



CMS Comprehensive Care for Joint Replacement Model: Performance Year 2 Evaluation Report – Appendices

Second 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**

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Appendix A: List of Acronyms & Glossary Terms

Exhibit A-1: List of acronyms

Acronym	Meaning
ACH	Acute Care Hospital
ACO	Accountable Care Organization
ACS	American Community Survey
ADLs	Activities of Daily Living
AHA	American Hospital Association
AHRF	Area Health Resource File
AHRQ	Agency for Healthcare Research and Quality
AIC	Akaike Information Criterion
ANOVA	Analysis of Variance
APM	Alternative Payment Model
BIC	Bayesian Information Criterion
BMI	Body Mass Index
BPCI	Bundled Payments for Care Improvement
CAHPS	Consumer Assessment of Health Providers and Systems
CBSA	Core-Based Statistical Area
CEC	Comprehensive ESRD Care Model
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CI	Confidence Interval
CJR	Comprehensive Care for Joint Replacement
CME	Common Medicare Enrollment
CMMI	Centers for Medicare and Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
COO	Chief Operating Officer
CORF	Comprehensive Outpatient Rehabilitation Facility
CRP	Clinical Review Panel
DDD	Difference-in-Difference-in-Differences
DiD	Difference-in-Differences
DME	Durable Medical Equipment
DRG	Diagnosis Related Group
DSH	Disproportionate Share Hospital
ED	Emergency Department
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPM	Episode Payment Model
ESRD	End-Stage Renal Disease
FFS	Fee-for-Service

Acronym	Meaning
FY	Fiscal Year
GDIT	General Dynamics Information Technology
GME	Graduate Medical Education
GPO	Group Purchasing Organization
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Systems
HCC	Hierarchical Condition Category
HH	Home Health
HHA	Home Health Agency
HHI	Herfindahl-Hirschman Index
HIE	Health Information Exchange
ICD	Internal Classification of Diseases
ICS	Internal Cost Savings
IDR	Integrated Data Repository
IME	Indirect Medical Education
IPF	Inpatient Psychiatric Facility
IPPS	Inpatient Prospective Payment System
IRB	Institutional Review Board
IRF	Inpatient Rehabilitation Facility
IRF-PAI	Inpatient Rehabilitation Facility-Patient Assessment Instrument
IT	Information Technology
JAMA	Journal of the American Medical Association
LEJR	Lower Extremity Joint Replacement
LOS	Length of Stay
LTCH	Long-Term Care Hospital
MA	Medicare Advantage
MBSF	Master Beneficiary Summary File
MCBSA	Medicare Core-Based Statistical Area
MCC	Major Complication or Comorbidity
MDM	Master Data Management
MDS	Minimum Data Set
MSA	Metropolitan Statistical Area
MS-DRG	Medicare Severity-Diagnosis Related Group
MSSP	Medicare Shared Savings Program
NP	Nurse Practitioner
NPPGP	Non-Physician Provider Group Practice
NPRA	Net Payment Reconciliation Amount
NQF	National Quality Forum
OASIS	Outcome and Assessment Information Set
OLS	Ordinary Least Squares
OT	Occupational Therapy

Acronym	Meaning
PA	Physician Assistant
PAC	Post-Acute Care
PCP	Primary Care Provider
PDP	Post-Discharge Period
PECOS	Medicare Provider Enrollment, Chain, and Ownership System
PEP	Post-Episode Period
PGP	Physician Group Practice
POC	Point-of-Contact
POS	Provider of Services
PPS	Prospective Payment System
PRO	Patient-Reported Outcomes
PT	Physical Therapy
PTI	Provider Telephone Interview
PY	Performance Year
QI	Quality Improvement
RAPT	Risk Assessment and Prediction Tool
RN	Registered Nurse
SD	Standard Deviation
SNF	Skilled Nursing Facility
SSI	Supplemental Security Income
SSP	Shared Savings Program
TAP	Monthly Medicare Claims File
TGP	Therapy Group Practice
THA	Total Hip Arthroplasty
TI	Telephone Interview
TIN	Tax Identification Number
TKA	Total Knee Arthroplasty
TP	Target Price
UCC	Uncompensated Care
UCP	Uncompensated Care Payment
VBP	Value-Based Payment
VP	Vice President

Exhibit A-2: Glossary of terms

Term	Definition
90-day post-discharge period (PDP)	The 90 days following discharge from the anchor hospitalization.
Acute care hospital (ACH)	A health care facility that provides inpatient medical care and other related services for acute medical conditions or injuries.
Anchor hospitalization	The hospitalization that triggers the start of the episode of care.
Baseline time period	The period of time that precedes the intervention period as a basis for comparison in the difference-in-differences statistical technique. The baseline period includes episodes that were initiated from 2012 to 2014 and that ended between April 1, 2012 and March 31, 2015.
Beneficiary incentive	A programmatic flexibility available to hospitals participating in the CJR model. This allows participating hospitals to offer patients certain incentives not tied to the standard provision of health care, as long as it supports a clinical goal.
Bundle	The services provided during the episode that are linked for payment purposes.
CJR collaborator	Medicare-enrolled providers and suppliers engaged in caring for CJR beneficiaries that enter into sharing agreements with a participant hospital. Collaborators may be a SNF, HHA, LTCH, IRF, physician, non-physician practitioner, provider or supplier of outpatient therapy services, PGP, non-physician provider group practice, ACO, hospital, or critical access hospital.
CJR sharing arrangement	A financial arrangement between a participant hospital and a CJR collaborator for the sole purpose of making gainsharing payments or alignment payments under the CJR model.
Effective discount percentage	The effective discount percentage serves as Medicare’s portion of the savings. A 3% effective discount percentage is used to set the prospective quality-adjusted target price. The effective discount percentage used at reconciliation varies based on the hospital’s quality performance in the year and whether the hospital’s average episode payment falls above or below its quality-adjusted target price. For hospitals receiving reconciliation payments, the effective discount percentages are: 1.5% for “excellent” quality, 2% for “good” quality, and 3% for “acceptable” quality. (Hospitals with “below acceptable” quality are ineligible to receive reconciliation payments.) For hospitals with repayment responsibility in PY2/3, the effective discount percentages are: 0.5% for “excellent” quality, 1% for “good” quality, and 2% for “acceptable” or “below acceptable” quality. These effective discount percentages for hospitals with repayment responsibility will increase in PY4/5 (1.5% for “excellent” quality, 2% for “good” quality, and 3% for “acceptable” and “below acceptable” quality).
Episode benchmark price	The episode benchmark price represents the expected episode payments if treatment patterns and patient mix did not change from historical spending for LEJR episodes. In the first three years of the model, the episode benchmark price is based on a blend of hospital-specific and regional historical LEJR payments. In PY4/5, the episode benchmark price is based solely on regional amounts. The product of the episode benchmark price and the effective discount percentage equals the quality-adjusted target price.
Episode of care	For the CJR model, an episode of care is triggered by an inpatient hospitalization for an LEJR procedure in which a beneficiary is discharged under MS-DRG 469 (major joint replacement or reattachment of lower extremity with MCC) or 470 (major joint replacement or reattachment of lower extremity without MCC) and ends 90 days after discharge from the anchor hospitalization.
Gainsharing payment	A payment from a participant hospital to a CJR collaborator made pursuant to a CJR sharing arrangement. A gainsharing payment may be composed of reconciliation payments, internal cost savings, or both.

