervention
IRF	inpatient rehabilitation facility
LEJR	lower extremity joint replacement
LTCH	long-term care hospital
MCC	Major complication or comorbidity
MSA	metropolitan statistical area
MS-DRG	Medicare Severity Diagnosis Related Group
pp	percentage point
PY	performance year
SNF	skilled nursing facility
THA	total hip arthroplasty
TKA	total knee arthroplasty

In our first method, we evaluated changes in individual patient characteristics in each of the four episode groups to determine if the CJR patient population was relatively different in the intervention period than in the baseline period. We examined changes in age, sex, race, Medicaid eligibility, disability status, health status, and prior health care use for inpatient LEJR patients from the baseline to the intervention period for CJR patients relative to control patients.

The second method focused on average episode payments – a composite measure of patient characteristics associated with higher episode costs. Using the decomposition method described in Kröger and Harmann (2021), we isolated the impact of the CJR model on average episode payments that is associated with relative changes in the patient populations at mandatory CJR hospitals.[27] Additional details on the approach are found in Appendix C.

For both approaches, we examined changes in patient characteristics both cumulatively and by PY. Full results are found in Appendix J.

[27] Kröger, Hannes, and Jörg Hartmann. 2021. "Extending the Kitagawa-Oaxaca-Blinder decomposition approach to panel data." The Stata Journal. June 29. doi.org/10.1177/1536867X211025800.

Return to Table of Contents

b. Results

Analyses of patient characteristics. The analyses of changes in patient characteristics provided additional insight into the changes in characteristics for CJR patients in the Elective Without MCC episode group, relative to the control group. The results were consistent with those of the composite measure analyses. The CJR patient population in the Elective Without MCC episode group became relatively less complex from the baseline to the intervention. Specifically, CJR patients became relatively less likely to be eligible for Medicaid, have prior SNF utilization, or have any prior care (Exhibit 32).

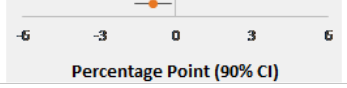
Medicaid. Relative to the control group, there was a statistically significant 1.3pp decrease in the proportion of patients who were eligible for Medicaid (p=0.01), a characteristic associated with higher expected episode payments.

Prior SNF stay. There was a 0.4pp relative decrease in the proportion of patients who had a SNF stay in the six months prior to their LEJR procedure (p<0.01).

Any prior care. There was a 0.9pp relative decrease in the proportion of patients who received any care in the six months prior to their LEJR procedure (p=0.04), where any care is defined as any inpatient hospital, psychiatric hospital, ED, IRF, SNF, HH, long-term care hospital (LTCH), or hospice utilization.

Exhibit 32: For the Elective Without Major Complications and Comorbidities episode group at mandatory CJR hospitals, some characteristics indicated a less complex patient population

	Characteristic	Frequencies				Relative Difference (CJR vs. Control)			
		CJR		Control		Estimate	Less Frequent	More Frequent	p-value
		Base.	Int.	Base.	Int.				
Demographics	Age, 80+	21.3%	19.5%	19.4%	18.3%	-0.8			0.17
	Sex, Female	64.6%	63.7%	64.5%	63.7%	-0.2			0.61
	Race, Black or African American	7.0%	6.1%	7.8%	7.3%	-0.4			0.28
Social determinants	Eligible for Medicaid	12.9%	9.9%	10.2%	8.4%	-1.3			0.01
	Disability, no ESRD	16.6%	14.8%	16.9%	15.2%	-0.1			0.87
Health status	HCC score	1.255	1.336	1.185	1.287	-0.022			0.25
	Obesity	17.6%	33.5%	18.1%	33.4%	0.7			0.76
	Diabetes	29.5%	29.5%	27.3%	26.5%	0.7			0.11
	Hypertension	75.2%	77.0%	75.3%	77.4%	-0.3			0.66
	Dementia	3.2%	2.8%	3.2%	2.8%	0.0			0.74
	Congestive Heart Failure	12.4%	12.1%	11.7%	11.7%	-0.3			0.47
Prior use	ACH stay	11.2%	10.4%	11.2%	10.5%	-0.2			0.41
	HH use	10.6%	9.4%	9.8%	9.2%	-0.6			0.22
	IRF stay	1.1%	0.7%	1.1%	0.9%	-0.2			0.18
	SNF stay	3.6%	2.6%	3.2%	2.6%	-0.4			<0.01
	Any prior care	26.4%	24.9%	26.2%	25.7%	-0.9			0.04



Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention).

Return to Table of Contents

***Notes*:** Relative differences for all characteristics, with exception of HCC score, are in percentage points. For HCC score, they are in points.

Net differences that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shading, respectively.

Any prior care includes inpatient hospital, psychiatric hospital, emergency department visits, IRF, SNF, HH, long-term care hospital, and hospice during the six months prior to anchor hospitalization.

Changes in patient characteristics for the Elective Without MCC episode group across performance years were consistent with the cumulative analysis, although statistical significance varied across years.

Changes in patient characteristics for the other three episode groups did not indicate systematic changes resulting in either an increase or decrease in complexity, either cumulatively or in any specific PY (Appendix J).

Analyses of a composite measure of patient characteristics. Due to CJR patient characteristic changes, average payments for the Elective Without MCC episode group decreased by $193 for mandatory CJR hospitals relative to control hospitals ($p<0.01$, Appendix J). Note, this $193 effect is not part of the average total payment DiD impact estimates (see Exhibit 8), as those estimates are obtained from a regression that risk-adjusts for patient characteristics.

5b. What was the impact of the CJR model on payments in the 30 days following the episode?

We monitor payments for services provided after the episode to identify whether CJR hospitals postponed services to reduce episode payments. Postponing services could reflect a reduction in quality of care under the model and while it would make it easier for hospitals to meet CJR cost targets, it would not reduce overall Medicare spending.

a. Methods

The same DiD methods described in Section II.A.1.b were used for this analysis. Additional details about the methodology are included in Appendix C Section III.

Acronym	
DiD	difference-in-differences
PY	performance year

b. Results

There is no evidence that mandatory hospitals shifted services until after the end of the episode under the CJR model. In each of the first five performance years, the CJR model resulted in small or no changes in payments in the 30 days following the episode (Exhibit 33). Four of the six impact estimates were negative, meaning there was a relative decrease in post-episode payments for CJR hospitals. If services were postponed, we would expect post-episode payments to increase. The relative decreases of $62 in PY3 and $51 in PY4 were statistically significant ($p=0.09$ for both). Cumulatively, during the first five performance years, the CJR model had no impact on payments for services provided during the 30 days following the end of the episode.

Return to Table of Contents

It is noteworthy that CJR and control group hospitals may have had different post-episode payment trends in the baseline, which means we cannot be certain that we isolated the impact of the CJR model on this outcome. Additional details about baseline trends are included in Appendix C Section III. These small, negative, and generally statistically insignificant estimates, however, suggest the CJR model did not result in shifts in services to after the end of the episode.

Exhibit 33: It is unlikely that services were shifted until the 30 days after the end of the episode under the CJR model

	Performance year (PY)						Cumulative
	PY1	PY2	PY3	PY4	PY5.1	PY5.2	PY1-5.2
30-day post-episode payments	$7	-$42	-$62	-$51	-$33	$54	-$25

Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and episodes initiated during or after April 2016 that ended by September 2021 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

c. Conclusion

For elective LEJRs without MCC, both CJR and control patients were less likely to be eligible for Medicaid, have a SNF stay in the six months prior to their LEJR, or have any prior health care use in the six months prior to their LEJR, but the prevalence of these characteristics decreased more in CJR patients, indicating a relative decrease in complexity for CJR patients. Other characteristics, including the HCC score and rate of obesity, increased for both CJR and control patients, albeit not differentially, indicating an increase in complexity for both populations. We found similar results for mandatory CJR hospitals during PY1-4, which we discussed in an earlier report.[28] Because target prices, and thus reconciliation payments, are not adjusted for patient characteristics other than hip fracture status (elective or fracture) and presence or absence of MCC, the relative changes in patient characteristics for the Elective Without MCC episode group likely contributed to higher reconciliation payments. This is because the observed changes in characteristics are associated with lower average payments, which in turn are associated with increased reconciliation payments. As a result, a portion of the reconciliation payments to mandatory CJR hospitals may have been due to relative changes in patient mix. In PY6 and beyond, target prices will be adjusted for beneficiary age, HCC count, and dual-eligibility status.[29] This will likely reduce the degree to which changes in patient characteristics lead to changes in reconciliation payments because episode target prices may more accurately reflect differences in payments due to variation in patient mix.

[28] https://innovation.cms.gov/data-and-reports/2021/cjr-py4-annual-report.

[29] Centers for Medicare & Medicaid Services. Medicare Program: Comprehensive Care for Joint Replacement Model Three-Year Extension and Changes to Episode Definition and Pricing; Medicare and Medicaid Programs; Policies and Regulatory Revisions in Response to the COVID–19 Public Health Emergency; Final Rule 2021:1-81.

Return to Table of Contents

It is unlikely that services were shifted until the 30 days after the end of the episode under the CJR model.

6. What was the impact of the CJR model on patients with LEJRs due to hip fractures?

Under the CJR model, episodes of care are triggered by LEJRs, which are primarily elective knee or hip replacements or hip replacements due to fracture. This chapter focuses on the subset of CJR patients who received LEJRs due to hip fractures.

In the first five performance years of the CJR model, mandatory CJR hospitals served approximately 35,000 hip fracture patients (17% of all episodes). While patients with LEJRs due to hip fractures are more complex and costly than patients undergoing elective LEJR, CMS included them in the CJR model because they believed there were opportunities for participant hospitals to increase efficiency of care for this population through improvements in care coordination, more appropriate PAC utilization, and chronic disease management. However, given the complexity of the population and emergent nature of hip fractures, these patients may be more sensitive to changes in care that occur under the CJR model.

Our most recent patient survey analysis, summarized below, does not suggest that CJR and control respondents with hip fractures differ in functional recovery or reliance on caregivers. This contrasts with findings described in the fourth annual report, which found CJR fracture respondents to the patient survey reported relatively less improvement in functional status by the end of their episode and required more help from caregivers than control fracture respondents. While those prior results raised concerns about the impact of the CJR model on longer term recovery, the more recent results suggest potential adverse effects on physical function may have dissipated.[30]

This chapter describes the fracture population and investigates the impact of the CJR model on fracture patients through analyses of claims and patient survey data and qualitative interviews of providers.

a. Key Findings

- Mandatory CJR hospitals reduced payments for fracture episodes through reductions in institutional post-acute care use while maintaining claims-based measures of quality of care during the episode.
- Fracture patients surveyed in performance year 5 reported similar changes in functional recovery to control patients from before their hospitalization to after the episode and similar levels of overall satisfaction with their care, contrary to findings reported in the fourth annual report.

[30] Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model - fourth annual report. https://innovation.cms.gov/data-and-reports/2021/cjr-py4-annual-report. 2021: 46-59.

Return to Table of Contents

b. Methods

Claims-based analyses

We compared characteristics of fracture episodes to elective episodes for the CJR group at baseline. We focused on the baseline period so we could look at the fracture population before the CJR model impacted their utilization, care pathways, and recovery.

Acronyms	
DiD	difference-in-differences
DME	durable medical equipment
ED	emergency department
HCC	hierarchical condition category
HH	home health
IRF	inpatient rehabilitation facility
LEJR	lower extremity joint replacement
MDS	Minimum Data Set
MSA	metropolitan statistical area
PAC	post-acute care
PHE	public health emergency
pp	percentage point
PY	performance year
SNF	skilled nursing facility

We used a DiD approach with several refinements from our usual approach to study the impact of the CJR model during and after fracture episodes (described in Appendix C Section VI). First, because fracture patients often face declining health and high mortality rates, we included patients who died during the episode period for select outcomes. Second, we adopted several outcome measures used in the health services research literature to further examine the quality, utilization, and mobility of fracture patients. Appendix F has additional details about these new outcomes. Lastly, we studied the impact of the CJR model on the long-term health trajectory of fracture patients by examining the impact of the CJR model during days 91-180, 181-270, and 271-360 after a patient's anchor hospitalization, also found in Appendix F.

Patient survey

We surveyed beneficiaries after the end of their inpatient LEJR episode to determine if CJR patients differed from control patients on several patient-reported outcomes.[31] Measure categories included: change in functional status and pain (pre- to post-surgery; Exhibit 40), satisfaction with overall recovery (Appendix O, Exhibit O-1), satisfaction with care management (Exhibit 41), experience with care transitions (Exhibit 42), and caregiver help needed after returning home (Appendix O, Exhibit O-1). The survey instrument is included in Appendix N. All outcomes were scaled such that positive differences indicated more favorable results for CJR respondents relative to control respondents, while negative differences indicated less favorable results for CJR respondents relative to control respondents. We estimated risk-adjusted differences between CJR and control respondents, accounting for beneficiary, hospital, and MSA attributes.

Data were collected in two batches: 1) inpatient hip fracture episodes discharged in July or August 2021; and 2) inpatient hip fracture episodes discharged in September or October 2021. Our starting sample included all CJR inpatient hip fracture episodes initiated during these periods (N=1,819) and all corresponding control episodes (N=1,884).

[31] The median time at which surveys were returned was 36 days after the conclusion of the patient's 90-day post-discharge period.

Return to Table of Contents

The response rate was 34.9% in the CJR group and 37.8% in the control group, which were not significantly different (p=0.13, Exhibit 34). Survey results are based on 634 completed survey responses from CJR patients and 712 from control patients.

Exhibit 34: Sample size and response rate for patients with hip fracture

	Patients surveyed (starting sample)		Survey responses received (analytic sample)		Response rate	
Group	**CJR**	**Control**	**CJR**	**Control**	**CJR**	**Control**
Hip Fracture	1,819	1,884	634	712	34.9%	37.8%

Source: CJR evaluation team analysis of patient survey data for fracture episodes discharged in July-October 2021.

Note: We tested for differences in response rate between CJR and control patients using a simple bivariate regression, with standard errors clustered at the MSA level. Differences in response rates were not statistically significant.

Telephone interviews

We conducted semi-structured telephone interviews with representatives from 39 hospitals about their experiences caring for patients with LEJR due to hip fracture. In this section, we incorporated previous findings when they added relevant context. More detail on methods is available in Appendix C Section IX.

c. Results

Characteristics and care pathways of CJR fracture LEJR during baseline

On average, CJR fracture patients were nearly 10 years older, were more likely to have comorbidities, were less likely to be obese, and were more likely to use health care services before their LEJR than elective patients at baseline (all p<0.01, Exhibit 35). In earlier years of the evaluation, hospital representatives commented that the emergent and complex nature of fracture episodes posed barriers to care redesign.

Exhibit 35: CJR fracture patients were older, had more comorbidities, and were more likely to use health care services before their lower extremity joint replacement than elective patients at baseline

Domain	Patient characteristic	CJR fracture patients	CJR elective patients	p-value
Demographics	Mean age	82.5	73.2	p<0.01
	Female	74.0%	64.5%	p<0.01
Health status	Mean HCC score	2.4	1.3	p<0.01
	Any cancer	16.8%	14.9%	p<0.01
	Congestive heart failure	25.9%	12.8%	p<0.01
	Dementia	30.1%	3.4%	p<0.01
	Obesity	4.3%	17.7%	p<0.01
Prior utilization (6 months)	Any prior utilization (IRF, SNF, HH, inpatient, hospice)	48.2%	26.8%	p<0.01

Source: CJR evaluation team analysis of Medicare claims and enrollment data and MDS assessment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline).

Return to Table of Contents

Consistent with the increased complexity of fracture patients, risk-adjusted average episode payments were over 80% higher for fracture patients than elective patients at baseline ($47,339 vs. $25,984, Exhibit 36). Even though fracture episodes accounted for only 16.2% of all CJR baseline episodes, they accounted for 25.9% of the total costs. Fracture patients spent 2.5 more days in the hospital for their LEJR, were more likely to be discharged to an IRF or a SNF, spent approximately three more weeks in a SNF, and received more HH visits than elective patients. Appendix M provides additional information about the numerous care pathways CJR fracture patients followed after their LEJR surgery.

Exhibit 36: CJR fracture episodes were more expensive and had more adverse outcomes at baseline

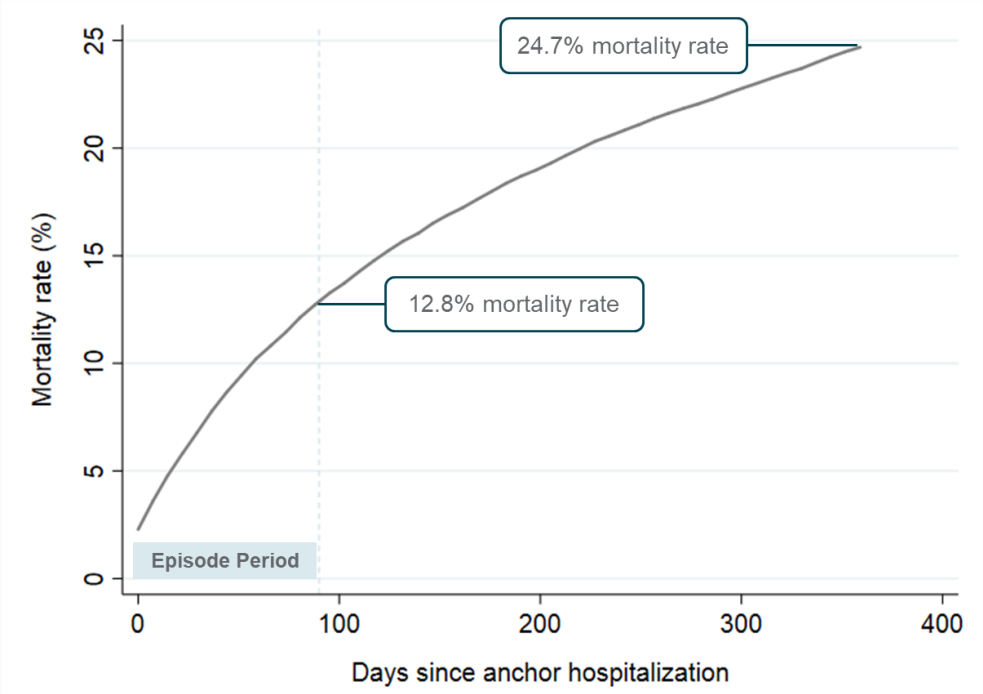
Domain	Outcome	CJR fracture patients	CJR elective patients
Payments	Mean episode payments	$47,339	$25,984
Utilization	Mean length of stay for the LEJR procedure (in days)	5.7	3.2
	First discharged to IRF	28.3%	11.5%
	First discharged to SNF	62.5%	36.5%
	Mean number of days in SNF, among SNF users	43.1	20.6
	Mean number of HH visits, among HH users	21.2	16.2
Quality	Unplanned readmissions	19.7%	7.3%
	ED visits	18.0%	12.2%
	Mortality during the episode	13.1%	0.6%

Source: CJR evaluation team analysis of Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline). All outcomes are risk-adjusted, except for mean length of stay for the LEJR procedure.

During the episode, fracture patients experienced more acute care hospital utilization than elective patients, as evidenced by their higher readmission rates and ED use (Exhibit 36). Fracture patients also had a higher probability of death during the episode than elective patients (13.1% vs. 0.6%), which nearly doubled to 24.7% at one-year after the LEJR procedure (not risk-adjusted, Exhibit 37).

Return to Table of Contents

Exhibit 37: One in four fracture patients died within one year of their lower extremity joint replacement surgery during the baseline



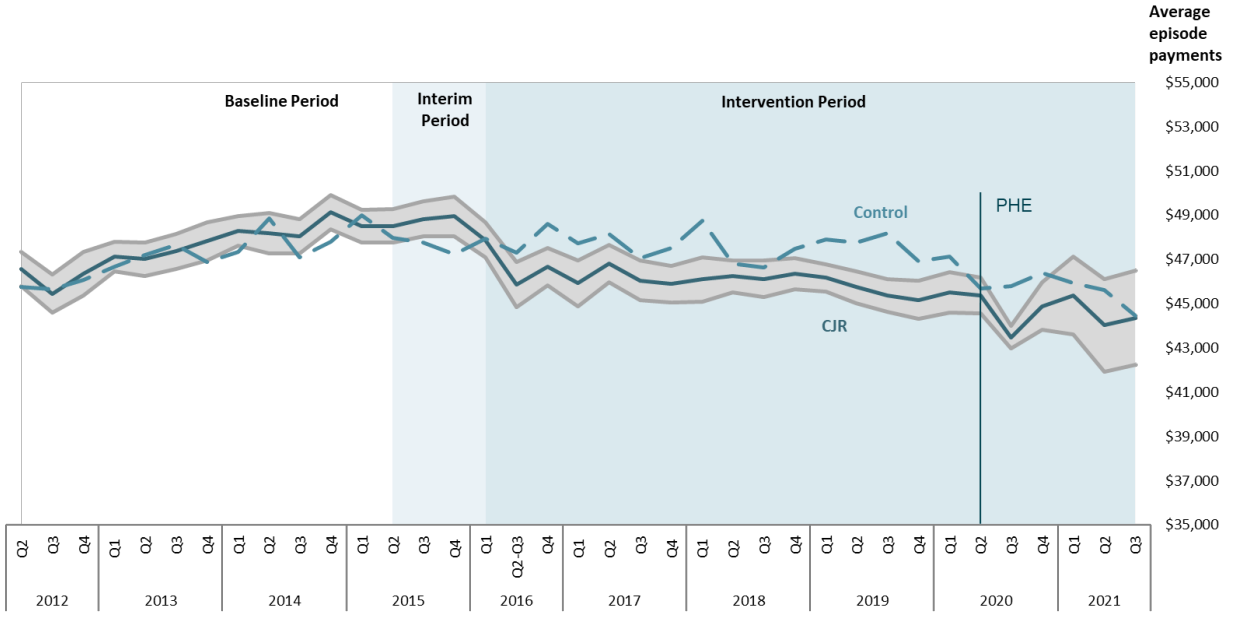
Source: CJR evaluation team analysis of Medicare claims and enrollment data for hip fracture beneficiaries with LEJR procedures from January 2012 through March 2015 (baseline).

Impact of the CJR model on fracture patients during the episode period

Average payments for fracture episodes declined for both mandatory CJR hospitals and control group hospitals during the first five performance years, but payments declined more for fracture episodes initiated at mandatory CJR hospitals (Exhibit 38). Notably, the difference in average payments between CJR and control fracture episodes narrowed during the latter part of PY5.

Return to Table of Contents

Exhibit 38: Average payments for fracture episodes decreased more for CJR than control episodes, but the difference between CJR and control narrows in the latter part of performance year 5



Source: CJR evaluation team analysis of Medicare claims and enrollment data for hip fracture episodes initiated on or after January 2012 that ended by September 2021.

Notes: Episodes that ended between April 1, 2015 and March 31, 2016 (the interim period) were excluded from our baseline because the CJR model was announced in July 2015 and hospitals may have been preparing for their future participation in the CJR model during that time. The gray shading represents the 90% confidence interval for the CJR estimate.

For mandatory hospitals, the CJR model reduced average payments for fracture episodes in all years except PY5.2, and the reductions were statistically significant (Exhibit 39). The relative reduction in PY4 was notably larger than the reduction in other years. In the first three performance years, the reduction in average episode payments was between $1,432 and $1,968 ($p<0.01$ in all three years). The reduction in payments increased by over 60% from PY3 to PY4. In PY4, the CJR model reduced average episode payments by $2,311 ($p<0.01$). In PY5.1, the $1,693 ($p=0.02$) reduction in average episode payments was more in line with the reductions in the first three performance years. The estimated reduction in average episode payments in PY5.2 was the smallest and not statistically significant ($1,019, $p=0.22$). We do not know if the reversal in PY5 was driven by the PHE or if PY4 was the aberration. Cumulatively, over the first five performance years, average payments decreased by $1,710 more for fracture episodes at mandatory CJR hospitals than for LEJR episodes initiated at control group hospitals from the baseline to the intervention period ($p<0.01$).

Similar to the full population, the relative reduction in average episode payments was mainly driven by a reduction in IRF and SNF payments and use, although the reductions in IRF and SNF payments and use varied in magnitude and statistical significance across performance years (Exhibit 39). The relative reduction in IRF payments was statistically significant in PY1 (-$681, $p=0.03$) and PY4 (-$1,150, $p=0.01$). The relative reduction in IRF payments was due to a relative

Return to Table of Contents

reduction in the proportion of CJR fracture patients first discharged to IRF. The relative reduction in SNF payments was statistically significant in PY2 (-$1,218, p<0.01) and PY3 (-$1,013, p=0.07). The relative reduction in SNF payments was due to a relative reduction in the number of days patients spent in SNFs.

The larger reduction in average episode payments in PY4 was driven by greater reductions in IRF spending and use. The relative reduction in the proportion of fracture patients discharged to an IRF in PY4 was more than double the impact in PY1 (-5.8 pp, p=<0.01 vs. -2.7 pp, p=0.07) and the reduction in IRF payments was about 70% larger in PY4 than PY1. This timing coincides with unfavorable self-reported functional status results from the patient survey reported in the fourth annual report.

Consistent with the reductions in institutional PAC use, between the baseline and the intervention, CJR patients spent 1.5 more days in the community during the episode, relative to control patients (p=0.02, Appendix L).[32]

Exhibit 39: Fracture lower extremity joint replacement impacts on payments, utilization and quality outcomes during the episode period, by performance year and cumulative.

Domain	Outcome	Performance year (PY) PY1	PY2	PY3	PY4	PY5.1	PY5.2	Cumulative PY1-5.2
Payments	Total episode	-$1,968	-$1,678	-$1,432	-$2,311	-$1,693	-$1,019	-$1,710
	IRF	-$681	-$359	-$515	-$1,150	-$636	-$283	-$615
	SNF	-$414	-$1,218	-$1,013	-$608	-$720	-$383	-$842
Utilization	First discharged to IRF (pp)	-2.7	-2.7	-2.6	-5.8	-3.8	-2.4	-3.5
	First discharged to SNF (pp)[a]	1.2	0.6	1.0	3.5	-1.4	-1.9	0.4
	SNF days, among SNF users	-0.9	-2.1	-2.1	-1.6	-0.3	0.3	-1.4

Source: CJR evaluation team analysis of Medicare claims and enrollment data for hip fracture episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and hip fracture episodes initiated during or after April 2016 that ended by September 2021 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

[a] CJR and control group hospitals may have had different baseline trends for first discharge to SNF, which means we cannot be certain that we isolated the impact of the CJR model on this outcome. Additional details about baseline trends are included in Appendix C Section III.

While payments decreased for CJR fracture episodes, we found no statistically significant impact of the CJR model on quality during the episode as measured by unplanned readmissions, ED use,

[32] The intervention period for the days in community outcome uses the same time period as the post-episode outcomes (PY1-PY3). We could not use an intervention period through PY5 because there was a temporary pause in MDS reporting during the PHE that affected our ability to calculate this outcome. We did study the impact of the CJR model on days in community during the episode in PY1-4, and the DiD was similar (-1.6, p=0.01).

Return to Table of Contents

and mortality overall or for any given PY (Appendix L, Exhibit L-3). Further, we found no evidence that the CJR model impacted outcomes that are highly relevant to the fracture population during the episode, including use of hospice and DME and incidence of pressure ulcers, delirium, and complications.

Impact of the CJR model on functional status, pain, and care experiences for patients with LEJRs due to hip fractures (patient survey findings)

Functional status and pain

We surveyed patients with episodes in performance year 5 about their functional status before their LEJR surgery and after the end of their episode. Fractures are emergent, which means that patients typically have an immediate decline in functional status from before to after their fracture, and the recovery process is usually long. Therefore, we expect fracture patients to rate their functional status lower after their episode than before the fracture necessitating their LEJR. Indeed, both CJR and control patients reported a functional decline from before their hospitalization to after the end of the episode. Overall, however, CJR and control respondents with hip fractures reported similar declines from before their surgery to after their episode on all eight measures of functional status and pain (Exhibit 40). Differences between CJR and control respondents across the measures varied in direction and were not statistically significant.

Exhibit 40: CJR and control survey respondents experienced similar changes in functional status and pain

Survey measure	Response range	Mean change in self-reported measure from before the hospitalization to after the episode *Higher value represents a more favorable change*		Difference between CJR and control groups (% difference)[a]
		CJR	Control group	
Ability to walk by yourself without resting	-4 to 4	-0.68	-0.67	-0.01 (-0.3%)
Difficulty walking up or down 12 stairs	-3 to 3	-0.43	-0.51	0.08 (3.1%)
Difficulty rising from sitting	-4 to 4	-0.23	-0.30	0.07 (1.7%)
Difficulty standing	-4 to 4	-0.16	-0.21	0.05 (1.2%)
Use of a mobility aid	-2 to 2	-0.65	-0.62	-0.03 (-1.4%)
Difficulty getting on/off the toilet	-4 to 4	-0.03	-0.03	-0.01 (-0.2%)
Frequency that pain interferes with normal activities	-4 to 4	-0.36	-0.29	-0.07 (-1.7%)
Medication use for pain in the joint you had replaced	-3 to 3	-0.32	-0.30	-0.02 (-0.6%)

Source: CJR evaluation team analysis of patient survey data for fracture episodes discharged in July-October 2021.

Notes: The estimates in this exhibit are the results of a cross-sectional regression model, weighted for sampling and nonresponse. Estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

[a] The change in a given measure refers to the difference between a respondent's self-reported status at the time of the survey and the respondent's recalled status prior to the hospitalization. Estimated changes, and the difference between

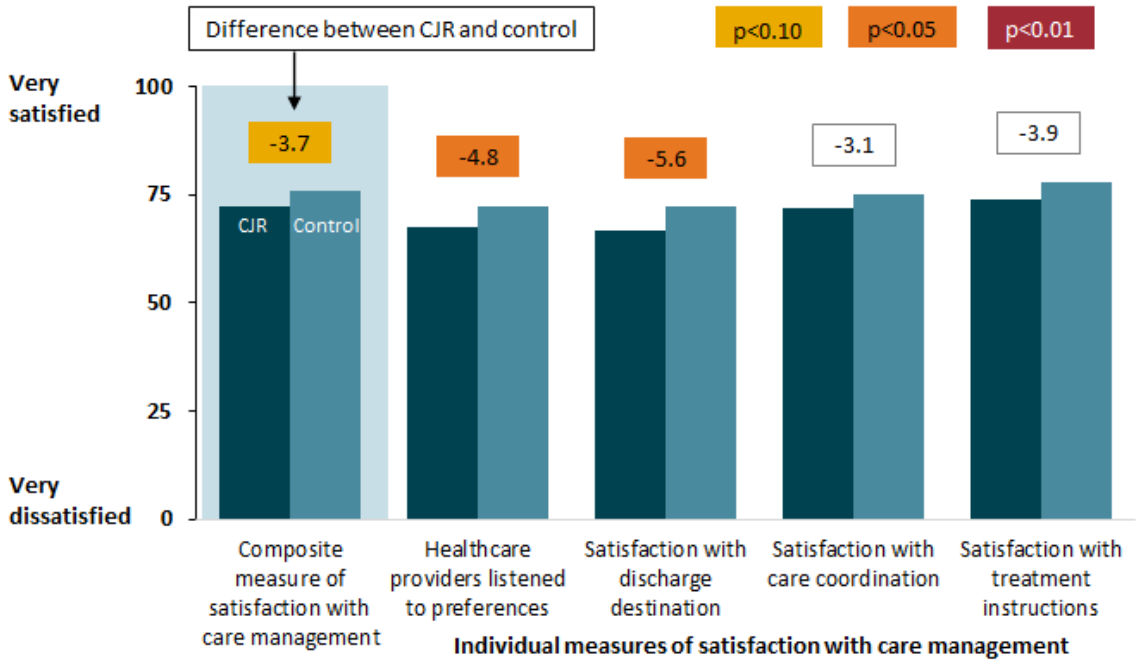
Return to Table of Contents

changes in the CJR and control groups, are reported in "level" terms (that is, levels of the Likert scale for each measure). Percentage differences are equal to the difference between CJR and control groups divided by the average CJR recalled status prior to the hospitalization.

Satisfaction

CJR and control respondents had similar levels of satisfaction with their overall recovery (Appendix O, Exhibit O-1). However, CJR respondents were less likely than control respondents to be satisfied with care management based on a composite score (-3.7 points out of 100; p=0.08) and the difference was statistically significant (Exhibit 41). CJR respondents had lower satisfaction ratings on all four underlying measures of the composite, with statistically significant differences for two of the four measures. CJR respondents reported significantly lower satisfaction with the extent to which providers listened to their preferences about medical treatment (-4.8 points out of 100; p=0.05) and with their discharge destination (-5.6 points out of 100; p=0.03). These results are roughly equivalent to 5 additional CJR respondents out of 100 reporting that they were "somewhat" or "very" dissatisfied instead of "somewhat" or "very" satisfied for each measure.