Term	Definition
Internal cost savings (ICS)	The measurable, actual, and verifiable cost savings realized by the CJR-participating hospital resulting from care redesign undertaken by the hospital in connection with providing items and services to CJR model beneficiaries. Internal cost savings does not include savings realized by any individual or entity that is not a CJR participant hospital.
Metropolitan Statistical Area (MSA)	Counties associated with a core urban area that has a population of at least 50,000.
Net Payment Reconciliation Amount (NPRA)	The aggregate quality-adjusted target price minus the total dollar amount of Medicare fee-for-service payments for items and services included in the bundle, adjusted by stop gain or stop loss limits, if applicable.
Post-acute care (PAC)	Rehabilitation and palliative care services received by the beneficiary from SNFs, IRFs, HHAs, or LTCHs following a hospitalization.
Post-episode care	Under the CJR model, care that occurs after the 90-day post-discharge period.
Post-discharge home visit waiver	A waiver available to hospitals participating in the CJR model. Under this waiver, CMS waives the direct supervision requirement for home visits so that CJR beneficiaries may receive a limited number of home visits (up to nine per episode) by licensed clinical staff paid under the Medicare Physician Fee Schedule.
Post-discharge period (PDP)	Period of time starting on the day of the anchor hospitalization discharge. For the CJR model, the post-discharge period covers the 90 days after discharge.
Quality-adjusted target price	The quality-adjusted target price is based on three years of historical data and is a blend of the hospital historical episode payments and the regional average historical payments in the first three years of the CJR model. By PY4/5, the target price is based completely on the regional historical episode payment. The three years of historical data is rolling across performance years (2012-2014 for years 1 and 2, 2014-2016 for years 3 and 4, 2016-2018 for year 5). The quality adjustment at the beginning of the performance year assumes that the hospital’s composite quality score falls in the “acceptable” range. The quality adjustment reflects the hospital’s actual composite quality score at reconciliation. There are separate quality-adjusted target prices to account for MS-DRG and hip fracture status.
Reconciliation payment	A retrospective payment that Medicare makes to a CJR participant hospital if total fee-for-service payments for its episodes during a performance year are less than the aggregate quality-adjusted target price. If total fee-for-service payments for a CJR participant hospital’s episodes are more than its aggregate quality-adjusted target price, the hospital repays the difference to Medicare in PY 2-5.
Related items and services	Episode-related items and services paid under Medicare Part A or Part B, after exclusions are applied, that are included in the bundle. These include physicians’ services; inpatient hospital services (including readmissions with certain exceptions discussed in the Final Rule); inpatient psychiatric facility (IPF) services; LTCH services; IRF services; SNF services; HHA services; hospital outpatient services; outpatient therapy services; clinical laboratory services; DME; Part B drugs; and hospice.
Risk adjustment	A statistical process to adjust claims-based outcomes and ADL measures to take into account differences at the patient, episode, hospital, state, and MSA level that are related to the measures of interest. Without adequate risk adjustment, providers treating a sicker or more service-intensive patient mix would have worse outcomes than otherwise comparable providers serving healthier patients.
Telehealth waiver	A waiver available to hospitals participating in the CJR model. Under this waiver, CMS allows Medicare coverage of telehealth services furnished to eligible beneficiaries regardless of their geographic region. Further, the originating site requirement is waived for eligible beneficiaries receiving telehealth services from their homes or places of residence.
Three-day hospital stay waiver	A waiver available to hospitals participating in the CJR model. Under this waiver, CMS waives the three-day hospital stay requirement for Part A skilled nursing facility coverage.

Appendix B: CJR Programmatic Flexibilities, Including Financial Arrangements, Beneficiary Incentives, and Program Rule Waivers

The CJR model allows hospitals to use payment policy waivers or fraud and abuse waivers to facilitate the implementation of care redesign interventions. Participating hospitals may or may not elect to use these waivers. Under the CJR model, hospitals may enter into financial arrangements with CJR collaborators, collaboration agents, downstream collaboration agents or provide incentives to CJR beneficiaries. Additionally, CMS waives certain program rules for beneficiaries in CJR episodes, such as: the direct supervision requirement for post-discharge home visits, specific requirements for furnishing telehealth services, and the three-day hospital stay requirement for coverage of skilled nursing facility (SNF) care. These waivers allow CJR beneficiaries to receive services under circumstances that would not otherwise be covered by Medicare.

The waivers allowed under the CJR model include:

- **Financial Arrangements** – Under the CJR model, hospitals may enter into sharing arrangements with certain collaborating providers and suppliers that are engaged in care redesign with the hospital and that furnish services to the beneficiary during an episode. Under such a sharing arrangement, hospitals may pass on a portion of their reconciliation payment, internal cost savings, or both (i.e., a gainsharing payment) to collaborating providers and suppliers. Sharing arrangements may also permit payments from a CJR collaborator to a participant hospital (i.e., an alignment payment) when the participating hospital has to repay CMS. Collaborators may be a SNF, home health agency (HHA), long-term care hospital (LTCH), inpatient rehabilitation facility (IRF), comprehensive outpatient rehabilitation facility (CORF), therapist in private practice, physician, non-physician practitioner, provider or supplier of outpatient therapy services, physician group practice (PGP), non-physician provider group practice (NPPGP), therapy group practice (TGP), accountable care organization (ACO), hospital, or critical access hospital. Under the CJR model, gainsharing payments must be made according to a pre-specified methodology.

To be eligible to receive a gainsharing payment, collaborators must meet quality criteria for the performance year for which the participant hospital accrued the internal cost savings or earned the reconciliation payment that comprises the gainsharing payment. The quality of care criteria must be established by the participant hospital and directly related to the CJR episode. A CJR collaborator other than an ACO, PGP, NPPGP, or TGP must have directly furnished a billable item or service to a CJR beneficiary during a CJR episode that occurred in the same performance year for which the participant hospital accrued the internal cost savings or earned the reconciliation payment that comprises the gainsharing payment or was assessed a repayment amount. A CJR collaborator that is a PGP, NPPGP, or TGP must have billed for an item or service that was rendered by one or more PGP member, NPPGP member, or TGP member respectively to a CJR beneficiary during a CJR episode that occurred during the same performance year for which the

participant hospital accrued the internal cost savings or earned the reconciliation payment that comprises the gainsharing payment or was assessed a repayment amount and must have contributed to CJR activities and been clinically involved in the care of CJR beneficiaries during the same performance year for which the CJR participant hospital accrued the internal cost savings or earned the reconciliation payment that comprises the gainsharing payment or was assessed a repayment amount. A CJR collaborator that is an ACO must have had an ACO provider/supplier that directly furnished, or an ACO participant that billed for, an item or service that was rendered to a CJR beneficiary during a CJR episode that occurred during the same performance year for which the participant hospital accrued the internal cost savings or earned the reconciliation payment that comprises the gainsharing payment or was assessed a repayment amount and the ACO must have contributed to CJR activities and been clinically involved in the care of CJR beneficiaries during the same performance year for which the participant hospital accrued the internal cost savings or earned the reconciliation payment that comprises the gainsharing payment or was assessed the repayment amount. In the event that a hospital is due to make a repayment to CMS under the CJR model, the total amount of alignment payments received by the hospital from a CJR collaborator that is an ACO may not be greater than 50% of the amount the hospital owes CMS. With respect to a CJR collaborator other than an ACO, the total amount of alignment payments received by the hospital may not be greater than 25% percent of the amount the hospital owes CMS. CMS also requires that gainsharing agreements cannot incentivize CJR collaborators to reduce service or provide substandard care to Medicare beneficiaries.

- **Beneficiary Incentives** – Participating hospitals may provide certain in-kind items or services to CJR beneficiaries during an episode of care. The item or service must be reasonably connected to a beneficiary’s medical care and either be preventive or advance a clinical goal. Incentives may include items of technology that allow a beneficiary to receive telehealth visits.
- **Post-Discharge Home Visit Waiver** – The direct supervision requirement for home visits can be waived so that CJR beneficiaries may receive a limited number of home visits (up to nine post-discharge home visits per episode) by licensed clinical staff paid under the Medicare Physician Fee Schedule.
- **Telehealth Waiver** – Under the CJR model, geographic and originating site requirements that typically apply for Medicare coverage of telehealth services may be waived as long as services are furnished according to other coverage and payment criteria. Medicare coverage criteria typically require telehealth services be furnished to individuals in certain geographic areas, including rural, medically underserved areas. For the CJR model, CMS waived this provision, allowing Medicare coverage of telehealth services furnished to eligible beneficiaries regardless of their geographic region. Medicare coverage criteria also specify that Medicare may only cover telehealth services that are received in certain clinical settings. For the CJR model, the originating site requirement is waived for eligible beneficiaries receiving telehealth services from their homes or places of residence.

- **Waiver of Hospital 3-Day Rule** – Under traditional Medicare fee-for-service (FFS) rules, beneficiaries are not eligible for Medicare-covered SNF care unless they have a prior inpatient hospital stay of at least three consecutive days within 30 days of SNF admission. Under the CJR three-day hospital stay waiver, the SNF-qualifying hospital admission can be shorter than three days, as deemed appropriate by the treating clinicians. This waiver became available in year 2 of the CJR model, which is when hospitals started bearing repayment responsibility. A provision of this waiver is that CJR beneficiaries may only be discharged to a SNF that is qualified at the time of the beneficiary’s admission. A qualified SNF is one that received three or more stars on CMS’ Five-Star Quality Rating System¹ for at least seven out of the past twelve months. CMS maintains a list of qualified SNFs based on these criteria on its web site, which is updated quarterly.