Exhibit 41: CJR survey respondents reported less satisfaction with care management than control respondents



Source: CJR evaluation team analysis of patient survey data for fracture episodes with discharge in July-October 2021.

Notes: Differences that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shading, respectively.

Measures of satisfaction are scaled from 0 to 100 points, where 0 = "very dissatisfied," 25 = "somewhat dissatisfied," 50 = "neither satisfied nor dissatisfied," 75 = "somewhat satisfied," and 100 = "very satisfied."

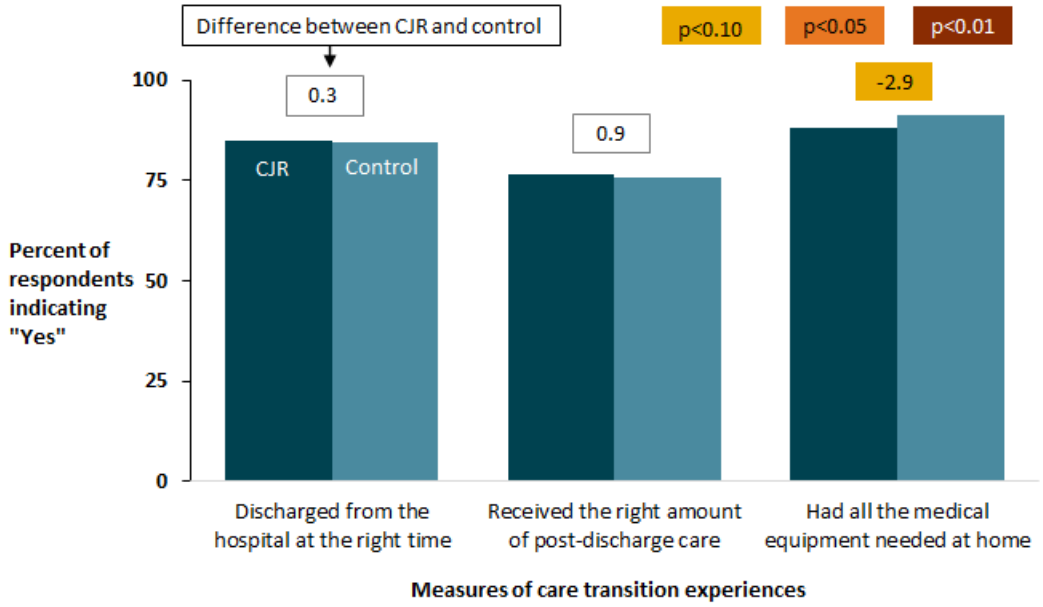
The composite summarizes the amount of satisfaction across all four measures. Differences between CJR and control outcomes are reported in point terms.

Return to Table of Contents

Experience with care transitions

Both the CJR and control respondents generally indicated positive experiences with care transitions with about 85% reporting they were discharged at the right time and 76% reporting they received the right amount of post-discharge care (Exhibit 42). However, CJR respondents were 2.9 percentage points less likely than control respondents to report that they had all of the medical equipment they needed when they returned home (p=0.08).

Exhibit 42: CJR survey respondents were less likely than control respondents to have all the medical equipment they needed when returning home



Source: CJR evaluation team analysis of patient survey data for fracture episodes with discharge in July-October 2021.

Notes: Differences that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shading, respectively.

Differences are reported in percentage point terms.

Caregiver help

Approximately 96% of both CJR and control respondents received help from a caregiver after returning home. Among those who received help from a caregiver, CJR and control respondents reported needing similar amounts of help with putting on and taking off clothes, bathing, and using the toilet.

Return to Table of Contents

Impact of the CJR model on fracture patients after the episode period

Hip fractures are associated with longer term morbidity, including increased risk of a second fracture, dementia, and mortality.[33,34,35] We investigated the impact of the CJR model on the long-term health trajectory of fracture patients by looking at claims-based outcomes beyond the episode period (91-360 days after discharge).

Generally, there was little evidence that the CJR model impacted payments, utilization, and DME use in the 12 months after discharge (Appendix L, Exhibits L-5, L-6, and L-8). There were a few exceptions. While we found no impact of the CJR model on the unplanned readmission rate for fracture patients during the episode period, the impact of the CJR model on the unplanned readmission rate increased across the post-episode periods, although there was only a small, statistically significant impact in the last post-episode period. During the 271-360 days post-discharge, there was a relative increase of 0.7 pp, or 6.0% from the CJR baseline, in the unplanned readmission rate for CJR fracture patients compared to control patients (p=0.09).

Similarly, we found no impact of the CJR model on the mortality rate for fracture patients during the episode period. However, between 91-180 days after discharge, CJR fracture patients had a small, statistically significant relative reduction in mortality compared to control fracture patients (0.5 pp, p=0.09). The impacts on mortality in later post-episode periods (181-270 days and 271-360 days) were positive, small in magnitude, and statistically insignificant.

Additional findings about the impact of the CJR model on fracture patients after the episode period are presented in Appendix M.

Telephone interview findings

Complexity and comorbidities

Similar to findings reported in Exhibit 35, CJR hospital interviewees frequently described fracture patients as a population distinct from elective patients, noting that fracture patients were generally older with more comorbidities, including cardiovascular disease, dementia or memory loss, diabetes, and chronic obstructive pulmonary disease. Further, interviewees noted that falls related

[33] Berry SD, Samelson EJ, Hanna MT, et al. Second hip fracture in older men and women: the Framingham Study. Arch Intern Med 2007; 167(18): 1971-76.

[34] Huette P, Abou-Arab O, Djebara AE, et al. Risk factors and mortality of patients undergoing hip fracture surgery: a one-year follow-up study. Scientific Reports 2020; 10(1): 1-8.

[35] Lee HB, Oldham MA, Sieber FE, Oh ES. Impact of delirium after hip fracture surgery on one-year mortality in patients with or without dementia: a case of effect modification. The American Journal of Geriatric Psychiatry 2017; 25(3): 308-315.

Return to Table of Contents

to a fracture were often the result of underlying medical issues (e.g., "metabolic or orthopedic comorbidities") rather than environmental issues (e.g., "patients who trip over the dog's leash"). Specifically, interviewees mentioned how some fracture patients experienced fractures from the weakening of bones or osteoporosis, a condition generally associated with older age and more commonly found in women than men. Designated trauma center interviewees reported treating fracture patients with polytrauma, a term used to describe the condition of a person who has been subjected to multiple traumatic injuries. Polytrauma patients required additional care coordination throughout the episode to manage the other injuries. For example, if the patient needed a walker but had a wrist fracture that made it challenging to use a walker, then the hospital would need to make accommodations during discharge planning.

> *"Even when age-matched, seventy-five- to eighty-year-old, elective patients are healthier and more educated [about the procedure] than fracture patients.... It is virtually impossible to try to have both of these populations try to follow the same rules."*

Interviewees frequently noted that it was difficult to meet cost and quality targets for the fracture population due to its complexity. Fracture patients had a heightened risk for readmissions and spent more days in PAC facilities, which increased cost of care and potentially worsened quality outcomes. One interviewee expressed challenges meeting target prices for "outlier patients" with very high episode costs due to high health care utilization in the post-discharge period. Interviewees also indicated that patients' co-morbidities and general health worsened during the pandemic, as fear of infection led patients to avoid healthcare facilities, delaying diagnosis and treatment of emergent issues.

Fracture care pathways

Interviewees indicated that hospitals developed a standardized care pathway for fracture patients, with many noting that the care pathway was based off the elective pathway and created or adjusted due to the CJR model. The core components of care pathways for fracture patients included medical clearances, medication and pain management, patient and caregiver education, and the discharge process. A handful of interviewees mentioned that their care pathway included "power plans," a group of orders designed to support a procedure or a process, to streamline care. Several interviewees noted that their "power plans" were based on a default order set in their electronic health record system that they customized to meet the needs of fracture patients.

Key differences between the fracture and elective pathways were related to the emergent nature and increased complexity of a fracture episode. Because the surgery was unexpected, fracture patients were less prepared than elective patients at the start of the episode. Hospitals focused on getting fracture patients into surgery within 24 hours of being admitted to the hospital because it reduced patient morbidity and mortality. This tight window before surgery does not allow for patient education or optimization prior to surgery, so interviewees noted providing the majority of patient and caregiver education for fracture patients following the surgery.

Return to Table of Contents

Interviewees stated that the care pathway for fracture patients involves staff members across multiple departments with the care navigators playing a key role. Care navigators educate patients after surgery, lead discharge planning, conduct home visits, and follow up with patients after discharge. One interviewee noted that care navigators "are the eyes and the ears" and notify surgeons right away of any potential complications. Interviewees noted physical therapists also play a key role. They assist fracture patients with ambulation after surgery, teach therapy exercises, and provide input to the clinician team on the most appropriate discharge destination.

> *"It is like an orchestra – they [the hospital staff] all play well together and it's become second nature. Everyone knows their job and they do it so well. We have improved the time to operating room, attention to care, [and] timeliness to discharge."*

Interviewees from trauma center hospitals described a more intensive intake and clearance process, as compared to non-trauma center hospitals, involving multiple trauma experts who collectively determine the appropriate care pathway. Interviewees reported that this highly specialized process reduced the influence of the orthopedic department on the fracture patient care pathway at trauma center hospitals.

Education and caregiver engagement

While interviewees reported that educational content for hip fracture patients was generally similar to the content provided to elective patients, hospitals created fracture-specific educational materials to account for the difference in timing and mode of delivery of the material. Like elective patients, the educational content for fracture patients focused on strategies for a successful recovery including returning home and resuming activities safely, continuing to build strength through physical therapy, managing pain without narcotics, preventing infection, and avoiding falls. This education was delivered by a variety of staff members including nurse navigators, case managers, physical therapists, and floor nurses.

> *"The hospital has been successful in educating around 98% of their elective cases before the LEJR surgery through classes. With fracture patients, pre-surgery education cannot happen because they are emergent cases. All of the education for the fracture patients occurs after the surgery."*

While elective patients generally received educational materials before their LEJR, the emergent nature of fractures precludes this and the majority of patient education for fracture patients happens post-operatively. Still, interviewees from one hospital system representing multiple hospitals described the importance of doing as much pre-operation education as possible with fracture patients because the patients are more alert prior to surgery. This hospital system began patient education during the surgery consent process so patients could process information prior to anesthesia. Several hospitals also indicated that setting caregiver and patient expectations before the surgery remained an important part of the education.

Return to Table of Contents

The higher complexity of the fracture patient population also made providing education challenging. For example, one hospital described a specific process for educating fracture patients with dementia or cognitive issues, noting that hospital staff took more time to provide these patients with a clear understanding of post-operative regulations or precautions.

Interviewees stressed the importance of engaging and educating caregivers due to the higher level of caregiver support needed for fracture patients. One interviewee explained it was important to engage caregivers because fracture patients were often not in a mental state conducive to retaining information during the hospital stay due to the trauma associated with the fracture and pain medication use. One hospital had a caregiver education program called "recovery coach training," which included intensive training sessions with a patient's family where physical therapists helped caregivers understand their role in the recovery process.

Discharge planning and post-discharge coordination

Similar to past findings, interviewees stated that the CJR model increased their hospitals' focus on discharging more patients home. While home was often the best discharge option for elective patients, interviewees reported that it was rarely a safe option for fracture patients due to the required level of care. Some interviewees reported that their hospitals exclusively discharged fracture patients to SNFs.

> *"[The CJR model] allowed us to think of home discharge as a more viable option...and allowed us to further the relationship we had with home care so they were more optimized to take these patients."*

Similar to past findings, interviewees described the importance of early discharge planning, including an assessment of the patient's home environment and caregiver availability; however, interviewees described that due to the emergent nature of a fracture, discharge planning had to wait until after surgery for fracture patients.

Interviewees identified discharge planning challenges, including patients experiencing homelessness and the COVID-19 pandemic. A handful of hospitals described that case managers spent extra time collaborating with patients to determine a safe discharge plan for those experiencing homelessness. Typically, fracture patients experiencing homelessness would go to a SNF for recovery, allowing additional time for the case manager to work with social services to determine safe housing options after discharge from the SNF. During the COVID-19 pandemic, interviewees reported some LEJR fracture patients refused discharge to an institutional PAC facility due to fear of COVID-19 infection. Interviewees also described periods of time during the pandemic with minimal-to-no SNF bed availability because capacity was reduced due to staffing shortages and capacity restrictions. Limited PAC availability made discharge planning difficult for fracture patients and resulted in longer inpatient length of stay.

d. Conclusion

CJR fracture patients were typically more complex than patients undergoing elective LEJR surgery. They required more institutional PAC use and had higher readmission rates, ED use, and

Return to Table of Contents

mortality than elective patients; correspondingly, CJR fracture episodes were nearly twice as expensive as CJR elective episodes.

Mandatory CJR hospitals were able to reduce payments for fracture episodes through reductions in institutional PAC use. Accordingly, fracture patients spent relatively more days in the community during the episode under the CJR model. Quality of care for fracture patients was maintained during the episode as measured by claims-based quality measures. In general, we found no evidence that the CJR model adversely impacted outcomes for the fracture population in the 12 months after discharge for the LEJR.

Contrary to findings reported in the fourth annual report, the most recent survey reported in this annual report found that CJR fracture patients reported similar levels of functional recovery to control patients, and CJR and control survey respondents also reported similar levels of overall satisfaction with their care. However, CJR respondents reported lower satisfaction with management of their care and were less likely to have all of the medical equipment they felt they needed at home. We will survey fracture patients again in PY7 to study how these results have persisted and further changed across performance years of the model.

Similar to elective episodes, hospitals participating in the CJR model implemented strategies for controlling costs and improving quality for LEJR fracture patients including patient education, caregiver engagement, discharge planning, coordination with PAC providers, and patient follow-up. However, hospitals identified several challenges in caring for fracture patients under the CJR model and were concerned about balancing the complex needs of the fracture population with pressures to control costs.

The analyses presented in this chapter mostly found no impact of the CJR model on quality of care or functional recovery for fracture patients. While a few results indicate careful monitoring is still necessary, we are cautiously optimistic that the CJR model can reduce payments for fracture episodes without sacrificing quality of care. Future reports will include updated results from additional surveys to further study the impact of the CJR model on functional recovery, satisfaction, and quality of care for this population.

Acronyms	
DDD	difference-in-difference-in-differences
DiD	difference-in-differences
ED	emergency department
FFS	fee for service
HCC	hierarchical condition category
HH	home health
HHA	home health agency
IRF	inpatient rehabilitation facility
LEJR	lower extremity joint replacement
MSA	metropolitan statistical area
PAC	post-acute care
pp	percentage point
PY	performance year
SNF	skilled nursing facility

7. *Did the CJR model reach historically underserved populations and what was the impact of the CJR model on historically underserved populations?*

The CJR model was designed to reduce spending while maintaining or improving the quality of care for Medicare FFS beneficiaries. More recently, CMMI launched a strategy refresh, introduced in 2021, which seeks to promote equitable outcomes through high-

Return to Table of Contents

quality, affordable, person-centered care, with a special focus on underserved communities.[36,37] One of the five strategic objectives is to advance health equity, and new models will be designed to reduce inequities in health care outcomes. Even though the CJR model did not explicitly incorporate health equity goals, we assessed the impact of the CJR model on health equity.

We studied the impact of the CJR model on three historically underserved populations.

Historically Underserved Populations

1. Beneficiaries who are Black or African American (**Black beneficiaries**)
2. Beneficiaries who are dually eligible for Medicare and Medicaid (**duals**)
3. Beneficiaries who are Black or African American and dually eligible (**Black duals**)*

* The sample size is small for this population, so effects of a clinically or financially important size may not be detectable with statistical significance.

We first examined whether the CJR model reached historically underserved populations by assessing their representativeness under the CJR model. Then, we studied descriptive characteristics for each underserved population and assessed disparities in payment, use, quality, and access between the underserved populations and their reference populations during the baseline. For Black beneficiaries, the reference population is White beneficiaries. For duals, the reference population is beneficiaries who are not dually eligible for Medicare and Medicaid (nonduals). For Black duals, the reference population is White beneficiaries who are not dually eligible for Medicare and Medicaid (White nonduals). We chose White nonduals as the reference group for Black duals to capture the combined effect of race and dual status. Next, for each underserved population and reference population, we evaluated the impact of the CJR model on payments, PAC use, quality, and LEJR rates in CJR MSAs. Finally, we evaluated whether the impacts on payments, PAC use, quality, and LEJR rates differed between each underserved population and its reference population and whether baseline disparities increased, decreased, or were maintained.

[36] See https://innovation.cms.gov/strategic-direction for more information about CMMI's strategy refresh.

[37] The Racial Equity and Support for Underserved Communities Through the Federal Government Executive Order 13985, states: "The term 'equity' means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. The term 'underserved communities' refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list in the preceding definition of 'equity.'" The executive order is available for download at https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-advancing-racial-equity-and-support-for-underserved-communities-through-the-federal-government/.

Return to Table of Contents

a. Key Findings

- Black beneficiaries, duals, and Black duals were underrepresented in the CJR model; however, this reflected the existing disparities in the larger population and was not due to model criteria.
- In the baseline, the three underserved populations had higher average episode payments, higher use of institutional post-acute care, and higher rates of emergency department use and readmissions than their reference populations.
- The CJR model reduced payments for all patients, including underserved populations by reducing the use of institutional post-acute care and increasing the proportion of patients first discharged to a home health agency.
- The mortality rate improved for Black beneficiaries. There were no changes in the other quality of care measures (rates of emergency department use and readmissions).
- In the baseline, there were large disparities in the rate of lower extremity joint replacements between the three underserved populations and their reference populations. The disparities increased under the model for two of the underserved populations — Black beneficiaries and Black duals.

b. Methods

Reach of the CJR model to underserved populations

We studied the representation of underserved populations in the CJR model to understand if features of the CJR model or the evaluation affected their representation. We compared the underserved populations' shares of all Medicare FFS beneficiaries to their shares in seven additional samples, each of which adds a model or evaluation restriction until we have the model sample and the evaluation sample for mandatory CJR episodes.

Analysis of the impact of the CJR model

Our primary approach to assessing the health equity impacts of the CJR model uses a difference-in-difference-in-differences (DDD) framework. This approach proceeds in three steps.

First, we used the same DiD approach used in our other analyses to estimate the impact of the CJR model on the three subpopulations with historically poor access to care. Second, we estimated the DiD impact of the CJR model on the reference populations. Finally, we estimated the difference between the CJR impact on the underserved population and the CJR impact on the corresponding reference population to determine the *differential* impact (or DDD impact) of the CJR model. This impact tells us if differences in outcomes between the underserved population and the reference population during the baseline, referred to as the "baseline gap," were impacted by the CJR model.

Return to Table of Contents

For example, we estimated the impact of the CJR model on duals and estimated the impact on nonduals. We then estimated the difference between the two estimated impacts to determine the differential impact of the CJR model on duals compared to nonduals.

The data included episodes initiated at mandatory CJR hospitals and their corresponding control group hospitals during the baseline (episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015) and the intervention period (episodes initiated during or after April 2016 that ended by December 2020), which includes PY1-PY5.1. Note, due to the timing of this study, the intervention period excludes PY5.2 and is three quarters shorter than other analyses included in this report.

A full technical description of the DDD regression is provided in the Methods Appendix (Appendix C).

Impact of the CJR model on payments, utilization, and quality

We studied the impact of the CJR model on payments, utilization, and quality for historically underserved populations. We used the DDD approach described above, including a full set of risk-adjusters in our regressions. The outcome measures were:

- Average episode payments
- PAC utilization measures:
    - First PAC discharge destination
    - SNF days
    - IRF days and HH visits (reported in Appendix P)
- Quality measures:
    - All-cause mortality during the hospital stay or in the 90 days post-discharge
    - ED use in the 90 days post-discharge
    - Unplanned readmissions in the 90 days post-discharge

Impact of the CJR model on the rate of LEJRs in CJR MSAs

We studied the impact of the CJR model on the rate of LEJRs for underserved populations. We used the DDD approach described above. Our outcome is the probability that a beneficiary received at least one elective LEJR in a given year. This included outpatient LEJRs. For this analysis, the data included *all* Medicare FFS beneficiaries living in mandatory CJR MSAs or their corresponding control MSAs between 2012 and 2019 (subject to some inclusion/exclusion rules). We dropped PY1 from the analysis because the CJR intervention began mid-year.

Return to Table of Contents

c. Reach of the CJR model to historically underserved populations

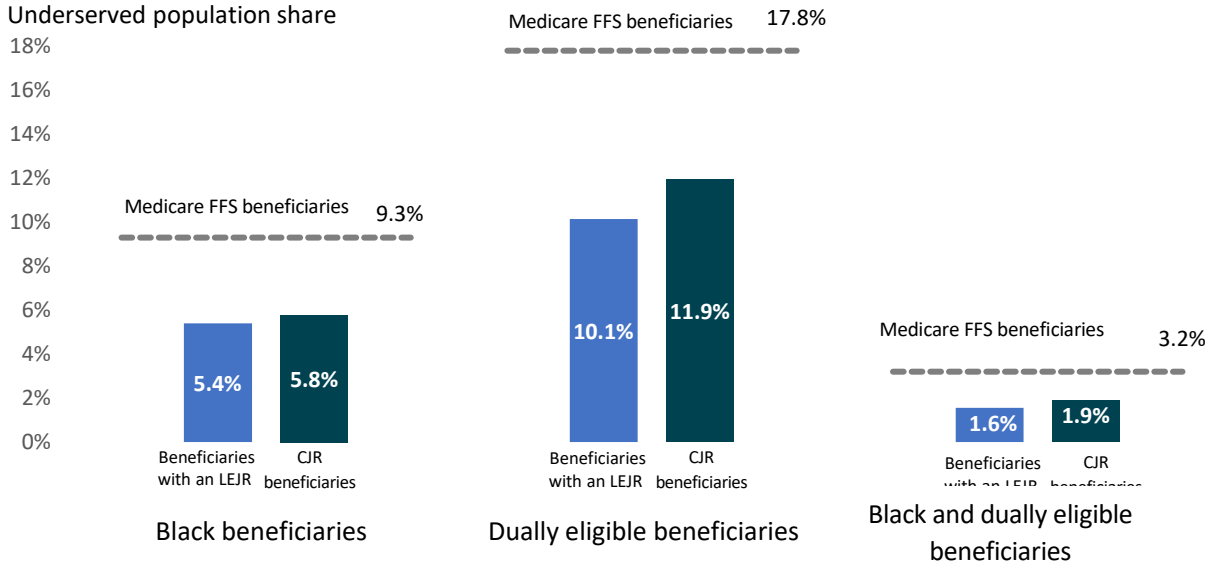
Black beneficiaries, duals, and Black duals were underrepresented in the CJR model; however, this reflected the existing disparities in the receipt of LEJRs in the larger Medicare FFS population and was not due to the model (Exhibit 43).

The share of mandatory CJR beneficiaries who were Black or African American (5.8%) was lower than their share of the overall FFS population (9.3%), but similar to their share of Medicare FFS beneficiaries who received LEJRs (5.4%).

The share of mandatory CJR beneficiaries who were dually eligible (11.9%) was lower than their share of the overall FFS population (17.8%), but similar to their share of Medicare FFS beneficiaries who received LEJRs (10.1%).

The share of mandatory CJR beneficiaries who were Black or African American and dually eligible (1.9%) was lower than their share in the overall FFS population (3.2%), but similar to their share of Medicare FFS beneficiaries who received LEJRs (1.6%).

Exhibit 43: Underserved populations are underrepresented in the CJR model reflecting their underrepresentation among Medicare fee-for-service (FFS) beneficiaries with a lower extremity joint replacement



Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated during or after April 2016 that ended by December 2020 (intervention).

d. Descriptive characteristics of historically underserved populations, baseline

Patient characteristics

Underserved populations had higher rates of chronic disease than their reference populations (Appendix P, Exhibits P-1, P-2, and P-3). In the baseline period, in both the CJR and control MSAs, the underserved populations had higher rates of obesity, diabetes, hypertension, congestive heart failure, and prior health care use than their reference populations. The dual share of Black

Return to Table of Contents

beneficiaries was five times greater than the dual share of White beneficiaries (for Black beneficiaries, 39.0% in CJR MSAs and 35.8% in control MSAs; for White beneficiaries, 7.1% in CJR MSAs and 6.7% in control MSAs).

Average episode payments

In the baseline period, in both CJR and control MSAs, underserved populations had higher average episode payments than their reference populations (Exhibit 44). Differences in average episode payments in both CJR and control MSAs were smallest between Black and White beneficiaries. In CJR MSAs, average episode payments for Black beneficiaries were about 6% higher than average episode payments for White beneficiaries. In control MSAs, average episode payments for Black beneficiaries were only about 1% higher than average episode payments for White beneficiaries. Differences in average episode payments were largest between duals and nonduals. Average episode payments for duals were over 20% higher than average episode payments for nonduals in both CJR and control MSAs.

Exhibit 44: In CJR metropolitan statistical areas, average episode payments at baseline were 6% to 20% higher for underserved populations than their reference populations

	CJR		Control	
Underserved and Reference Populations	**Average Episode Payments**	**Gap**	**Average Episode Payments**	**Gap**
Black	$30,664	$1,689	$28,994	$363
White	$28,976		$28,631	
Dual	$35,492	$7,199	$34,048	$6,153
Nondual	$28,292		$27,895	
Black dual	$33,144	$4,836	$30,882	$2,968
White nondual	$28,308		$27,914	

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline).

PAC utilization

Underserved populations had higher average episode payments in the baseline because they used more institutional PAC than their reference populations. The underserved populations had higher rates of discharge to an IRF and SNF and lower rates of discharge to home health and home without home health compared to their reference populations (Exhibit 45). Duals and Black duals with a SNF stay also spent more days in a SNF than their reference populations. Differences in PAC use between Black and White beneficiaries were generally smaller than differences in PAC use between duals and nonduals and between Black duals and White nonduals. Differences between underserved populations and their reference populations were generally smaller in control MSAs than in CJR MSAs.

Return to Table of Contents

Exhibit 45: At baseline, underserved populations used more institutional post-acute care (PAC) than their reference populations

Outcome	Underserved and Reference Populations	CJR		Control	
		Baseline	Gap	Baseline	Gap
First PAC IRF	Black	17.1%	3.6 pp	14.1%	1.0 pp
	White	13.6%		13.0%	
	Dual	15.8%	2.1 pp	13.5%	0.5 pp
	Nondual	13.7%		13.1%	
	Black dual	17.7%	4.2 pp	14.1%	1.1 pp
	White nondual	13.6%		13.0%	
First PAC SNF	Black	43.9%	3.7 pp	43.4%	1.9 pp
	White	40.2%		41.5%	
	Dual	53.5%	14.6 pp	52.1 %	12.0 pp
	Nondual	38.9%		40.1%	
	Black dual	44.8%	6.0 pp	44.0%	4.0 pp
	White nondual	38.9%		40.0%	
First PAC HH	Black	32.8%	-4.7 pp	31.9%	-2.1 pp
	White	37.5%		34.0%	
	Dual	25.2%	-13.4 pp	27.2%	-7.8 pp
	nondual	38.6%		34.9%	
	Black dual	31.8%	-6.9 pp	32.1%	-3.1 pp
	White nondual	38.6%		35.1%	
First PAC home without HH	Black	6.1%	-2.6 pp	10.6%	-0.9 pp
	White	8.7%		11.5%	
	Dual	5.5%	-3.3 pp	7.2%	-4.7 pp
	Nondual	8.8%		11.9%	
	Black dual	5.6%	-3.3 pp	9.8%	-2.0 pp
	White nondual	8.9%		11.8%	
SNF days	Black	28.1	0.9	26.1	-1.3
	White	27.1		27.4	
	Dual	35.2	9.6	34.0	8.2
	Nondual	25.6		25.8	
	Black dual	32.0	6.3	29.1	3.2
	White nondual	25.6		25.9	

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline).

Return to Table of Contents

Quality

In the baseline period, in both CJR and control MSAs, underserved populations had higher rates of ED use and readmissions compared to their reference populations (Exhibit 46). Duals also had higher mortality rates than nonduals. In contrast, Black beneficiaries and dual Black beneficiaries had lower mortality rates than their reference populations.

Exhibit 46: At baseline, underserved populations had higher rates of emergency department use and readmissions

Outcome	Underserved and Reference Populations	CJR		Control	
		Baseline	Gap (pp)	Baseline	Gap (pp)
Mortality	Black	1.7%	-1.2	1.7%	-1.2
	White	2.9%		3.0%	
	Dual	4.0%	1.4	4.6%	2.0
	Nondual	2.5%		2.6%	
	Black dual	2.1%	-0.5	2.1%	-0.6
	White nondual	2.6%		2.7%	
ED use	Black	17.7%	5.0	17.3%	5.0
	White	12.8%		12.3%	
	Dual	18.9%	6.8	19.6%	8.1
	Nondual	12.1%		11.5%	
	Black dual	23.6%	11.6	23.7%	12.1
	White nondual	12.0%		11.6%	
Readmissions	Black	10.5%	1.4	10.1%	1.3
	White	9.1%		8.8%	
	Dual	13.5%	5.0	12.8%	4.6
	Nondual	8.5%		8.2%	
	Black dual	13.7%	5.2	12.4%	4.1
	White nondual	8.6%		8.3%	

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline).

LEJR rates

In the baseline period, in both CJR and control MSAs, there were large disparities in LEJR rates between underserved populations and their reference populations. In both the CJR and control MSAs, LEJR rates were about 40% lower for Black beneficiaries compared to White beneficiaries, about 55% lower for duals compared to nonduals, and about 60% lower for Black duals compared to White nonduals (Exhibit 47).

Return to Table of Contents

Exhibit 47: At baseline, elective LEJR rates were 40% to 60% lower for underserved populations than their reference populations

Outcome	Underserved and Reference Populations	CJR		Control	
		Baseline	Gap	Baseline	Gap
Access to elective LEJRs (LEJRs per 100,000 beneficiaries per year)	Black	709	-513	712	-562
	White	1,222		1,274	
	Dual	547	-697	610	-675
	Nondual	1,244		1,285	
	Black dual	530	-745	561	-769
	White nondual	1,275		1,330	

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline).

e. Results

Impact on payments

The CJR model reduced average episode payments for each of the underserved populations and their reference populations ranging from -$1,349 for White nonduals to -$2,380 for Black beneficiaries (Exhibit 48). The reductions were statistically significant at the 5% level or less. The reductions in average episode payments were larger for underserved populations than for their reference populations, narrowing baseline payment gaps, however, the differential impact for Black and White beneficiaries was the only one that was statistically significant.[38] The differential impact for duals and nonduals was smallest even though the baseline payment gap between duals and nonduals was largest.

[38] The CJR model decreased average episode payments for both Black beneficiaries and White beneficiaries, relative to their counterparts in the control group (Exhibit 48). The relative reduction in average episode payments was $2,380 ($p<0.01$) for Black beneficiaries and was $1,358 ($p<0.01$) for White beneficiaries. Thus, the CJR model decreased average episode payments by $1,023 ($p=0.06$) more for Black beneficiaries than for White beneficiaries, reducing the baseline gap in payments.

Return to Table of Contents

Exhibit 48: The CJR model reduced average episode payments for underserved and reference populations

Underserved and Reference Populations	DiD $	DiD as a % of CJR baseline	Differential Impact	Baseline Gap	% Change in Baseline Gap
Black	-$2,380	-7.8%	-$1,023	$1,689	-60.6%
White	-$1,358	-4.7%			
Dual	-$1,830	-5.2%	-$420	$7,199	-5.8%
Nondual	-$1,410	-5.0%			
Black dual	-$2,309	-7.0%	-$961	$4,836	-19.9%
White nondual	-$1,349	-4.8%			

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and LEJR episodes initiated during or after April 2016 that ended by December 2020 (intervention).

Notes: Estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

Impact on PAC use

For each of the underserved populations and their reference populations, the CJR model reduced the use of institutional PAC and increased the proportion of beneficiaries first discharged to an HHA, relative to their counterparts in the control group (Exhibit 49). Differential impacts in PAC use between underserved populations and their reference populations were generally not statistically significant although Black-White gaps in PAC use narrowed across all measures and Black dual-White nondual gaps in PAC use narrowed for four of the five measures.