¹ www.medicare.gov/NursingHomeCompare/

Appendix C: CJR Participant Hospitals Compared with All Other IPPS Hospitals

Exhibit C-1a & C-1b: Characteristics of CJR participant hospitals compared with all other IPPS hospitals, baseline (2012 – 2014)

Characteristic		CJR participant hospitals (N=733)		All other IPPS hospitals (N=2,174)		p-value ^a
		N	%	N	%	
Ownership	Non-Profit	454	61.9	1386	63.8	p=0.67
	For-Profit	161	21.9	452	20.8	
	Government	118	16.1	336	15.5	
Census region	Northeast	151	20.6	325	15.0	p<0.01
	South	232	31.6	874	40.2	
	Midwest	150	20.5	558	25.6	
	West	200	27.3	417	19.2	
Urban/rural	Urban	733	100.0	2036	93.7	p<0.01
Teaching hospital	Yes	304	41.5	733	33.7	p<0.01
Part of chain	Yes	566	78.1	1465	77.3	p=0.68
Prior Bundled Payments for Care Improvement participation	Ever participated in Bundled Payments for Care Improvement (LEJR or non-LEJR)	75	10.2	385	17.7	p<0.01
Safety-net	Safety-net hospital	296	40.4	634	29.2	p<0.01

Characteristic		CJR participant hospitals (N=733)		All other IPPS hospitals (N=2,174)		p-value ^a
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
LEJR episodes ^b	Number of LEJR episodes	396.2 (513.7)	373.3 (421.5)			p=0.28
	Standardized Total Episode Allowed Payment (\$), inpatient stay plus 90 day post-discharge period	\$30,546 (\$7,611)	\$28,700 (\$6,347)			p<0.01
	First PAC SNF	45.8% (22.8%)	43.0% (22.1%)			p<0.01
	First PAC IRF	11.4% (14.9%)	11.1% (16.0%)			p=0.68
	First PAC home with HH	29.7% (20.3%)	29.6% (19.4%)			p=0.84
	First PAC home without HH	13.0% (17.1%)	16.3% (18.7%)			p<0.01
Bed count		252.8 (207.6)	195.8 (180.9)			p<0.01
Medicare days percent		33.6% (13.0%)	38.8% (12.3%)			p<0.01

Characteristic	CJR participant hospitals (N=733)	All other IPPS hospitals (N=2,174)	p-value ^a
	Mean (SD)	Mean (SD)	
Medical residents per 1,000 beds	101.6 (204.7)	59.3 (153.1)	p<0.01
Disproportionate share percent	31.0% (22.0%)	27.3% (14.6%)	p<0.01

Source: Lewin analysis of December 2016 POS, December 2014 PECOS, FY 2016 CMS Annual IPPS, 2014 AHA Hospital Survey, and Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015.

Notes: CJR participant hospitals are defined as all hospitals located in CJR participating MSAs as of December 2017, except hospitals that are currently participating in a Bundled Payments for Care Improvement LEJR episode model. All other IPPS hospitals include all other acute care hospitals paid under the IPPS, including hospitals in the United States and Puerto Rico and hospitals in CJR MSAs that are exempt from CJR (i.e., Bundled Payments for Care Improvement participants). Hospitals in Maryland are excluded from the table as they are not paid under the IPPS.

HH = home health, IPPS = inpatient prospective payment system, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, PAC = post-acute care, SD = standard deviation, SNF = skilled nursing facility.

^a Differences between CJR participant and all other IPPS hospitals tested using chi-square statistics for categorical variables and t-tests for continuous variables. The null hypothesis for these tests is no difference between the two groups in means for t-tests and distributions for categorical variables. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

^b The baseline outcomes are not risk adjusted.

Appendix D: Definitions of Hospital and Patient Characteristics

Exhibit D-1: Hospital characteristic variable definitions

Variable	Definition	Source
Bed count	Number of beds	FY 2016 CMS Annual IPPS Final Rule data (based on FY 2012-2013 cost report data)
Below PY1 quality-adjusted target price	Whether the hospital started the CJR model with historical episode payments below the PY1 quality-adjusted target price	PY1 CMS payment contractor hospital quality-adjusted target price data
Census region	Location of hospital among four Census Regions	December 2016 CMS POS file
DSH patient percentage	The sum of the percentage of Medicare inpatient days attributable to patients eligible for both Medicare Part A and Supplemental Security Income (SSI), and the percentage of total inpatient days attributable to patients eligible for Medicaid but not Medicare Part A	FY 2016 CMS Annual IPPS Final Rule data (based on FY 2012-2013 cost report and Social Security Administration data)
First PAC home with HH	Percent of LEJR episodes at the hospital first discharged home with HH within 14 days of discharge	January 2012 - December 2014 Medicare Claims
First PAC home without HH	Percent of LEJR episodes at the hospital not discharged to a SNF or IRF within 5 days of discharge and not discharged home with HH within 14 days of discharge	January 2012 - December 2014 Medicare Claims
First PAC IRF	Percent of LEJR episodes at the hospital first discharged to a IRF within 5 days of discharge	January 2012 - December 2014 Medicare Claims
First PAC SNF	Percent of LEJR episodes at the hospital first discharged to a SNF within 5 days of discharge	January 2012 - December 2014 Medicare Claims
Health system membership	Whether the hospital is a member of a health system	2015 AHA Hospital Survey
High-payment MSA	Whether the hospital is located in a historically high-payment MSA based on the CMS MSA sampling strata for CJR model participation (MSA sampling strata 3, 4, 7, and 8)	CMS MSA-level population and episode payment data used to select the 67 MSAs in the 2015 final rule (available at: https://innovation.cms.gov/Files/worksheets/ccjr-populationpayment.xlsx)
LEJR discharges as a percent of hospital's total discharges	Percent of the hospital's total discharges that were LEJR discharges	January 2012 - December 2014 Medicare Claims
LEJR episodes	Total number of LEJR episodes initiated at the hospital meeting CJR eligibility criteria	January 2012 - December 2014 Medicare Claims PY1 and PY2 CMS payment contractor data
LEJR share in the market	Percent of LEJR in a given MSA that were performed at the hospital	January 2012 - December 2014 Medicare Claims
Medical residents per 1,000 beds	Number of medical residents assigned per 1,000 beds	FY 2016 CMS Annual IPPS Final Rule data (based on FY2012-2013 cost report)

Variable	Definition	Source
Medicare days percent	Medicare days as a percent of total inpatient days	FY 2016 CMS Annual IPPS Final Rule data (based on FY2012-2013 cost report)
Medicare discharges	Total number of Medicare discharges (LEJR and non-LEJR) at the hospital	January 2012 - December 2014 Medicare Claims
Ownership	Ownership type (i.e., for-profit, not-for-profit, government)	December 2016 CMS POS file
Ownership of PAC provider	Whether the hospital or its health system owns an HH, SNF or IRF	2015 AHA Hospital Survey
Part of a chain	Whether the hospital is part of a chain of providers	December 2014 CMS PECOS
Prior Bundled Payments for Care Improvement experience	Whether the hospital ever participated in the Bundled Payments for Care Improvement initiative (LEJR or non-LEJR)	2016 CMS Bundled Payments for Care Improvement Salesforce database
Quality composite score	The CJR model quality composite score ranges from 0 (worst) to 20 (best) and is comprised of: THA/TKA complications rate (weighted 50%); HCAHPS linear mean roll-up measure (weighted 40%); and submission of CJR model PRO data (weighted 10%)	PY1 and PY2 CJR quality performance data
Safety-net hospital	Whether the hospital is in the upper quartiles of DSH patient percentage or UCC per claim, based on national distributions of these variables ¹	FY 2016 CMS Annual IPPS Final Rule data (based on FY2012-2013 cost report for DSH percent and FY2012-2014 for UCC per claim)
Teaching hospital	Whether the hospital has any affiliation with a medical school	December 2016 CMS POS file
Total episode payment	Hospital average standardized total episode allowed payment, anchor hospitalization plus 90 day post-discharge period	January 2012 - December 2014 Medicare Standardized Payments
Urban	Hospital is located in an urban area, as defined by a MSA	December 2016 CMS POS file

Notes: AHA = American Hospital Association, CMS = Centers for Medicare & Medicaid Services, DSH = disproportionate share hospital, FY = fiscal year, HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems, HH = home health, IPPS = inpatient prospective payment system, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, MSA = metropolitan statistical area, PAC = post-acute care, PECOS = Provider Enrollment, Chain, and Ownership System, POS = Provider of Services, PRO = patient-reported outcomes, PY = performance year, SNF = skilled nursing facility, SSI = Supplemental Security Income, THA = total hip arthroplasty, TKA = total knee arthroplasty, UCC = uncompensated care.

¹ Safety-net definition taken from: Norton EC, Kim J, Das A, Chen LM. Moneyball in Medicare. *NBER Working Paper* No. 22371. Cambridge, MA: NBER.