Exhibit 49: The CJR model reduced institutional post-acute care (PAC) use for underserved and reference populations

Outcome	Underserved and Reference Populations	DiD	DiD as a % of CJR baseline	Differential Impact	Baseline Gap	% Change in Baseline Gap
First PAC IRF	**Black**	-5.6pp	-32.8%	-1.9pp	3.6pp	-51.9%
	White	-3.8pp	-27.7%			
	Dual	-3.9pp	-24.6%	0.0pp	2.1pp	0.4%
	Nondual	-3.9pp	-28.5%			
	Black dual	-4.9pp	-27.9%	-1.1pp	4.2pp	-25.9%
	White nondual	-3.9pp	-28.5%			
First PAC SNF	**Black**	-4.7pp	-10. 8%	-2.6pp	3.7pp	-69.4%
	White	-2.2pp	-5.4%			
	Dual	-3.1pp	-5.9%	-0.8pp[a]	14.6pp	-5.2%
	Nondual	-2.4pp	-6.1%			
	Black dual	-3.7pp	-8.3%	-1.6pp	6.0pp	-26.7%
	White nondual	-2.1pp[b]	-5.5%			

Return to Table of Contents

Outcome	Underserved and Reference Populations	DiD	DiD as a % of CJR baseline	Differential Impact	Baseline Gap	% Change in Baseline Gap
First PAC HH	Black	8.4pp	25.7%	1.6pp	-4.7pp	-34.9%
	White	6.8pp	18.1%			
	Dual	6.8pp	26.9%	-0.3pp	-13.4pp	2.4%
	Nondual	7.1pp	18.4%			
	Black dual	6.3pp	19.9%	-0.6pp	-6.9pp	8.0%
	White nondual	6.9pp[b]	17.8%			
First PAC home without HH	Black	1.9pp	31.6%	2.8pp	-2.6pp	-107.7%
	White	-0.9pp	-10.0%			
	Dual	0.2pp	4.1%	1.1pp	-3.3pp	-32.6%
	Nondual	-0.8pp	-9.5%			
	Black dual	2.3pp	41.2	3.2pp	-3.3pp	-98.2%
	White nondual	-0.9pp	-10.1%			
SNF days	Black	-3.4	-12.0%	-1.0	0.9	-107.2%
	White	-2.4	-8.7%			
	Dual	-2.2	-6.2%	0.3	9.6	3.0%
	Nondual	-2.5	-9.6%			
	Black dual	-3.0	-9.4%	-0.6	6.3	-9.8%
	White nondual	-2.4	-9.4%			

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and LEJR episodes initiated during or after April 2016 that ended by December 2020 (intervention).

Notes: Estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively. (a) We cannot be certain that we isolated the differential impact of the CJR model on this outcome due to differences in baseline trends. (b) CJR and control group hospitals may have had different trends in the baseline, which means we cannot be certain that we isolated the impact of the CJR model on this outcome.

Impact on quality

Mortality rates decreased for Black beneficiaries (Exhibit 50). The mortality rate for Black CJR beneficiaries decreased by 0.3 pp, a decrease of 20.0% of the baseline rate, relative to Black control beneficiaries (p=0.07). Although, not statistically significant, the mortality rate for White CJR beneficiaries increased by 0.1 pp, an increase of 3.1% of the baseline rate, relative to White control beneficiaries. These changes combined resulted in a larger relative reduction in the mortality rate for Black beneficiaries compared to White beneficiaries (-0.4 pp, p=0.03). Since the baseline mortality rate for Black beneficiaries was lower than the mortality rate for White beneficiaries, the gap in mortality rates between Black and White beneficiaries widened.

The CJR model had no statistically significant impact on the rates of ED use and readmissions for underserved populations and their reference populations. The CJR model also had no statistically significant differential impact between underserved populations and their reference populations,

Return to Table of Contents

leaving unchanged the disparities in the rates of ED use and readmissions between underserved populations and their reference populations.

Exhibit 50: The CJR model reduced the mortality rate for Black beneficiaries, but did not impact emergency department use or readmissions

Outcome	Underserved and Reference Populations	DiD (pp)	DiD as a % of CJR baseline	Differential Impact (pp)	Baseline Gap (pp)	% Change in Baseline Gap
Mortality	Black	-0.3	-20.0%	-0.4	-1.2	34.9%
	White	0.1	3.1%			
	Dual	0.2[a]	4.5%	0.1[b]	1.4	10.5%
	Nondual	0.0	1.2%			
	Black dual	-0.4	-20.9%	-0.5	-0.5	89.2%
	White nondual	0.1	2.0%			
ED Use	Black	0.0[a]	0.1%	0.0[b]	5.0	-0.7%
	White	0.0	0.4%			
	Dual	-0.1[a]	-0.4%	-0.2	6.8	-2.8%
	Nondual	0.1	1.0%			
	Black dual	-1.0[a]	4.3%	-1.1	11.6	-9.8%
	White nondual	0.1	0.1%			
Readmissions	Black	-0.4	-3.6%	-0.2	1.4	-13.4%
	White	-0.2	-2.1%			
	Dual	-0.4	-3.0%	-0.2	5.0	-3.7%
	Nondual	-0.2	-2.7%			
	Black dual	0.0	-0.2%	0.1	5.2	2.6%
	White nondual	-0.2	-1.9%			

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and LEJR episodes initiated during or after April 2016 that ended by December 2020 (intervention).

Notes: Estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively. (a) CJR and control group hospitals may have had different trends in the baseline, which means we cannot be certain that we isolated the impact of the CJR model on this outcome. (b) We cannot be certain that we isolated the differential impact of the CJR model on this outcome due to differences in baseline trends.

Return to Table of Contents

Impact on LEJR rates

As discussed above, underserved populations had higher average episode payments and used more institutional PAC than their reference populations in the baseline (Section II.A.7.d). This could prompt hospitals to provide fewer LEJRs to underserved populations as a way to reduce average episode payments and increase reconciliation payments.

The LEJR rate analysis is more robust than the patient mix analysis.

In this section we estimate the impacts of the CJR model on LEJR rates for the underserved populations and their reference populations (relative to their counterparts in the control group), and on the disparities in LEJR rates between the underserved populations and their reference populations. Unlike the analysis of patient characteristics, the impact estimates for LEJR rates and disparities in LEJR rates account for changes in the demographics of the underlying FFS beneficiary population. For example, the CJR LEJR rate for Black beneficiaries is the number of CJR LEJRs for Black beneficiaries per 100,000 FFS Black beneficiaries in CJR MSAs. The impact estimates for LEJR rates and disparities in LEJR rates are also risk adjusted.

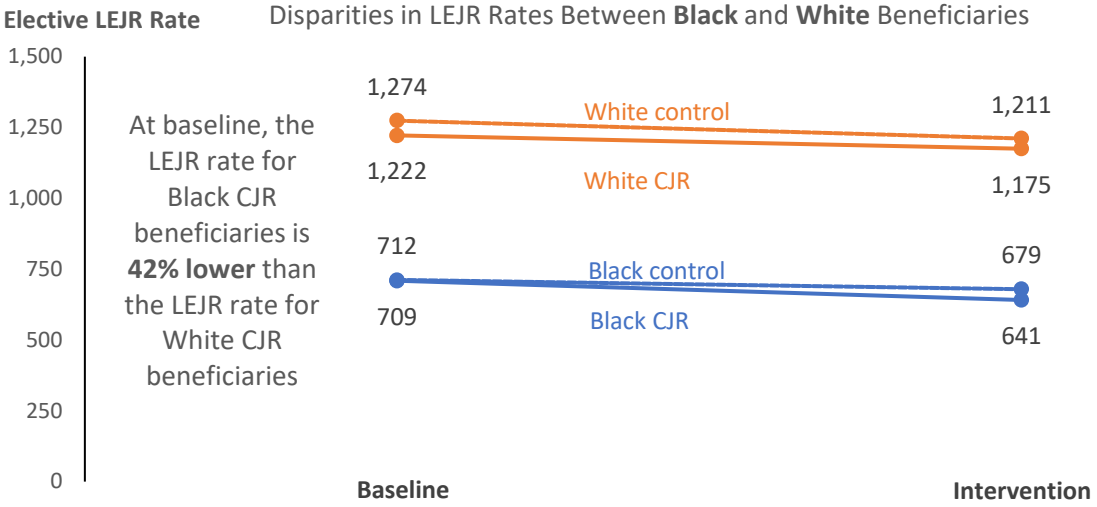
As seen in Exhibit 51, in both CJR and control MSAs, there were large disparities in baseline LEJR rates between underserved populations and their reference populations, corresponding to results in the literature.[39,40] The LEJR rate was lower for Black beneficiaries compared to White beneficiaries by 42% in CJR MSAs and 44% in control MSAs; lower for duals compared to nonduals by 56% in CJR MSAs and 53% in control MSAs; and lower for Black duals compared to White nonduals by 58% in both CJR and control MSAs.

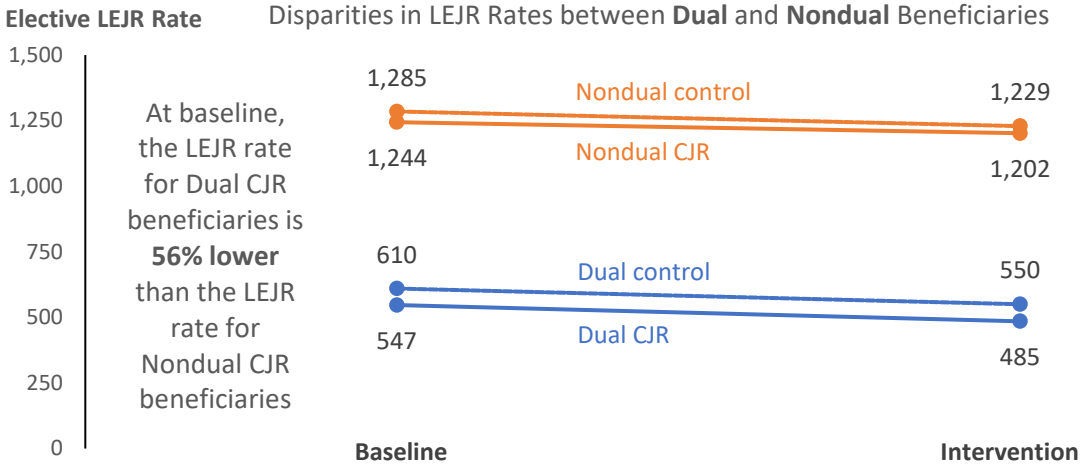
[39] Kim H, Meath THA, Quiñones AR, McConnell KJ, Ibrahim SA. Association of Medicare Mandatory Bundled Payment Program With the Receipt of Elective Hip and Knee Replacement in White, Black, and Hispanic Beneficiaries. JAMA Netw Open. 2021;4(3):e211772. doi:10.1001/jamanetworkopen.2021.1772.

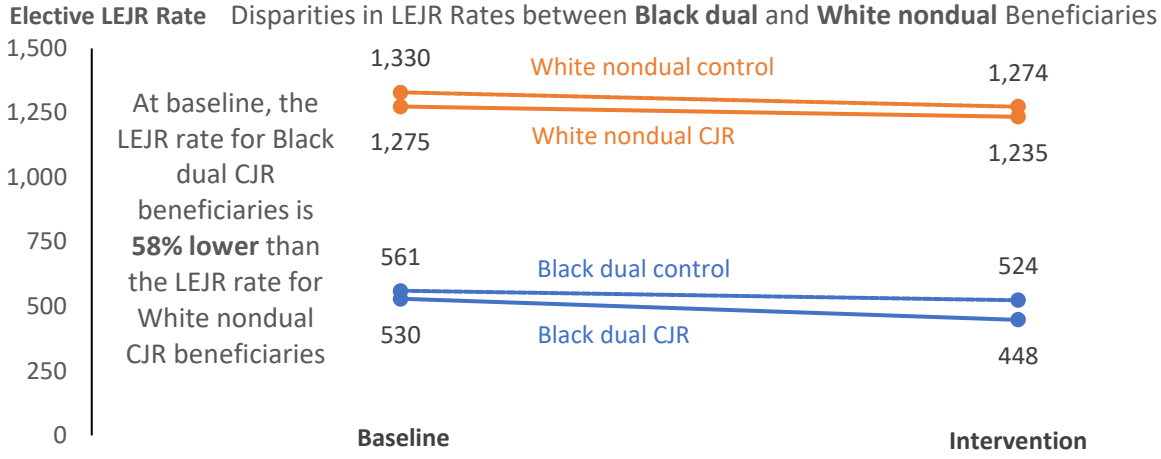
[40] Thirukumaran CP, Kim Y, Cai X, et al. Association of the Comprehensive Care for Joint Replacement Model With Disparities in the Use of Total Hip and Total Knee Replacement. JAMA Netw Open. 2021;4(5):e2111858. doi:10.1001/jamanetworkopen.2021.11858.

Return to Table of Contents

Exhibit 51: In both CJR and control metropolitan statistical areas, there were large disparities in LEJR rates between underserved populations and their reference populations, and LEJR rates declined in all populations studied







Return to Table of Contents

From baseline to intervention, LEJR rates declined in both the CJR and control MSAs for all populations studied. However, while not statistically significant, LEJR rates for underserved populations declined more, and LEJR rates for reference populations declined less than the declines of their counterparts in the control group. This caused small but statistically significant widenings of already large disparities in LEJR rates between Black beneficiaries and White beneficiaries and between Black duals and White nonduals. These findings, despite being small in magnitude, are important in the face of already large baseline disparities and similar results found in other studies.[41,42] The change in the LEJR rate disparity between duals and nonduals was small and not statistically significant.

Exhibit 52 provides more detail about these nuanced results. Although not statistically significant, the LEJR rate for Black CJR beneficiaries decreased by 35 LEJRs per 100,000 beneficiaries per year relative to Black control beneficiaries, a decrease of 4.9% of the baseline rate. Although also not statistically significant, the LEJR rate for White CJR beneficiaries increased by 16 LEJRs per 100,000 beneficiaries per year relative to White control beneficiaries, an increase of 1.3% of the baseline rate. While these within population changes are not individually statistically significant, this movement in opposite directions led to a statistically significant widening of the baseline LEJR rate disparity between Black and White CJR beneficiaries by 51 LEJRs per 100,000 beneficiaries per year ($p=0.06$). This means that at the population level there were 51 fewer elective surgeries per 100,000 beneficiaries per year for Black beneficiaries compared to White beneficiaries, equating to a 9% widening of the baseline disparity.

Although not statistically significant, the LEJR rate for CJR Black duals decreased by 45 LEJRs per 100,000 beneficiaries per year relative to control Black duals, a decrease of 8.5% of the baseline rate. Although, also not statistically significant, the LEJR rate for CJR White nonduals increased by 17 LEJRs per 100,000 beneficiaries per year relative to control White nonduals, an increase of 1.3% of the baseline rate. While these within population changes were not individually statistically significant, this movement in opposite directions led to a statistically significant widening of the baseline LEJR rate disparity between CJR Black duals and CJR White nonduals by 62 LEJRs per 100,000 beneficiaries per year ($p=0.06$). This means that at the population level there were 62 fewer elective surgeries per 100,000 beneficiaries per year for Black duals compared to White nonduals, equating to an 8.4% widening of the baseline disparity (Exhibit 52).

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41 Kim H, Meath THA, Quiñones AR, McConnell KJ, Ibrahim SA. Association of Medicare Mandatory Bundled Payment Program With the Receipt of Elective Hip and Knee Replacement in White, Black, and Hispanic Beneficiaries. JAMA Netw Open. 2021;4(3):e211772. doi:10.1001/jamanetworkopen.2021.1772.

42 Thirukumaran CP, Kim Y, Cai X, et al. Association of the Comprehensive Care for Joint Replacement Model With Disparities in the Use of Total Hip and Total Knee Replacement. JAMA Netw Open. 2021;4(5):e2111858. doi:10.1001/jamanetworkopen.2021.11858.

Return to Table of Contents

Exhibit 52: There were no statistically significant changes in lower extremity joint replacement rates for any of the populations studied, but a small widening of already large baseline disparities between Black and White beneficiaries and Black duals and White nonduals

Underserved and Reference Populations	LEJRs per 100k beneficiaries per year					Impact as a % of CJR baseline
	CJR Baseline	CJR Intervention	Control Baseline	Control Intervention	Estimated CJR Impact	
Black	709	641	712	679	-35	-4.9%
White	1,222	1,175	1,274	1,211	16	1.3%
Black-White Gap	-513	-534	-562	-532	-51	9.9%
Dual	547	485	610	550	-1	-0.3%
Nondual	1,244	1,202	1,285	1,229	14	1.1%
Dual-Nondual Gap	-697	-716	-675	-678	-15	2.2%
Black dual	530	448	561	524	-45	-8.5%
White nondual	1,275	1,235	1,330	1,274	17	1.3%
Black dual-White nondual Gap	-745	-787	-769	-749	-62	8.4%

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and LEJR episodes initiated during or after April 2016 that ended by December 2019 (intervention).