Exhibit D-2: Patient characteristic variable definitions

Variable	Definition	Source
Age	Percent of patients by age category; 20 to 64, 65 to 79, 80 and above	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Enrollment Database
Diabetes	Percent of patients with diabetes	July 2010 – December 2012 (baseline) and April 2014 – December 2017 (intervention) Medicare Claims
Disability, not due to ESRD	Percent disabled, based on Medicare eligibility status (not including ESRD)	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Enrollment Database
Eligible for Medicaid	Percent eligible for Medicaid based on Medicare enrollment file	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Enrollment Database
Fracture status	Percent of patients with hip fractures at the anchor hospitalization based on ICD codes provided by CMMI on the CJR model website (https://innovation.cms.gov/Files/worksheets/cjr-icd10hipfracturecodes.xlsx)	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Claims
Sex	Percent of female patients	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Enrollment Database
HCC score	Average CMS-HCC score that corresponds to the HCCs present during the one year prior to the anchor hospitalization. HCC scores of less than 1.0 indicate the patient is healthier than the average Medicare beneficiary, while scores greater than 1.0 indicate a patient is unhealthier than the average Medicare beneficiary	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Claims
MS-DRG 469	Percent of patients discharged under MS-DRG 469 (major joint replacement or reattachment of lower extremity with major complications or comorbidities) for the anchor hospitalization	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Claims
No prior institutional utilization	Percent of patients with no institutional use (inpatient, SNF, IRF or LTCH) during the six months prior to the anchor hospitalization	July 2011 - December 2014 (baseline) and October 2015 – December 2017 (intervention) Medicare Claims
Obesity	Percent of patients obese or with a BMI of greater than 30	July 2010 – December 2012 (baseline) and April 2014 – December 2017 (intervention) Medicare Claims

Variable	Definition	Source
Prior HH utilization	Percent of patients with one or more instances of home health use during the six months prior to the anchor hospitalization	July 2011 - December 2014 (baseline) and October 2015 – December 2017 (intervention) Medicare Claims
Prior inpatient acute care hospitalization utilization	Percent of patients with one or more inpatient acute care hospitalizations during the six months prior to the anchor hospitalization	July 2011 - December 2014 (baseline) and October 2015 – December 2017 (intervention) Medicare Claims
Prior IRF utilization	Percent of patients with one or more inpatient rehabilitation facility stays during the six months prior to the anchor hospitalization	July 2011 - December 2014 (baseline) and October 2015 – December 2017 (intervention) Medicare Claims
Prior SNF utilization	Percent of patients with one or more skilled nursing facility stays during the six months prior to the anchor hospitalization	July 2011 - December 2014 (baseline) and October 2015 – December 2017 (intervention) Medicare Claims
Race/ethnicity	Percent of patients by race/ethnicity: White, Black, Hispanic, Other race, Unknown	January 2012 - December 2014 (baseline) and April 2016 – December 2017 (intervention) Medicare Enrollment Database
Smoking	Percent of patients smoking	July 2010 – December 2012 (baseline) and April 2014 – December 2017 (intervention) Medicare Claims

Notes: BMI = body mass index, CMS = Centers for Medicare & Medicaid Services, ESRD = end-stage renal disease, HCC = hierarchical condition category, HH = home health, ICD = International Classification of Diseases, IRF = inpatient rehabilitation facility, LTCH = long term care hospital, MS-DRG = Medicare Severity Diagnosis Related Group, SNF = skilled nursing facility.

Appendix E: Methodology

I. Data Sources

A. Secondary data sources

Secondary data sources were used to:

- 1) Characterize Comprehensive Care for Joint Replacement (CJR) and control group markets (Area Health Resource File, inpatient rehabilitation facility (IRF) Prospective Payment System (PPS) Final Rule, and Census data);
- 2) Identify and characterize CJR participant hospitals and control group hospitals (Provider of Services (POS) file, Acute Inpatient Prospective Payment System (IPPS) data files, and Medicare Provider Enrollment, Chain, and Ownership System);
- 3) Sample CJR participant hospitals for participation in site visits and telephone interviews (CJR programmatic data and American Hospital Association (AHA) Hospital Survey);
- 4) Create lower extremity joint replacement (LEJR) episodes and characterize episodes and beneficiaries (Medicare fee-for-service claims, Medicare fee-for-service beneficiary enrollment data, Master Data Management, and Bundled Payments for Care Improvement Salesforce Database); and
- 5) Generate payment, utilization and quality outcomes (Medicare fee-for-service claims and Medicare standardized payments).

Exhibit E-1 lists the secondary sources, their contents, purpose in this evaluation, and relevant date ranges used for this report.

Exhibit E-1: Secondary data sources

Data source	Date range	Dataset contents	Use
AHA Hospital Survey	2014	Annual survey of acute care hospitals that collects information on hospital organizational structure, system affiliation, facility/service lines, inpatient/outpatient utilization, finances/expenses, physician arrangements, staffing, and corporate/purchasing affiliations.	Used to characterize CJR and control group hospitals. Information on health system membership and PAC ownership was used to inform site visit and telephone interview sampling.
AHRF	2015-2016 (Data is from 2012-2014)	County-level data aggregated to the MSA level. Variables include Medicare Advantage penetration, average Medicare beneficiary HCC score, dual eligible percentage, population per square mile, geography, and supply of health care facilities (SNF beds, LTCH beds) and health care professionals (primary care physicians, orthopedic surgeons, NPs/PAs, specialists).	Used to characterize CJR and control group markets. Orthopedic surgeon supply was used for telephone interview sampling.

Data source	Date range	Dataset contents	Use
Bundled Payments for Care Improvement Salesforce Database	Baseline and intervention	Identifies health care providers (hospitals, PAC providers, physicians, and physician practice groups) that are participating in the Bundled Payments for Care Improvement initiative, the time period of participation, and the models and episodes for which they are participating.	Used to identify LEJR episodes that are assigned to Bundled Payments for Care Improvement participants instead of CJR participant hospitals. Used to identify past Bundled Payments for Care Improvement participants for risk adjustment.
CJR programmatic data	Intervention	List of CJR participant hospitals, as well as their performance years 1 and 2 quality-adjusted target price, reconciliation (NPRA), and hospital quality data.	Used to identify CJR participating hospitals, their start dates in the CJR model, and their reconciliation payments or repayment responsibility (NPRA categories). Used to generate PY1 actual to target payment ratios for site visit and telephone interview sampling. Used as a hospital financial performance metric in the hospital survey analyses. Used total reconciliation payments and repayments to CMS to calculate savings to Medicare.
FY Acute IPPS Final Rule data files	FY 2016 (Data is from FY 2012-2014)	On an annual basis, CMS sets acute care hospital IPPS payment rates. Data files include fiscal year hospital-level information on provider identification number, bed count, medical residents per 1,000 beds, average daily census, DSH patient percentage, UCP per claim, and Medicare days as a percent of total inpatient days.	Used to identify and characterize acute care IPPS hospitals located in CJR and control group markets.
FY IRF PPS Final Rule data files	FY 2016 (Data is from FY 2014)	CMS IRF PPS data are used to set payment rates. Data files identify IRF facilities (by Medicare provider identification number), their geographic location, and annual number of IRF discharges.	Used to identify PPS IRF facilities in CJR and control group markets and produce market level IRF variables (IRF present in MSA; number of IRF discharges per 10,000 population).
MDM	Baseline and Intervention	Provider- and beneficiary- level information on participation in CMS Innovation Center payment demonstration programs. Includes beneficiary ID, program ID, and start and end dates of participation.	Used to identify beneficiaries involved in Pioneer, Next Generation, and Medicare Shared Savings ACO programs and control for their participation in our analyses. Used to apply the ACO exclusion for episodes starting on or after July 1, 2017 (MSSP track 3, CEC with downside risk, and Next Generation).
Medicare FFS beneficiary enrollment data	Q4 2007 to Q4 2017	Enrollment data (from CME and MBSF) provide beneficiary Medicare Part A/B eligibility information.	Enrollment data were used to confirm beneficiary eligibility and provide beneficiary characteristics for analyses (e.g., risk adjustment models, LEJR volume analysis).

Data source	Date range	Dataset contents	Use
Medicare FFS claims	Q4 2007 to Q4 2017	Parts A and B claims data (from TAP files) provide claims for different services received during the anchor hospitalization and post-discharge period (e.g., dates and types of service). A minimum three month claims run out was used for episodes included in this report.	Claims were used to create the CJR episodes, describe service use, and create risk adjustment (e.g., Medicare beneficiary HCC score) and outcome variables (e.g., unplanned readmissions, emergency department visits, and number of days/visits in each PAC setting). Claims data were also used to generate the number of LEJR discharges. Claims data were used to generate LEJR volume, LEJR share, and average HCC score for site visit and telephone interview sampling.
Medicare IRF-PAI data	Baseline and Intervention	The IRF-PAI is a comprehensive assessment instrument administered by nursing staff to all Medicare beneficiaries when they are admitted to an IRF and at discharge (for stays longer than three days). The IRF-PAI collects information on patients’ demographics, comorbidities, living arrangements, skin conditions, and functional, cognitive, respiratory, bladder, bowel, and swallowing status. A minimum six month run out of IRF-PAI data was used for episodes included in this report.	IRF-PAI data were used to measure the percent of patients who were admitted to an IRF within five days of discharge from the anchor hospitalization and improved in functional status (mobility) by the time they were discharged from the IRF. IRF-PAI data were also used to measure the change in case-mix of CJR patients and patients in the control group who were discharged from the hospital to an IRF, between the baseline and the intervention periods.
MDS 3.0 data	Baseline and Intervention	The MDS is a comprehensive assessment instrument administered by nursing staff to all Medicare beneficiaries when they are admitted to a Medicare-certified SNF, at discharge, as well as on days five, 14, 30, 60, 90, and quarterly, thereafter. The MDS collects information on patients’ demographics, history and diagnoses, skin conditions, medications, care management, restraint use, preferences for routine and activities, and functional, sensory, cognitive, neuro/emotional, bladder, bowel, swallowing/nutritional, and pain status. A minimum six month run out of MDS data was used for episodes included in this report.	MDS data were used to measure the percent of patients who were admitted to a SNF within five days of discharge from the anchor hospitalization and improved in functional status (toilet use and transfer, locomotion, and walking in the corridor) by the time they were discharged from the SNF. Patients without self-reported moderate to severe pain was also measured. MDS data were also used to identify patients who were in a SNF or long-term nursing facility during the six months preceding the episode, and to measure the change in case-mix of CJR patients and patients in the control group who were discharged from the hospital to a SNF, between the baseline and the intervention periods.