Notes: Estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

As discussed above, the dual share of Black beneficiaries was about five times greater than the dual share of White beneficiaries (Section II.A.7.d). We considered whether the increase in LEJR rate disparities was a true race effect or could be a function of the intersectionality of race and dual status. To investigate, we split the Black population into Black duals and Black nonduals. If the increase in the Black-White LEJR rate disparity was due at least in part to dual status, then the Black dual LEJR rate would have decreased more than the Black nondual LEJR rate. However, we found no statistically significant difference between the relative changes in LEJR rates for Black duals and Black nonduals (Exhibit 53).

Return to Table of Contents

Exhibit 53: There was no change in the disparity in elective LEJR rates from baseline to intervention between CJR Black duals and CJR Black nonduals

Underserved and Reference Populations	LEJRs per 100k beneficiaries per year					Impact as a % of CJR baseline
	CJR Baseline	CJR Intervention	Control Baseline	Control Intervention	Estimated CJR Impact	
Black dual	538	439	585	521	-36	-6.6%
Black nondual	848	775	882	823	-15	-1.8%
Black dual-Black nondual Gap	-311	-336	-297	-302	-21	6.7%

Source: CJR evaluation team analysis of Medicare claims and enrollment data for LEJR episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015 (baseline) and LEJR episodes initiated during or after April 2016 that ended by December 2019 (intervention).

Notes: Estimates that are significant at the 1%, 5%, or 10% significance level are indicated by red, orange, or yellow shaded cells, respectively.

Finally, we examined changes in patient characteristics for evidence of patient selection within the underserved populations. The analyses of patient characteristics were consistent with the analyses of the impacts on LEJR rates: There were declines in the dual share of CJR Black beneficiaries relative to the control group and declines in the Black share of CJR duals relative to the control group. There were no other systematic changes in patient characteristics associated with a more or less complex patient mix (Appendix P).

f. Conclusion

The CJR model, implemented in 2016, was designed to reduce spending while maintaining or improving the quality of care for Medicare FFS beneficiaries. More recently, in 2021, CMMI launched a strategy to advance health equity, and new models will be designed to reduce inequities in health care outcomes. Even though the CJR model did not explicitly incorporate health equity goals, we assessed health equity in this evaluation. We studied the impact of the model on three underserved populations: Black beneficiaries, duals, and Black duals relative to their counterparts in the comparison group. Prior literature found disparities in LEJR rates for these three underserved populations in Medicare FFS data.[43] We also studied the impact of the model on the three underserved populations compared to their reference populations: White beneficiaries, nonduals, and White nonduals, respectively.

Reflecting the existing disparities in LEJR rates in the overall Medicare FFS population, we found that these underserved populations were underrepresented in the CJR model. The eligibility criteria for the CJR model did not affect their representation.

In the baseline, the underserved populations had higher rates of chronic disease than their reference populations. CJR beneficiaries from these three underserved populations also had higher average

[43] Thirukumaran CP, Cai X, Glance LG, Kim Y, Ricciardi BF, Fiscella KA, Li Y. Geographic Variation and Disparities in Total Joint Replacement Use for Medicare Beneficiaries: 2009 to 2017. J Bone Joint Surg Am. 2020 Dec 16;102(24):2120-2128. doi: 10.2106/JBJS.20.00246. PMID: 33079898; PMCID: PMC8190867. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8190867/.

Return to Table of Contents

episode payments, higher use of institutional PAC, and higher rates of ED use and readmissions, compared to their reference populations. The mortality rate was also higher for duals, but lower for Black beneficiaries and Black duals, compared to their reference populations.

The CJR model reduced episode payments for all three underserved populations and their reference populations, relative to their counterparts in the control group, by reducing the use of institutional PAC and increasing the proportion of patients first discharged to an HHA. Although not statistically significant, the use of institutional PAC decreased more for Black beneficiaries than for White beneficiaries and decreased more for Black duals than for White nonduals reducing the differences in PAC use between Black beneficiaries and White beneficiaries and between Black duals and White nonduals.

There was a statistically significant reduction in the mortality rate for Black beneficiaries, widening the baseline gap that was already favorable to Black beneficiaries. A reduction in the mortality rate could indicate that CJR hospitals are avoiding Black beneficiaries with certain comorbidities that are known to complicate recovery, such as obesity, hypertension, and diabetes. However, we did not find changes in the incidence of these conditions nor any systematic changes in patient characteristics to indicate that the CJR Black beneficiary population became less complex. There were no changes in the other quality of care measures (i.e., rates of ED use and readmissions). There were also no improvements in baseline disparities in quality of care.

In the baseline, there were large disparities in LEJR rates between the underserved populations and their reference populations: LEJR rates for the underserved populations were between 40% to 60% lower than LEJR rates for their reference populations. Under the CJR model, there were no statistically significant changes in LEJR rates for the underserved populations nor for their reference populations. However, the changes in rates for Black and White beneficiaries and the changes in rates for Black duals and White nonduals moved in opposite directions leading to small widenings of already large baseline disparities, a finding consistent with recent academic studies.[44,45] In future work, we will continue to examine disparities in LEJR rates.

At the implementation of the CJR model, some were concerned that the model would reduce LEJR rates and lower quality for underserved populations.[46] The evaluation found that these negative unintended consequences did not occur. However, the evaluation also found that the CJR model did not reduce disparities in LEJR rates and quality. These results suggest that to reduce healthcare

[44] Kim H, Meath THA, Quiñones AR, McConnell KJ, Ibrahim SA. Association of Medicare Mandatory Bundled Payment Program With the Receipt of Elective Hip and Knee Replacement in White, Black, and Hispanic Beneficiaries. JAMA Netw Open. 2021;4(3):e211772. doi:10.1001/jamanetworkopen.2021.1772.

[45] Thirukumaran CP, Kim Y, Cai X, et al. Association of the Comprehensive Care for Joint Replacement Model With Disparities in the Use of Total Hip and Total Knee Replacement. JAMA Netw Open. 2021;4(5):e2111858. doi:10.1001/jamanetworkopen.2021.11858.

[46] Ibrahim SA, Kim H, McConnell KJ. The CMS Comprehensive Care Model and Racial Disparity in Joint Replacement. JAMA. 2016 Sep 27;316(12):1258-9. doi: 10.1001/jama.2016.12330. PMID: 27653166; PMCID: PMC5549782.

Return to Table of Contents

disparities, CMS may need to explicitly design models to do so, given that general incentives for increasing value may be sufficient to reduce long standing inequities.

The CJR model extension, beginning with PY6, includes additional episode-level risk adjustment (beneficiary age, HCC count, and dual eligibility status) that could increase LEJR rates for beneficiaries who are likely to require more resources and be costlier to treat.[47] It will be important to evaluate the model's impact on health equity under the new risk adjustment methodology.

B. Choice of Response

1. How did the CJR model affect care coordination?

The CJR model incentivizes participant hospitals to coordinate care between physicians, PAC providers, and other providers and clinicians involved in the episode to reduce episode payments and improve quality. CJR hospitals have reduced payments, primarily through reductions in institutional post-acute care use. CJR hospital representatives that we interviewed have described the importance of care coordination in meeting the goals of the CJR model.

In PY5, we surveyed care coordinators from 395 mandatory and opt-in CJR hospitals to understand their hospitals' care coordination efforts under the CJR model. The survey (Appendix H) included four domains of questions: investment in care coordination, types of care coordination activities, patient selection and care transition, and impact of the CJR model on key outcomes (e.g., complications, readmissions, patient satisfaction). The survey was designed, in collaboration with CMS, to systematically capture information from care coordinators across the care continuum at CJR mandatory and opt-in hospitals, building on findings from previous qualitative activities. Results from the survey are highlighted below (the full set of results is in Appendix I).

a. Key Findings

- Hospitals invested in care coordination to achieve the goals of the CJR model.
- 41% of care coordinators respondents were hired in response to the CJR model.
- Hospitals implemented or enhanced numerous activities across the care continuum.
- The most common activities focused on improving patient care and care coordination pre- and post-discharge.

[47] Centers for Medicare & Medicaid Services. Medicare Program: Comprehensive Care for Joint Replacement Model Three-Year Extension and Changes to Episode Definition and Pricing; Medicare and Medicaid Programs; Policies and Regulatory Revisions in Response to the COVID–19 Public Health Emergency; Final Rule 2021:1-81.

Return to Table of Contents

b. Methods

The care coordination survey was administered to a care coordinator at each CJR participant hospital that provided LEJRs in 2019, which includes CJR mandatory hospitals, opt-in hospitals in voluntary MSAs, and rural hospitals in mandatory MSAs that opted in. There were 470 CJR participant hospitals included in the 2019 CJR participant list. Hospitals with fewer than 20 episodes in 2019 were excluded from the sample (n = 75). The final sample included 395 (84.0%) CJR participant hospitals. Of all hospitals in the sample, 90.4% were affiliated with a health system (n = 357).

Acronyms	
DME	durable medical equipment
EHR	electronic health record
LEJR	lower extremity joint replacement
LOS	length of stay
IRF	inpatient rehab facility
MSA	metropolitan statistical area
NPRA	net payment reconciliation amount
PAC	post-acute care
PRO	patient reported outcomes
PT	physical therapy
SNF	skilled nursing facility

The survey was fielded from July 28 to August 30, 2020. A total of 199 hospitals responded to the survey (50.4% response rate). Characteristics of respondent and non-respondent hospitals were similar, so we did use a weight in our analysis to account for non-response. Of the respondents, 68% identified as a nurse, followed by social worker (10%) and nurse practitioner (6%). Consistent with round 5 telephone interviews, care coordinator titles varied. Common titles included care coordinators, care navigators, and care managers. Approximately half of care coordinators have been working in a care coordination role since the CJR model began.

c. Results

Investments in Care Coordination

41% of care coordinators who responded to the survey reported they were hired or assigned to perform additional care coordination activities in response to the CJR model.

Hospitals invested in care coordination in response to the CJR model. Investments and attributions varied across hospitals. Forty-one percent of care coordinators were newly hired or assigned to perform care coordination activities they did not previously perform. Over half of care coordinator respondents reported performing care coordination activities prior to the model, and one-quarter reported that their hospitals dedicated additional staff or resources to care coordination due to the CJR model.

Staffing and resource investments included adding staff to support key roles, such as care coordinator, administration, or management. It also included adding staff with specific backgrounds, such as nursing, social work, physical therapy, or occupational therapy. Respondents also reported expanding technology to provide tools for patient education, data collection, and documentation. Finally, some care coordinators reported their hospitals hired outside companies for care management and analytics.

Care Coordination Activities

The most commonly reported care coordination activities were developing discharge or transition plans, engaging patients in development of care and discharge plans, following up with patients post-discharge, reviewing readmission data, tracking patient outcomes during the discharge period,

Return to Table of Contents

communicating with PAC providers regarding patient care, performing risk assessment or stratification, and monitoring patient status while receiving PAC services.

More than 70% of respondents at hospitals indicated that the CJR model influenced their hospital's decision to implement or enhance key activities related to patient care and outcomes including: tracking patient outcomes, developing discharge plans, and tracking patient referrals during the discharge period (Exhibit 54). More than 25% of respondents at hospitals indicated that medication reconciliation, performing multidisciplinary rounds, and coordinating patient's DME were activities being implemented, but were not influenced by the CJR model (Exhibit 54).

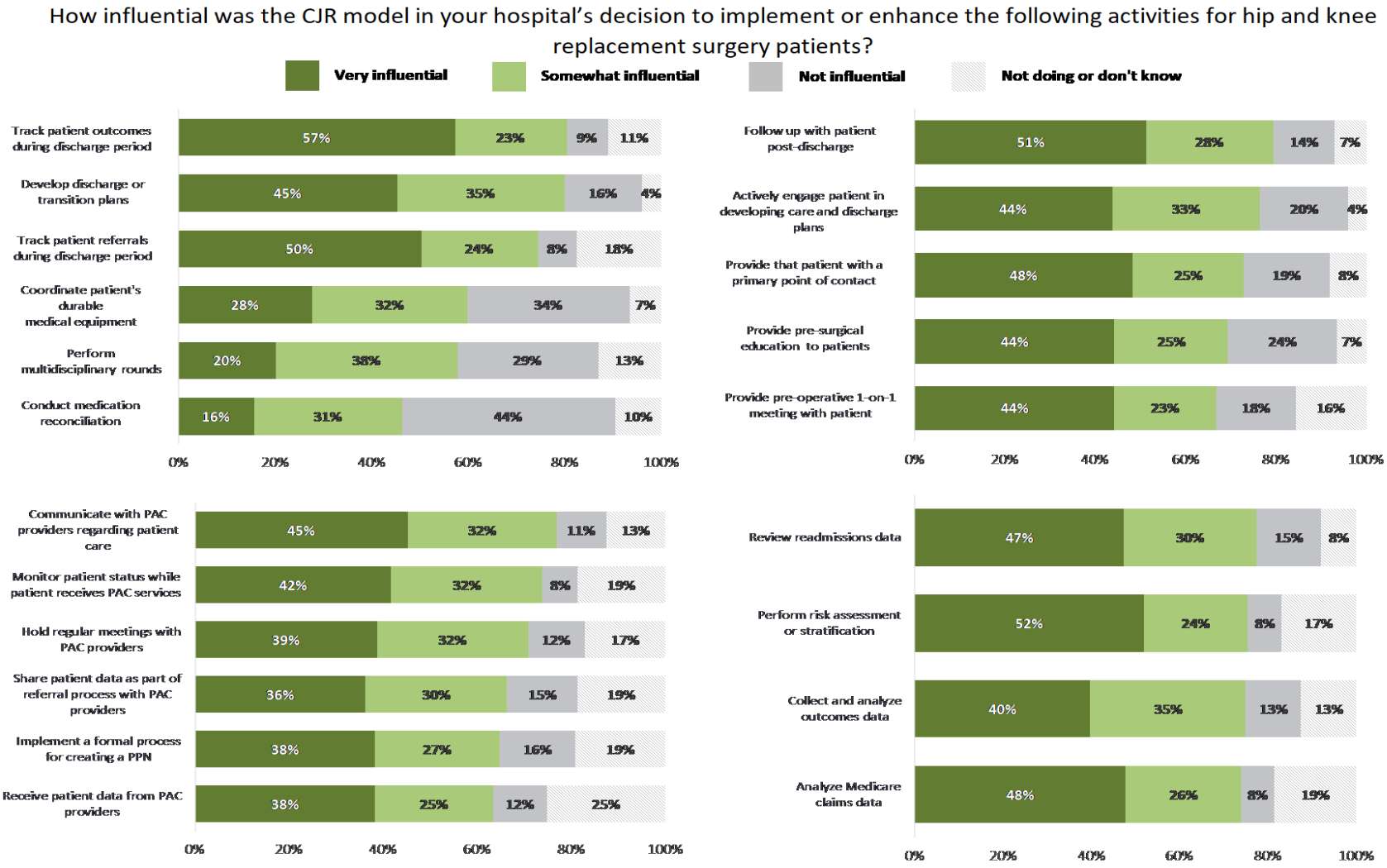
Nearly half of respondents reported the CJR model was very influential in their hospital's decision to implement or enhance patient engagement and follow-up activities including follow-up post discharge, engaging patients in developing care plans, providing patients with a primary point of contact, and providing pre-surgical education and meetings (Exhibit 54).

More than 70% of respondents at hospitals indicated that the CJR model influenced their hospital's decision to implement or enhance communication with PAC providers. The activities most influenced by the CJR model were communicating with PAC providers regarding patient care, monitoring status while patients receive PAC services, and holding regular meetings with PAC providers (Exhibit 54).

More than 70% of respondents at hospitals indicated that the CJR model influenced their hospital's decision to implement or enhance data utilization activities (Exhibit 54). Examples of activities include implementing a surgical optimization clinic to review patient health status to ensure patients were as healthy as possible prior to surgery, conducting "prehab" in a patient's home prior to surgery, providing resources, such as tobacco cessation and behavioral health referrals to improve overall outcomes among the CJR population. In addition to collecting and analyzing outcomes data, some respondents identified activities specific to optimizing patient outcomes.

Return to Table of Contents

Exhibit 54: Over 70% of respondents stated that the CJR model influenced their hospital's decision to implement or enhance patient care and outcomes, patient engagement and follow-up, post-acute care communication, and data utilization.



Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals

Return to Table of Contents

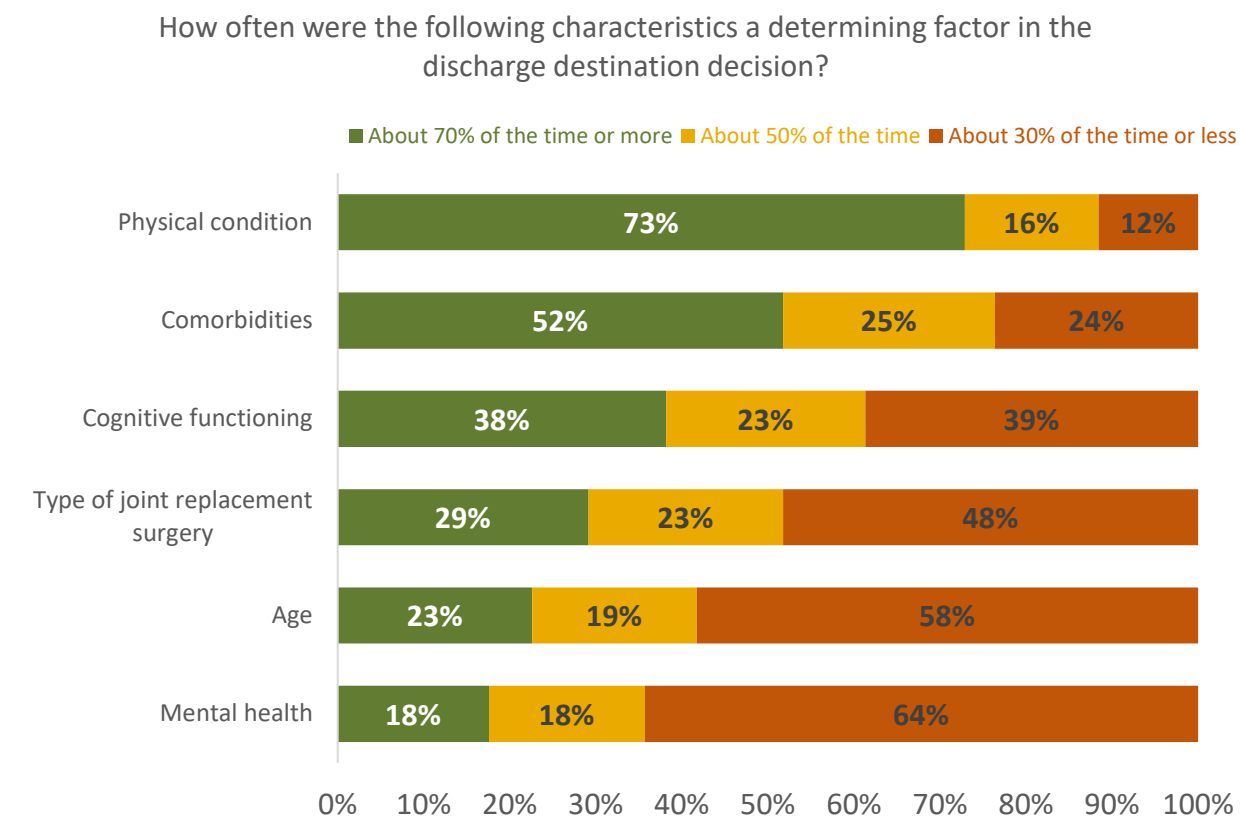
Transitions of Care

Condition-specific factors were more frequently identified as a determining factor for discharge destination than social determinants of health. Over 50% of respondents identified physical conditions and comorbidities as key characteristics for determining a discharge destination to a SNF or IRF (Exhibit 55).

Additional factors identified by respondents for selecting a SNF or IRF beyond what was listed in the survey included functional status and mobility, which may be similar to physical condition but appears to be more focused on a patient's ability to progress with therapy in the hospital. Another factor identified was patient preferences/expectations which focused on patients who may have had past experiences with joint surgery and want to recover in a SNF or patient expectations and unwillingness to go home. Finally, some reported that the surgeon decision or hospital guideline was an important factor.

Overall, characteristics specific to social determinants of health were often not considered when making discharge decisions (Exhibit 56). Of the characteristics assessed, only availability of a caregiver was reported as a key determining factor in discharging to a SNF or IRF.

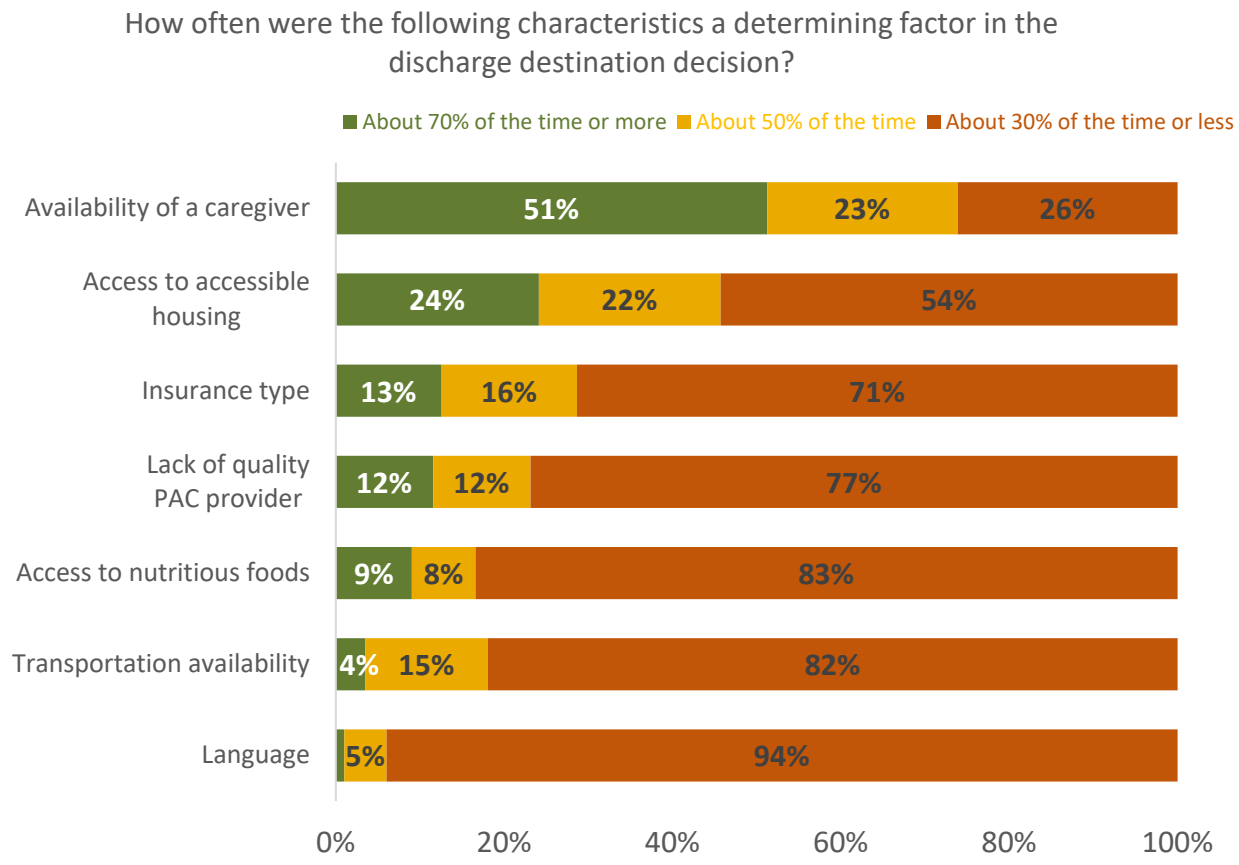
Exhibit 55: Over 50% of respondents identified physical conditions and comorbidities as key characteristics for determining a discharge destination to a skilled nursing facility or inpatient rehabilitation facility.



Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals.

Return to Table of Contents

Exhibit 56: Only availability of a caregiver was reported as a key determining factor by more than 50% of respondents when discharging to a skilled nursing facility or inpatient rehabilitation facility.

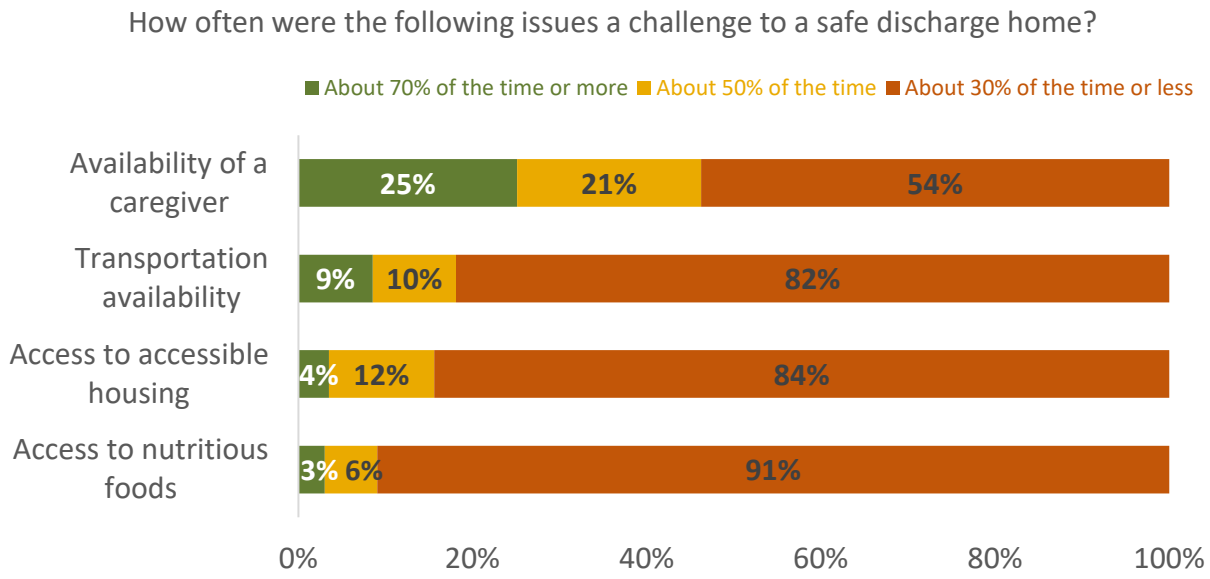


Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals.

Characteristics specific to social determinants of health were often not considered when making decisions regarding discharge to home. Additional factors identified included access to outpatient physical therapy and home health, particularly for those patients in remote areas, living alone or social isolation, and type of housing (e.g., patients who live in small, confined spaces, such as a trailer) (Exhibit 57).

Return to Table of Contents

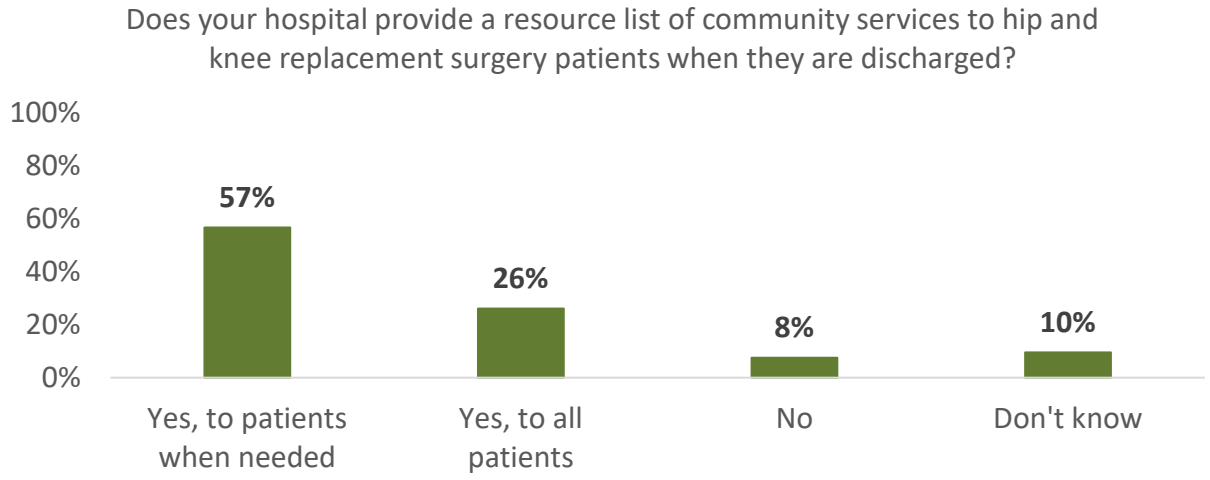
Exhibit 57: Characteristics specific to social determinants of health were often not considered when making decisions regarding discharge to home.



Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals.

Although more than 80% of hospitals provided a list of community services at discharge, the majority of hospitals provided this resource only when a patient need is identified (Exhibit 58). Respondents provided examples of community services provided via their resource list. Examples of frequently identified resources include transportation services, meal programs, private care and adult daycare, behavioral health, housing, and DME equipment rental services.

Exhibit 58: The majority of hospitals provided a resource list only when a patient need is identified



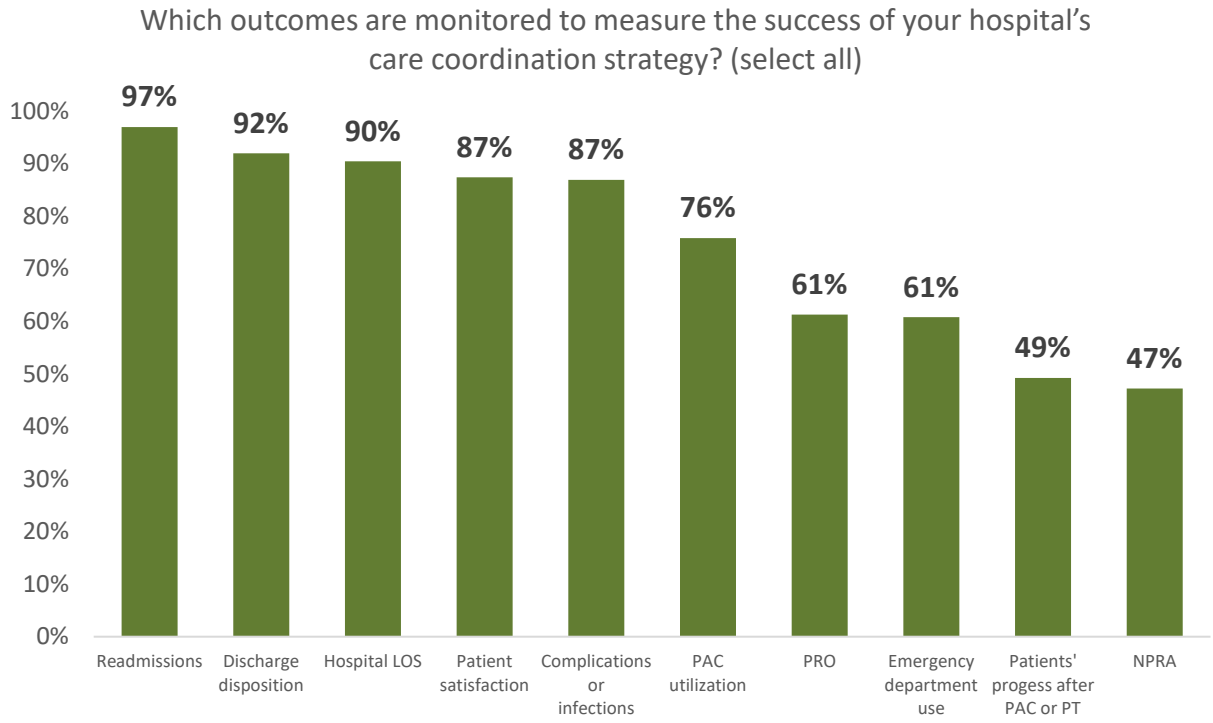
Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals.

Return to Table of Contents

Care Coordination Measures

Survey respondents reported a variety of goals and focused on quantitative data to measure progress, such as hospital readmissions, discharge disposition, and length of stay to measure progress. Approximately 80% of hospitals identified specific goals for their care coordination program. Examples of frequently reported goals included reducing readmission rates, improving or requiring pre-operative joint class participation, increasing home discharges, reducing length of stay, and optimizing patient outcomes. More than 80% of hospitals measure progress by reviewing data related to patient satisfaction, complications, infections, hospital length of stay, discharge disposition, and readmissions (Exhibit 59).