Data source	Date range	Dataset contents	Use
Medicare OASIS data	Baseline and Intervention	The OASIS is a comprehensive assessment instrument administered by nursing staff to all Medicare beneficiaries at the initiation of home health care, at resumption of care following a hospitalization, and when the patient is discharged from home health care. The OASIS collects information on patients’ demographics, history and diagnoses, living arrangements, skin conditions, medications, care management, therapy needs, use of emergent care, and functional, sensory, cognitive, neuro/emotional, respiratory, cardiac, bladder, bowel, and pain status. A minimum six month run out of OASIS data was used for episodes included in this report.	OASIS data were used to measure the percent of patients who started home health care within 14 days of discharge from the anchor hospitalization and improved in functional status (ambulation/ locomotion, bed transferring, and pain when moving around) by the time they were discharged from home health care. OASIS data were also used to measure the change in case-mix of CJR patients and patients in the control group who were discharged from the hospital to home health care, between the baseline and the intervention periods.
Medicare PECOS	December 2014 (end of baseline period)	Information on Medicare providers (hospitals and PAC providers) including ownership and chain relationships. For this evaluation, a hospital is considered to have “chain ownership” when it bills under the same TIN as another hospital <u>or</u> it has at least one TIN in the PECOS ownership table that is different than the hospital’s TIN.	Used to create an indicator of hospital chain ownership for characterizing CJR and control group hospitals.
Medicare standardized payments	Baseline and Intervention	Medicare standardized payments for 100% of Part A and B claims received via the IDR. Produced by a CMS contractor.	Used to create Medicare standardized and non-standardized paid amounts (Part A and B) and allowed standardized payment amounts, including beneficiary out-of-pocket amounts. Used to calculate impact of the CJR model on episode payments, the savings to Medicare analysis, and change in episode payments.
POS file	December 2016	Information on Medicare-approved facilities, including provider identification number, ownership status, size, medical school affiliation, and staffing.	Used to identify and characterize acute care hospitals actively engaged in Medicare and located in CJR and control group markets.
US Census Bureau’s American Community Survey	2014 5-year estimates	Annual survey from the US Census Bureau that provides sociodemographic (population size, age, sex, race/ ethnicity) and socioeconomic (median household income) population estimates at the MSA level.	Used to characterize CJR and control group markets.

Notes: ACO = accountable care organization, AHA = American Hospital Association, AHRF = Area Health Resource File, CEC = comprehensive ESRD care model, CME = Common Medicare enrollment, DSH = disproportionate share hospital, ESRD = end-stage renal disease, FFS = fee-for-service, FY = fiscal year, HCC = hierarchical condition category, IDR = integrated data repository, IPPS = inpatient prospective payment system, IRF = inpatient rehabilitation facility, IRF-PAI = Inpatient Rehabilitation Facility Patient Assessment Instrument, LEJR = lower extremity joint replacement, LTCH = long-term care hospital, MBSF = Medicare beneficiary summary file, MDM = Master Data Management, MDS = Medicare Minimum Data Set 3.0, MSA = metropolitan statistical area, MSSP = Medicare shared savings programs, NP = nurse practitioner, NPRA = net payment reconciliation amount, OASIS = Outcome and

Assessment Information Set, PA = physician assistant, PAC = post-acute care, PECOS = Provider, Enrollment, Chain, and Ownership System, POS = provider of services, PPS = prospective payment system, PY = performance year, Q=quarter, SNF = skilled nursing facility, TAP = monthly Medicare claims file, TIN = tax identification number, UCP = uncompensated care payment.

B. Primary data sources

We collected and analyzed primary data from site visits and telephone interviews to inform questions that are not readily answered by secondary data. In this appendix we describe the qualitative methods employed during the second performance year. (Please see the Appendix of the first Annual report for detailed methods used in the first performance year.¹) We conducted site visits to eleven hospitals in three randomly selected Metropolitan Statistical Areas (MSAs) and conducted two rounds of telephone interviews with 88 providers. During the site visits we had in-depth discussions with staff from hospitals and health systems, orthopedic surgical practices, home health agencies (HHAs), and skilled nursing facilities (SNFs) about CJR model implementation experiences, characteristics of local markets affecting CJR model response strategies, choices of action under the model (i.e., strategies to lower payments or improve quality), and early successes under the model. The telephone interviews were used to efficiently collect targeted information from CJR participant hospitals, such as perspectives on the early impacts of the CJR model on providers and patients, efforts to achieve internal cost savings, and changes in relationships with orthopedic surgeons and post-acute care (PAC) providers.

1. Site visits

We conducted site visits to providers in three CJR-participating MSAs. In each MSA, we conducted in-person interviews with representatives from one to six hospitals, as well as with orthopedic surgeons and PAC providers that received LEJR patients from the hospitals we visited (Exhibit E-2 lists targeted interviewees). We spent one to two days on site conducting individual interviews that were typically scheduled for one hour each. Site visits were the primary data source for the case studies, which detail individual hospital characteristics, choices of action under the model, and resulting impacts.

¹ <https://innovation.cms.gov/Files/reports/CJR-firstannrptapp.pdf>

Exhibit E-2: Target interviewees for site visits

Organization	Interview session	Sample job titles
Hospital	Executive and financial leadership	CEO, COO, CFO
	Orthopedic service line and care redesign leadership	Orthopedic surgery or surgical service line leader, head of surgery department, head of operating room, VP for QI, nurse in charge of QI or CJR initiatives, care redesign experts, supply chain management
	Patient care - nursing and other direct care staff	RN, pharmacist, occupational therapist, physical therapist, hospitalist (if involved in LEJR patient care)
	Data management	Analyst working with cost and quality information, individual in charge of PRO submission, individual that works with IT or data analysis vendors
	Discharge planning and PAC partnerships	CJR program coordinator, care coordinator/nurse navigator, discharge planner, VP of QI
Orthopedic surgeons and surgical groups	Surgeons	Orthopedic surgeons, physician assistants
Post-acute care providers	Clinical and financial leadership	Administrator, executive director, director of nursing, chief nursing officer
	Physical therapy	Director of rehabilitation, physical therapists

Notes: CEO = chief executive officer, CFO = chief financial officer, COO = chief operating officer, IT = information technology, LEJR = lower extremity joint replacement, PAC = post-acute care, PRO = patient reported outcomes, QI = quality improvement, RN = registered nurse, VP= vice president.

a. Topics

To capture the variability in responses to the CJR model, the list of interview topics was broad and diverse. The primary objective was to capture detailed information about how hospitals and other providers prepared for and responded to the CJR model. In addition, we explored characteristics of local markets that affected CJR model response strategies, factors that could explain variation in key outcomes, and changes in the relationships between hospitals and other providers. We also discussed perceived unintended consequences.

We developed semi-structured interview guides tailored to the expertise of each type of interviewee. Flexibility was encouraged such that if an orthopedic surgeon was also responsible for the “data management” interview topics, for example, questions intended for the data analyst would be asked of the physician. Given the diversity of hospitals, the number of interviews and interviewees varied by hospital.

b. Hospital selection criteria

Site visits sampling occurred at the MSA level. Given the changes to the CJR model that took effect on January 2018, we focused our sampling on the 34 MSAs that remain mandatory. We also excluded MSAs that were represented in site visits from performance year (PY) 1 and, to ensure adequate response rates, excluded MSAs that had fewer than four participating hospitals. We then randomly selected three MSAs to visit in year 2. Our goal was to capture the

perspective of PY1 “high performers” and “low performers” in our year 2 site visits, so within these selected MSAs, CJR participant hospitals were split into primary and backup samples using a “positive deviance” approach. Using reconciliation data, we identified the hospitals with PY1 episode spending furthest above and below their quality-adjusted target price as the priority hospitals. Backup hospitals were only contacted after priority hospitals declined or were deemed non-responders. Of the 11 hospitals visited in year 2, six achieved a positive reconciliation payment in PY1, while five did not.

c. Hospital recruitment

To recruit sampled hospitals for participation, we emailed information to the CJR point-of-contact (POC) for 39 hospitals, inviting them to participate in a brief introductory call with our team. Of the 24 hospitals that responded to our outreach efforts, 14 (58%) participated in an introductory call during which we described the purpose of the visit, the content that would be covered, and provided hospital representative(s) with an opportunity to ask questions. After hospitals agreed to participate, our team worked with the hospital POC to schedule interviews with select hospital staff and identify the appropriate orthopedic surgeons and PAC providers to interview. In cases where multiple hospitals from the same health system were sampled, if one system hospital agreed to participate we did not visit other system hospitals to minimize participant burden. Exhibit E-3 shows that hospital response rates for year 1 and year 2 were similar.

Exhibit E-3: Year 1 and year 2 site visit response rates

	Contacted in year 1 (n=30)	Contacted in year 2 (n=39)	Total (n=69)
Agreed to participate	9 (30%)	11 (28%)	20 (29%)
Declined to participate	13 (43%)	13 (33%)	26 (38%)
Did not respond	7 (23%)	9 (23%)	16 (23%)
System participating (removed)	1 (3%)	5 (13%)	6 (9%)

Exhibit E-4 summarizes year 2 site visit interviews conducted across the three MSAs.

Exhibit E-4: Site visit interviews by MSA, year 2

MSA	Hospitals visited	Hospital interviews	Orthopedic surgeon and surgical practice interviews	Post-acute care provider interviews
1	4	21	6	8
2	1	5	1	4
3	6	36	7	12
Total	11	62	14	24

Note: MSA = metropolitan statistical area.

Exhibit E-5 presents characteristics of CJR participant hospitals that participated in year 2 site visits compared to all CJR participant hospitals.

Exhibit E-5: Characteristics of CJR hospitals that participated in Year 2 site visits versus all CJR hospitals

	Year 2 site visit ^a (n=11)	All CJR ^{b,c} (n=681)
Patient HCC score, PY1 mean	1.2	1.2
Health system membership, % yes	40%	76%
Total Medicare discharges, baseline mean	17,321	11,393
Proportion of Medicare discharges for LEJR, baseline mean	9%	7%
Number of beds, mean	272	258
Teaching facility, % yes	45%	42%
Own a PAC provider, % yes	70%	67%

Source: Lewin analysis of December 2016 POS, FY 2016 CMS Annual IPPS, 2014 AHA Hospital Survey, and Medicare claims and enrollment data for LEJR episodes in the baseline period (2012-2014) and performance year 1 (episodes starting on or after April 2016 and ending by December 2016).

Notes: HCC = hierarchical condition category, LEJR = lower extremity joint replacement, PAC = post-acute care, PY = performance year.

^a One hospital missing data for health system membership and PAC ownership.

^b One hospital has missing data for teaching status, 4 hospitals have missing data on total Medicare discharges and proportion of Medicare discharges for LEJR, and 113 hospitals have missing data for health system membership and PAC ownership.

^c “All CJR” hospitals are defined as CJR participant hospitals with any LEJR episodes in PY1.

2. Telephone interviews

In year 2 we conducted two rounds of telephone interviews with representatives from hospitals selected from the 34 mandatory CJR MSAs. Topics for the 30 minute telephone interviews are listed below in Exhibit E-6.

a. Topics

Exhibit C-6 presents all of the interview topics for telephone interviews conducted in years 1 (rounds 1 & 2) and 2 (rounds 3 & 4). The third round of telephone interviews was about strategies employed by hospitals to achieve internal cost savings (ICS). The fourth round of telephone interviews were about the relationship between CJR participant hospitals and orthopedic surgeons, and how these relationships evolved since the start of the CJR model. Most often, interviews were conducted with managerial staff (e.g., executives, vice presidents, managers, directors), though C-suite staff (e.g., Chief of Orthopedic Surgery, Chief of Nursing) and direct care staff (e.g., nurse navigators, surgeons) sometimes participated. Occasionally, program managers that oversaw programs such as CJR and analysts joined calls.

Exhibit E-6: Telephone interview topics, rounds 1-4

Telephone interview round	Topic	Completed
1	Impact of the CJR model on Medicare beneficiaries, the hospital itself, providers, and local market dynamics	Year 1: Spring 2017
2	Hospitals’ relationships with PAC providers and how those relationships changed since the initiation of the CJR model	Year 1: Summer 2017
3	Hospital internal cost saving (ICS) strategies	Year 2: Fall 2018
4	Hospitals’ relationships with orthopedic surgeons, and how those relationships have evolved since the start of the CJR model	Year 2: Spring 2018

Note: PAC = post-acute care.

b. Hospital selection criteria

For round 3 telephone interviews we used a tiered approach to oversample hospitals that were more likely to take actions in response to the CJR model while also ensuring representation of “average” or “typical” hospitals (i.e., those with values close to the median or mode of the total sample of CJR participant hospitals), similar to hospital selection in year 1. Variables included hospital characteristics that might motivate or shape hospital responses to the CJR model (i.e., hospital-specific episode payment relative to regional episode payment and proportion of LEJR discharges relative to hospital’s total Medicare discharges) and barriers and facilitators to successfully responding to the CJR model (i.e., medical complexity of the patient population as measured by Hierarchical Condition Categories (HCC) score, LEJR volume as a proxy for quality performance). For round 4 we selected all CJR participant hospitals in the 11 MSAs with the largest supply of orthopedic surgeons per 10,000 adults aged 65 and older, and all CJR participant hospitals in the 11 MSAs with the smallest supply of orthopedic surgeons per 10,000 adults aged 65 and older.

To reduce participant burden, hospitals were excluded from the sample if they were also selected for year 2 site visits, participated in the previous round of telephone interviews, or were contacted by the CJR Learning and Diffusion contractor for participation in telephone interviews. Through this process, we identified 164 hospitals for recruitment in round 3 and 136 hospitals for recruitment in round 4.

c. Hospital recruitment

To recruit interview participants, we worked with the CJR POC at each hospital to obtain contact information for individuals who were knowledgeable about hospital ICS strategies (round 3) or relationships with orthopedic surgeons (round 4). We first contacted potential interviewees over email and included key information and related materials (i.e., frequently asked questions document, topics list, and informed consent information).

We encountered some challenges in recruiting participants, including difficulty obtaining current contact information, a low response rate to our initial outreach, and hospital representatives having

limited awareness of or time to participate in evaluation activities. When we were unable to schedule an interview with a priority hospital, an alternative hospital was selected from the sample.

In the third round of telephone interviews, we successfully interviewed 43 (26%) of the 164 contacted hospitals. Twelve hospitals (7%) declined to participate and 109 hospitals (67%) did not respond to our request. In the fourth round of telephone interviews, we successfully interviewed 46 (34%) of the 136 contacted hospitals. Sixteen hospitals (12%) declined to participate and 63 (46%) did not respond to our request. Exhibit E-7 presents participation rates for telephone interviews conducted in years 1 and 2.

Exhibit E-7: Telephone interview participation rates, rounds 1-4

	R1 TI N=95	R2 TI N=90	R3 TI N=164	R4 TI N=136
Declined Participation	5 (5%)	6 (7%)	12 (7%)	16 (12%)
Did Not Respond	56 (59%)	49 (54%)	109 (67%)	63 (46%)
Interviewed	34 (36%)	35 (39%)	43 (26%)	46 (33%)

Notes: Sample size was increased in the second year of the evaluation due to lower than anticipated response rates in the first year.

R1 = round 1, R2 = round 2, R3 = round 3, R4 = round 4, TI = telephone interview.

Exhibit E-8 presents characteristics of CJR participant hospitals that participated in telephone interviews compared to all CJR participant hospitals.

Exhibit E-8: Characteristics of CJR hospitals that participated in telephone interviews versus all CJR hospitals

	R1 TI ^a (n=34)	R2 TI (n=35)	R3 TI (n=43)	R4 TI (n=46)	All CJR ^{b,c} (n=681)
Patient HCC score, PY1 mean	2.4	2.1	1.0	1.22	1.18
Health system membership, % yes	88%	91%	74%	74%	76%
Annual total Medicare discharges, baseline mean	6,396	3,062	5,356	5,567	3,797
Proportion of Medicare discharges for LEJR, baseline mean	8%	19%	11%	6%	7%
Number of beds, mean	389	211	322	332	258
Teaching facility, % yes	50%	29%	50%	48%	42%
Own a PAC provider, % yes	53%	63%	67%	64%	67%

Source: Lewin analysis of December 2016 POS, FY 2016 CMS Annual IPPS, 2014 AHA Hospital Survey, and Medicare claims and enrollment data for LEJR episodes in the baseline period (2012-2014) and performance year 1 (episodes starting on or after 4/1/2016 and ending by 12/31/2016).

Notes: HCC = hierarchical condition category, LEJR = lower extremity joint replacement, PAC = post-acute care, PY = performance year, R1 = round 1, R2 = round 2, R3 = round 3, R4 = round 4, TI = telephone interview.

^a Four hospitals had missing data for PAC ownership.

^b One hospital had missing data for teaching status, 4 hospitals had missing data on total Medicare discharges and proportion of Medicare discharges for LEJR, and 113 hospitals had missing data for health system membership and PAC ownership.

^c “All CJR” hospitals are defined as CJR participant hospitals with any LEJR episodes in PY1.