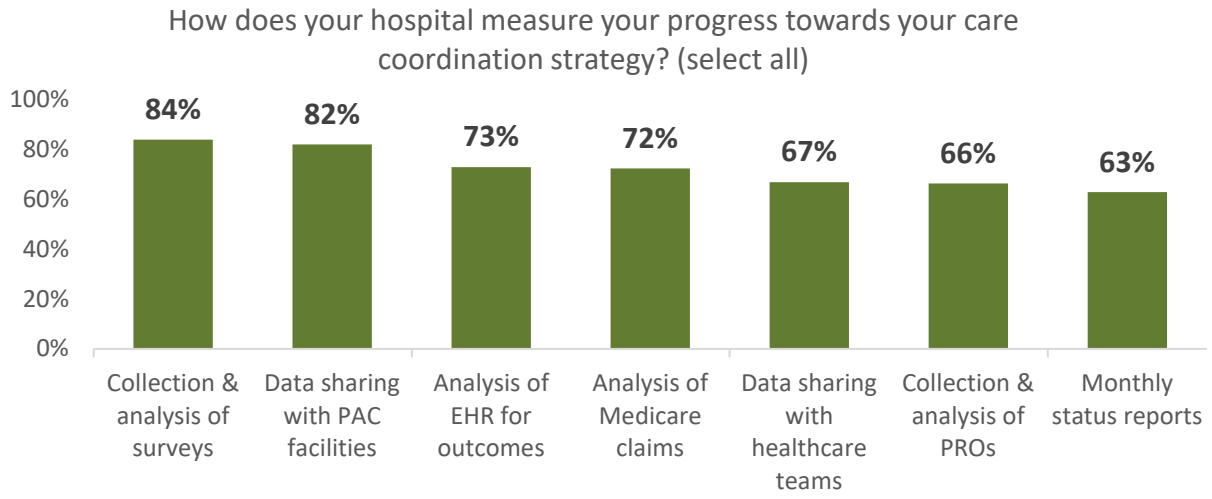
Exhibit 59: More than 80% of hospitals measure progress by reviewing data related to patient satisfaction, complications, infections, hospital length of stay, discharge disposition, and readmissions.



Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals.

Return to Table of Contents

Exhibit 60: A variety of data sources, including electronic health records, medical claims, and patient surveys are used by care coordinators to assess the effects of care coordination.



Source: CJR evaluation team analysis of the care coordination survey data (fielded July 28 through August 30, 2020) to CJR mandatory and opt-in hospitals.

Respondents reported they measured progress toward care coordination using data measures. More than 70% of hospitals measured progress by analyzing data. A variety of data sources, including electronic health records, medical claims, and patient surveys are used by care coordinators to assess the effects of care coordination (Exhibit 60).

d. Conclusion

Care coordination activities are some of the most important strategies used by participant hospitals to respond to the CJR model. In prior rounds of interviews, hospital representatives have described the importance of care coordination in meeting the goals of the CJR model. In this survey of care coordinators, we confirmed previous findings and gained a better understanding of hospitals' efforts to invest in and improve care coordination under the CJR model.

The survey identified key strategies used in care coordination across four domains: investment in care coordination, types of care coordination activities, patient selection and care transition, and impact of the CJR model on key outcomes. Interviewees indicated that care coordination efforts typically required significant resources, and as a result, some hospitals hired additional staff while others distributed responsibilities across existing roles. Interviewees also indicated the most important additions or enhancements to care coordination were developing discharge or transition plans, engaging patients in development of care and discharge plans, following up with patients post-discharge, reviewing readmission data, tracking patient outcomes during the discharge period, communicating with PAC providers regarding patient care, and performing risk assessment or stratification. Care coordinators noted that condition-specific factors were more frequently identified as a determining factor for discharge destination than social determinants of health. Finally, care coordinators reported that nearly 80% of hospitals used a wide variety of care coordination measures to evaluate the effectiveness of their care coordination activities.

Return to Table of Contents

III. Discussion, Considerations, and Future Directions

A. Discussion

The CJR model remains a promising approach for reducing LEJR episode payments and generating savings to Medicare, although changes in the health care landscape affected its performance. The model was designed to encourage hospitals, physicians, and post-acute care providers to work together to improve the quality and coordination of care from the initial hospitalization or outpatient procedure through recovery. In each of the first five performance years, mandatory CJR hospitals reduced average episode payments while maintaining or improving performance on quality measures (although only the PY2 savings estimate was statistically significant.) These results demonstrate that a wide range of hospitals, even hospitals that would not have volunteered for such a model, can and do respond as intended to financial incentives under a mandatory model.

In the first four performance years, mandatory hospitals generated $72 million dollars in savings to Medicare. But in PY5, reconciliation payments substantially increased, due to the COVID-19 PHE policy to remove downside risk. To provide relief to participant hospitals, CMS extended the existing "extreme and uncontrollable circumstances" policy to the COVID-19 PHE. For episodes starting between January 31, 2020 and March 31, 2021, CMS capped episode payments at the quality-adjusted target price for the purposes of calculating reconciliation. This means that no episode could generate repayments; episodes could only generate positive reconciliation payments, thus weakening the financial incentives under the CJR model. This generous relief policy resulted in reconciliation payments being triple what they were in previous years, which reversed the savings trajectory and resulted in statistically significant losses to Medicare for mandatory hospitals. The losses in PY5 were large enough to offset total estimated savings prior to the PHE. After March 2021, CMS implemented a more fiscally conservative PHE relief policy capping only episodes with a COVID diagnosis which likely will reduce reconciliation payments in future performance years.

We saw the effects of the COVID-19 PHE on the model in other ways. At the start of the PHE, CMS paused non-essential elective procedures. Elective LEJR volume dropped, and LEJRs due to hip fracture became the predominate episode. When elective procedures resumed, control hospitals, as well as CJR hospitals, reduced institutional PAC use during the PHE contributing to PY5 having the smallest reductions in average episode payments. We do not know if this trend will persist and continue to reduce impacts from the CJR model.

Medicare coverage of outpatient LEJRs and the COVID-19 PHE amplified the shift of LEJRs to the less expensive outpatient setting. By PY5, the majority of LEJRs were performed in the outpatient setting sharply reducing the volume of episodes in the model. Because the share of outpatient LEJRs in mandatory CJR hospitals remained about 6-7 percentage points below the share in control group hospitals, average episode payments at CJR hospitals were higher than they otherwise would have been, further reducing the impact of the model on average episode payments. Starting in PY6, outpatient episodes are included in the CJR model, and the target price

Return to Table of Contents

is site neutral (i.e., the target price does not vary by outpatient or inpatient setting). These changes to the model design could increase the share of CJR LEJRs in the less costly outpatient setting.

While the COVID-19 PHE policy to remove downside risk changed the trajectory of savings for mandatory hospitals, opt-in hospitals generated Medicare losses in every year. Losses from opt-in hospitals comprise roughly 72% of total losses from the model. Beginning with PY6, opt-in hospitals will no longer be model participants.

For the highest volume and least complex episode group, elective LEJRs without MCC, we saw a decline in patient complexity for mandatory CJR hospitals relative to the control group. Specifically, CJR patients became relatively less likely to be eligible for Medicaid, have prior SNF utilization, or have any prior care. A reduction in complexity could help mandatory CJR hospitals meet payment and quality targets and receive larger reconciliation payments. Lastly, we did not find evidence that mandatory CJR hospitals are shifting care outside of the episode to help contain costs.

We conducted an exhaustive investigation of the impact of the CJR model on fracture patients, and did not discover any concerning impacts, providing tempered optimism that fracture patients can be safely included in the CJR model. Patients with hip fractures (17% of all episodes) were typically more complex than patients undergoing elective LEJR surgery. They may be particularly vulnerable to declines in institutional PAC because their surgeries are not planned, and hospital representatives reported there is less opportunity to prepare patients and to coordinate their care prior to surgery. Mandatory CJR hospitals were able to reduce payments for fracture episodes through reductions in institutional PAC use while maintaining quality during the episode. In the fourth annual report, CJR fracture patients reported worse functional recovery than control patients. Our most recent survey found that CJR fracture patients reported similar levels of functional recovery to control patients, and CJR and control survey respondents also reported similar levels of overall satisfaction with their care. However, CJR respondents reported lower satisfaction with their care management and were less likely to have all the medical equipment they felt they needed at home. We will survey fracture patients again in PY7 to assess these important self-reported measures of beneficiary experience.

We studied the impact of the CJR model on three underserved populations: Black beneficiaries, duals, and Black duals relative to their counterparts in the comparison group. Prior literature has found disparities in LEJR rates for these three underserved populations in Medicare FFS.[48] We also studied the impact of the model on the three underserved populations compared to their reference populations: White beneficiaries, nonduals, and White nonduals, respectively.

[48] Thirukumaran CP, Cai X, Glance LG, Kim Y, Ricciardi BF, Fiscella KA, Li Y. Geographic Variation and Disparities in Total Joint Replacement Use for Medicare Beneficiaries: 2009 to 2017. J Bone Joint Surg Am. 2020 Dec 16;102(24):2120-2128. doi: 10.2106/JBJS.20.00246. PMID: 33079898; PMCID: PMC8190867. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8190867/.

Return to Table of Contents

Reflecting the existing disparities in LEJR rates in the overall Medicare FFS population, we found that these underserved populations were underrepresented in the CJR model. (The eligibility criteria for the CJR model did not affect their representation.) In the baseline, the underserved populations also had higher rates of chronic disease, higher average episode payments, higher use of institutional PAC, and higher rates of ED use and readmissions, compared to their reference populations. The mortality rate was also higher for duals, but lower for Black or African American patients and Black duals, compared to their reference populations.

The CJR model reduced episode payments for the three underserved populations studied and their reference populations, relative to their counterparts in the control group, by reducing the use of institutional PAC and increasing the proportion first discharged to an HHA.

There was a statistically significant reduction in the mortality rate for Black or African American patients, widening the baseline gap that was already favorable to Black or African American patients. A reduction in the mortality rate could indicate that CJR hospitals are avoiding Black or African American patients with certain comorbidities that are known to complicate recovery, such as obesity, hypertension, and diabetes. However, we did not find changes in the incidence of these conditions nor any systematic changes in patient characteristics to indicate that the CJR Black or African American patient population became less complex. There were no changes in the other quality of care measures (i.e., rates of ED use and readmissions). There were also no improvements in baseline disparities in quality of care.

In the baseline, there were large disparities in LEJR rates between the underserved populations and their reference populations: LEJR rates for the underserved populations were between 40% to 60% lower than LEJR rates for their reference populations. Under the CJR model, there were no statistically significant changes in LEJR rates for the underserved populations nor for their reference populations. However, the changes in rates for Black or African American and White patients and the changes in rates for Black or African American duals and White nonduals moved in opposite directions leading to small widenings of already large baseline disparities, a finding consistent with recent academic studies.[49,50]

At the implementation of the CJR model, some were concerned that the model would reduce LEJR rates and lower quality for underserved populations.[51] The evaluation found that these negative unintended consequences did not occur. However, the evaluation also found that the CJR model did not reduce disparities in LEJR rates and quality. These results suggest that to reduce healthcare

[49] Kim H, Meath THA, Quiñones AR, McConnell KJ, Ibrahim SA. Association of Medicare Mandatory Bundled Payment Program With the Receipt of Elective Hip and Knee Replacement in White, Black, and Hispanic Beneficiaries. JAMA Netw Open. 2021;4(3):e211772. doi:10.1001/jamanetworkopen.2021.1772.

[50] Thirukumaran CP, Kim Y, Cai X, et al. Association of the Comprehensive Care for Joint Replacement Model With Disparities in the Use of Total Hip and Total Knee Replacement. JAMA Netw Open. 2021;4(5):e2111858. doi:10.1001/jamanetworkopen.2021.11858.

[51] Ibrahim SA, Kim H, McConnell KJ. The CMS Comprehensive Care Model and Racial Disparity in Joint Replacement. JAMA. 2016 Sep 27;316(12):1258-9. doi: 10.1001/jama.2016.12330. PMID: 27653166; PMCID: PMC5549782.

Return to Table of Contents

disparities, CMS may need to explicitly design models to do so, given that general incentives for increasing value may be sufficient to reduce long standing inequities.

The CJR model extension, beginning with PY6, includes additional episode-level risk adjustment (beneficiary age, HCC count, and dual eligibility status) that could increase LEJR rates for beneficiaries who are likely to require more resources and be costlier to treat. [52] It will be important to evaluate the model's impact on health equity under the new risk adjustment methodology.

In PY5, we surveyed care coordinators from 395 mandatory and opt-in CJR hospitals to understand their hospitals' care coordination efforts in response to the CJR model. Over 70% of care coordinator survey respondents stated that CJR influenced care coordination strategies across the care continuum with the most common activities: developing discharge plans, engaging patients in development of care and discharge plans, and following-up with patients post-discharge.

B. Considerations

We have employed a robust mixed methods approach that assesses the impact of the CJR model through multiple types of analyses. This approach allows results to be triangulated across data sources and methods, with shortcomings or open questions from one analysis addressed by another. Quantitative results from claims and patient surveys combined with information gleaned from the care coordination survey and provider telephone interviews provide a strong evaluation of the CJR model. Consistency across findings lends strength to our conclusions, while inconsistencies raise questions for further inquiry. The CJR model's mandatory, randomized design mitigates some of the most important concerns that hampered the evaluation of previous, voluntary episode-based payment models, including selection bias and poor generalizability.[53]

While the results in this report confirm the promise of a mandatory episode-based payment model, several considerations and caveats are important to note. Our evaluation seeks to isolate the impact of the CJR model, however, interactions between the CJR model and other CMS policies and initiatives make it challenging to do so and require refinements to our methodologic approach. In response to Medicare coverage of outpatient LEJRs, CJR participant hospitals shifted a lower share of TKAs and THAs to the hospital outpatient setting than control group hospitals, and evidence indicates that the lower share is due to the CJR model. To improve our impact estimate of the CJR model while taking into account its interaction with this other CMS policy change, in this report, we employed the propensity score weighting method and included *all* control outpatient TKAs and THAs in the DiD model, weighted by the probability of an outpatient LEJR being inpatient if the hospital had been participating in the CJR model.

[52] Centers for Medicare & Medicaid Services. Medicare Program: Comprehensive Care for Joint Replacement Model Three-Year Extension and Changes to Episode Definition and Pricing; Medicare and Medicaid Programs; Policies and Regulatory Revisions in Response to the COVID–19 Public Health Emergency; Final Rule 2021:1-81.

Return to Table of Contents

While our difference-in-differences design accounts for common shocks experienced by both the CJR and control groups, the temporal and geographic variation in the pandemic led to the possibility that the pandemic may have differently influenced outcomes in CJR and control MSAs. To help isolate the true effects of the CJR model away from any effects of the pandemic, we included a series of COVID-19 risk-adjustment variables in our impact analyses. The risk-adjustment variables were designed to account for both the direct impact of a beneficiary having COVID-19, as well as the indirect impact of the pandemic on the healthcare system. Despite our enhanced risk adjustment methodology, we cannot be certain that our impact estimates exclude all effects from the differential impact of the pandemic on CJR and control MSAs.

CJR and control hospitals participate or have participated in other value-based payment models which could impact their CJR model performance. For example, hospitals in CJR MSAs that participated in the former BPCI initiative were more likely than hospitals in control group MSAs to drop out of the BPCI initiative before its completion and participate in CJR. This unequal contribution of episodes from former BPCI hospitals could contribute to an overestimate of the impact of the CJR model. On the other hand, in the control group, there is a high level of participation in the BPCI Advanced model for LEJR clinical episodes. While we control for BPCIA alignment in the control group, the fact that CJR participant hospitals cannot participate in the BPCI Advanced model could nonetheless contribute to an underestimate.

Other factors may lead to an underestimate of the impact of the CJR model. The qualitative analyses indicate that diffusion of CJR care practices to non-CJR hospitals takes place through health systems, which could contaminate our control group. Using 2018 AHRQ Health Compendium data, we found that 50% of control hospitals are in the same health system as at least one mandatory CJR hospital. Any influence of the CJR model on control group hospitals in the same health system as CJR participant hospitals would likely result in an underestimate of the CJR model.

C. Future Directions

In future reports we will evaluate how hospitals respond to the three-year extension of the CJR model, which includes outpatient LEJRs as episodes. Site neutral target pricing could increase the share of CJR LEJRs in the hospital outpatient setting, which could lower payments and increase savings under the model. Alternatively, as the outpatient share of LEJRs increases for both CJR and control hospitals, it may be harder for CJR hospitals to reduce episode costs (relative to control hospitals) by reducing the use of institutional PAC. We will assess whether payment reductions rebound as the COVID-19 pandemic subsides and decompose payment impacts into those attributable to increases in the outpatient LEJR share and those attributable to decreases in institutional PAC use following an inpatient LEJR. We will continue to study the impact of the model on fracture patients. Future reports will include updated survey results on functional recovery, satisfaction, and quality of care for this population. In the three-year extension of the CJR model, CMS expanded risk adjustment for target prices to include dual status, HCC count, and age in addition to MS-DRG and fracture status, which could increase LEJR rates for

Return to Table of Contents

beneficiaries who are likely to require more resources and be costlier to treat. We will evaluate the impact of the CJR model extension on underserved populations and assess the model's impact on LEJR rates.

Return to Table of Contents