II. Study Population

This section defines the CJR and control group populations, explains the weights used in the analyses to account for differences in sampling probabilities, and outlines the additional eligibility criteria for hospitals and episodes.

A. Defining the CJR and control group populations

The Centers for Medicare & Medicaid Services (CMS) selected MSAs for CJR participation based on a stratified random sampling methodology in which MSAs were stratified into eight strata based on historical wage-adjusted episode payments and population size. The eight strata excluded MSAs with Bundled Payments for Care Improvement initiative penetration greater than 50% or low LEJR volume. Within each stratum, MSAs were randomly selected to participate in the CJR model (n=67 MSAs). This design allowed for a control group of hospitals in MSAs that were eligible but not selected by CMS to participate in the CJR model (n=104 MSAs). These MSAs represent what would have happened in CJR-type markets if the model was never implemented (i.e., the counterfactual).

Exhibit E-9 shows the count of CJR and control group MSAs by stratum and the proportion of MSAs in each stratum that make up the CJR and control groups. The probability of an MSA being selected to participate in the CJR model varied across the strata, with CMS proportionally under-sampling MSAs in the lower average episode payment strata (stratum 1, 2, 5, and 6) and over-sampling MSAs in higher average episode payment strata (stratum 3, 4, 7, and 8).

Exhibit E-9: CMS’ stratified random sample of CJR MSAs and analytic weights

MSA population	MSA sampling stratum	MSA average episode payment	# MSAs eligible for sampling	CJR sample			Control group sample		
				# CJR MSAs	Proportion of MSAs selected for CJR	CJR weight	# Control group MSAs	Proportion of MSAs in the control group	Control group weight
Less than median population	1	Lowest quartile	25	8	32.0%	1.0	17	68.0%	8/17
	2	2 nd lowest quartile	18	6	33.3%	1.0	12	66.7%	6/12
	3	3 rd lowest quartile	19	8	42.1%	1.0	11	57.9%	8/11
	4	Highest quartile	22	11	50.0%	1.0	11	50.0%	11/11
More than median population	5	Lowest quartile	15	5	33.3%	1.0	10	66.7%	5/10
	6	2 nd lowest quartile	28	10	35.7%	1.0	18	64.3%	10/18
	7	3 rd lowest quartile	22	9	40.9%	1.0	13	59.1%	9/13
	8	Highest quartile	22	10	45.5%	1.0	12	54.5%	10/12
Total			171	67			104		

Source: Lewin analysis of the Medicare Program Comprehensive Care for Joint Replacement Payment Model for Acute Care Hospitals Furnishing Lower Extremity Joint Replacement Services; A Final Rule by the Centers for Medicare & Medicaid Services, 80 FR 73273 (November 24, 2015) (codified at 42 CFR 510).

Note: MSA = metropolitan statistical area.

To account for the differential probability of selection and minimize differences between the CJR and control groups, weights were created and used in the descriptive, risk-adjusted and subgroup analyses. For this report, the control group was weighted to represent the CJR group; CJR MSAs all had a weight of 1, while the control group weights were calculated as the number of CJR MSAs in the stratum divided by the number of control group MSAs in the stratum (Exhibit X). In the first annual report, the results were weighted to represent the entire sample of CJR-eligible MSAs (control group MSAs in addition to CJR MSAs).²

Exhibit E-10 shows the names and core-based statistical area (CBSA) IDs of the CJR treatment and control group MSAs.

² <https://innovation.cms.gov/Files/reports/CJR-firstannrptapp.pdf>

Exhibit E-10: CJR treatment and control group MSAs

Treatment		Control	
CBSA ID	MSA name, state	CBSA ID	MSA name, state
10420	Akron, OH	10180	Abilene, TX
10740	Albuquerque, NM	10580	Albany-Schenectady-Troy, NY
11700	Asheville, NC	10900	Allentown-Bethlehem-Easton, PA-NJ
12020	Athens-Clarke County, GA	11100	Amarillo, TX
12420	Austin-Round Rock, TX	11260	Anchorage, AK
13140	Beaumont-Port Arthur, TX	12060	Atlanta-Sandy Springs-Roswell, GA
13900	Bismarck, ND	12700	Barnstable Town, MA
14500	Boulder, CO	13460	Bend-Redmond, OR
15380	Buffalo-Cheektowaga-Niagara Falls, NY	13820	Birmingham-Hoover, AL
16020	Cape Girardeau, MO-IL	14260	Boise City, ID
16180	Carson City, NV	14460	Boston-Cambridge-Newton, MA-NH
16740	Charlotte-Concord-Gastonia, NC-SC	14540	Bowling Green, KY
17140	Cincinnati, OH-KY-IN	15940	Canton-Massillon, OH
17860	Columbia, MO	15980	Cape Coral-Fort Myers, FL
18580	Corpus Christi, TX	16060	Carbondale-Marion, IL
19500	Decatur, IL	16300	Cedar Rapids, IA
19740	Denver-Aurora-Lakewood, CO	16620	Charleston, WV
20020	Dothan, AL	16700	Charleston-North Charleston, SC
20500	Durham-Chapel Hill, NC	16860	Chattanooga, TN-GA
22420	Flint, MI	16980	Chicago-Naperville-Elgin, IL-IN-WI
22500	Florence, SC	17020	Chico, CA
23540	Gainesville, FL	17780	College Station-Bryan, TX
23580	Gainesville, GA	17900	Columbia, SC
24780	Greenville, NC	17980	Columbus, GA-AL
25420	Harrisburg-Carlisle, PA	18140	Columbus, OH
26300	Hot Springs, AR	19100	Dallas-Fort Worth-Arlington, TX
26900	Indianapolis-Carmel-Anderson, IN	19380	Dayton, OH
28140	Kansas City, MO-KS	19660	Deltona-Daytona Beach-Ormond Beach, FL
28660	Killeen-Temple, TX	19820	Detroit-Warren-Dearborn, MI
30700	Lincoln, NE	20260	Duluth, MN-WI
31080	Los Angeles-Long Beach-Anaheim, CA	20740	Eau Claire, WI
31180	Lubbock, TX	22020	Fargo, ND-MN
31540	Madison, WI	22520	Florence-Muscle Shoals, AL
32820	Memphis, TN-MS-AR	22900	Fort Smith, AR-OK
33100	Miami-Fort Lauderdale-West Palm Beach, FL	23060	Fort Wayne, IN
33340	Milwaukee-Waukesha-West Allis, WI	23420	Fresno, CA
33700	Modesto, CA	24340	Grand Rapids-Wyoming, MI
33740	Monroe, LA	24580	Green Bay, WI

Treatment		Control	
CBSA ID	MSA name, state	CBSA ID	MSA name, state
33860	Montgomery, AL	24860	Greenville-Anderson-Mauldin, SC
34940	Naples-Immokalee-Marco Island, FL	25060	Gulfport-Biloxi-Pascagoula, MS
34980	Nashville-Davidson--Murfreesboro--Franklin, TN	25540	Hartford-West Hartford-East Hartford, CT
35300	New Haven-Milford, CT	25620	Hattiesburg, MS
35380	New Orleans-Metairie, LA	25940	Hilton Head Island-Bluffton-Beaufort, SC
35620	New York-Newark-Jersey City, NY-NJ-PA	26140	Homosassa Springs, FL
35980	Norwich-New London, CT	26420	Houston-The Woodlands-Sugar Land, TX
36260	Ogden-Clearfield, UT	26580	Huntington-Ashland, WV-KY-OH
36420	Oklahoma City, OK	26620	Huntsville, AL
36740	Orlando-Kissimmee-Sanford, FL	26980	Iowa City, IA
37860	Pensacola-Ferry Pass-Brent, FL	27140	Jackson, MS
38300	Pittsburgh, PA	27860	Jonesboro, AR
38940	Port St. Lucie, FL	27900	Joplin, MO
38900	Portland-Vancouver-Hillsboro, OR-WA	29180	Lafayette, LA
39340	Provo-Orem, UT	29200	Lafayette-West Lafayette, IN
39740	Reading, PA	29340	Lake Charles, LA
40980	Saginaw, MI	29420	Lake Havasu City-Kingman, AZ
41860	San Francisco-Oakland-Hayward, CA	29460	Lakeland-Winter Haven, FL
42660	Seattle-Tacoma-Bellevue, WA	29620	Lansing-East Lansing, MI
42680	Sebastian-Vero Beach, FL	30460	Lexington-Fayette, KY
43780	South Bend-Mishawaka, IN-MI	30620	Lima, OH
41180	St. Louis, MO-IL	30780	Little Rock-North Little Rock-Conway, AR
44420	Staunton-Waynesboro, VA	31140	Louisville/Jefferson County, KY-IN
45300	Tampa-St. Petersburg-Clearwater, FL	31420	Macon, GA
45780	Toledo, OH	31700	Manchester-Nashua, NH
45820	Topeka, KS	33460	Minneapolis-St. Paul-Bloomington, MN-WI
46220	Tuscaloosa, AL	34820	Myrtle Beach-Conway-North Myrtle Beach, SC-NC
46340	Tyler, TX	34900	Napa, CA
48620	Wichita, KS	35840	North Port-Sarasota-Bradenton, FL
		36100	Ocala, FL
		36540	Omaha-Council Bluffs, NE-IA
		37900	Peoria, IL
		37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
		38060	Phoenix-Mesa-Scottsdale, AZ
		38860	Portland-South Portland, ME
		39300	Providence-Warwick, RI-MA
		39460	Punta Gorda, FL

Treatment		Control	
CBSA ID	MSA name, state	CBSA ID	MSA name, state
		39580	Raleigh, NC
		40140	Riverside-San Bernardino-Ontario, CA
		40220	Roanoke, VA
		40340	Rochester, MN
		40380	Rochester, NY
		40900	Sacramento--Roseville--Arden-Arcade, CA
		41500	Salinas, CA
		41620	Salt Lake City, UT
		41740	San Diego-Carlsbad, CA
		41940	San Jose-Sunnyvale-Santa Clara, CA
		41980	San Juan-Carolina-Caguas, PR
		42200	Santa Maria-Santa Barbara, CA
		42220	Santa Rosa, CA
		42340	Savannah, GA
		43340	Shreveport-Bossier City, LA
		43620	Sioux Falls, SD
		44060	Spokane-Spokane Valley, WA
		44100	Springfield, IL
		44180	Springfield, MO
		41100	St. George, UT
		46060	Tucson, AZ
		46140	Tulsa, OK
		46520	Urban Honolulu, HI
		47940	Waterloo-Cedar Falls, IA
		48300	Wenatchee, WA
		48900	Wilmington, NC
		49340	Worcester, MA-CT
		49620	York-Hanover, PA
		49660	Youngstown-Warren-Boardman, OH-PA

Sources: <https://innovation.cms.gov/initiatives/CJR>. Information for control group MSAs provided by CMS.

Notes: CBSA = core-based statistical area, MSA = metropolitan statistical area.

B. Additional eligibility criteria for hospitals and episodes

1. Hospital criteria

For inclusion in the analysis, hospitals had to be acute care hospitals (ACH) paid under the IPPS that performed LEJR for Medicare beneficiaries in the baseline or intervention periods. Hospitals were excluded from the control group if they participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR. This exclusion was made for the control group so that the impact of the CJR model could be measured relative to no prior experience in a bundled payment program for LEJR. In contrast, CJR participating hospitals that previously

participated in the Bundled Payments for Care Improvement initiative for LEJR (n=48) were included in the analysis as part of the treatment group in order to study the full set of CJR participating hospitals; we controlled for CJR participant hospitals with prior participation in the Bundled Payments for Care Improvement initiative for LEJR in our regression models.

2. Episode definition

For both the CJR and control group populations, the beginning of an episode is triggered by an admission to a CJR participating or control group hospital (called an anchor hospitalization) with a resulting discharge in Medicare Severity-Diagnosis Related Group (MS-DRG) 469 or 470 (LEJR with major complications or comorbidities and LEJR without major complications or comorbidities, respectively). The end of the episode is 90 days after the anchor hospital discharge.

Medicare beneficiaries who met and maintained the following eligibility throughout the period were included in the analysis:

- enrolled in Medicare Parts A and B,
- Medicare was the primary payer (i.e., not enrolled in any managed care plan or covered under other health plans), and
- not eligible for Medicare based on end-stage renal disease (ESRD).

3. Episode criteria

Episodes were cancelled in the CJR model and excluded from the analysis if:

- the patient no longer met the eligibility criteria described in the preceding paragraph;
- the patient was readmitted to a participating hospital during the episode and discharged under MS-DRG 469 or 470 (in which case the first episode is canceled and a new CJR episode begins);
- the patient died at any time during the episode period; or
- episodes started on or after July 1, 2017 and were prospectively assigned to a Next Generation ACO, a Medicare Shared Savings Program ACO track 3, or a Comprehensive ESRD Care Model ACO with downside risk.³

To estimate the all-cause mortality rate measure, we retained episodes that were canceled due to death of patient, but otherwise met all other eligibility criteria.

We also excluded episodes that lacked certain beneficiary information used to risk-adjust outcomes (age, sex, and six months of Medicare fee-for-service (FFS) enrollment history prior to the LEJR hospital admission). Finally, as specified in the Final Rule, LEJR episodes initiated at

³ This additional exclusion criterion was added with the January 2017 Final Rule, Advancing Care Coordination Through Episode Payment Models (EPMs); Cardiac Rehabilitation Incentive Payment Model; and Changes to the Comprehensive Care for Joint Replacement Model (CJR). Available at: <https://www.federalregister.gov/documents/2017/01/03/2016-30746/medicare-program-advancing-care-coordination-through-episode-payment-models-epms-cardiac>

CJR or control group hospitals but attributed to the Bundled Payments for Care Improvement initiative were excluded from the evaluation.⁴

⁴ Episodes initiated at CJR participant hospitals could be attributed to a physician group practice (PGP) participating in the Bundled Payments for Care Improvement initiative or to skilled nursing facilities, inpatient rehabilitation facilities, long-term care hospitals or home health agencies participating in the Bundled Payments for Care Improvement initiative Model 3.

III. Impact of the CJR Model on Claims and Assessment-based Outcomes

A. Measures of impact on payments, utilization, and quality

In this section we present the episode-level outcome measures that were constructed to assess the impact of the CJR model on Medicare payments, utilization, and quality during the first CJR performance year. Exhibit E-11 and E-12 list each claims-based and assessment-based measure respectively.

Exhibit E-11: Payment, utilization, and quality measures

Measure category	Measure name/description ^f
Medicare payments ^a	Total Medicare standardized allowed amounts included in the episode, inpatient anchor hospitalization through the 90-day PDP
	Medicare standardized allowed amounts per episode, by service, 90-day PDP ^b
	Medicare standardized allowed amounts, 30-Day PEP ^c
Utilization	First post-acute discharge was to IRF
	First post-acute discharge was to SNF
	First post-acute discharge was to HHA
	First post-acute discharge was home without HHA
	Number of IRF days, 90-day PDP ^d
	Number of SNF days, 90-day PDP ^d
	Number of HHA visits, 90-day PDP ^d
	Number of HHA PT/OT visits, 90-day PDP ^d
	Number of PT/OT visits ^d
	Pre-surgical outpatient PT/OT visits in the 30 days prior to the inpatient anchor hospitalization
Acute inpatient care (anchor hospitalization) length of stay (in days)	
Quality	Unplanned readmission, 90-day PDP
	Emergency department visit, 90-day PDP
	All-cause mortality, inpatient stay and 90-day PDP ^e
	Incidence of any complications, 90-day PDP ^f

Notes: HHA = home health agency, IRF = inpatient rehabilitation facility, OT = occupational therapy, PDP = post-discharge period, PEP = post-episode period, PT = physical therapy, SNF = skilled nursing facility.

^a Payments are the standardized Medicare allowed amounts. Standardization removes wage adjustments and other Medicare payment adjustments. Allowed amounts include beneficiary cost sharing.

^b Services include inpatient readmissions, IRF, SNF, HHA, and services covered under Medicare Part B.

^c Services include all health care services covered under Medicare Part A and Part B.

^d The eligible sample for PAC days and visits is among those with any use.

^e Under the CJR model, death during the anchor hospitalization or 90-day PDP cancels the episode. Therefore, to estimate the all-cause mortality rate, this analysis includes CJR and control group episodes as well as beneficiary admissions at CJR and control group hospitals that would have been identified as episodes if the beneficiaries had not died during the anchor hospitalization or 90-day PDP.

^f Pre-surgical and complications are measured among elective episodes only.

^g All measures are constructed from Medicare fee-for-service claims data.

Exhibit E-12: Functional status and pain

First PAC setting	Outcome name
HHA	Improved ambulation/ locomotion
	Improved bed transferring
	Reduced pain
SNF	Improved transfer, locomotion on unit, and walking in corridor
	Improved toilet use
	Without self-reported pain
IRF	Average change in mobility score

Notes: HHA = home health agency, IRF = inpatient rehabilitation facility, PAC = post-acute care, SNF = skilled nursing facility.

B. Measures of unintended consequences

Our evaluation of unintended consequences of the CJR model focused on changes in patient mix. Exhibit E-13 lists the patient characteristics from claims and enrollment data that we monitored. While the impact analysis on payment, utilization, and quality controlled for changes in these patient characteristics, we also monitored changes in these characteristics separately to directly examine changes in patient mix.

Exhibit E-13: Measures of unintended consequences

Type of unintended consequence	Measure name/description
Changes in patient mix	Age
	Sex
	Race/ethnicity
	Medicaid eligibility
	Disability, no ESRD
	Fracture
	HCC score
	Tobacco use
	Obesity
	Diabetes
	Prior utilization (in the six months prior to the anchor hospitalization)
	<ul style="list-style-type: none"> ▪ Inpatient ACH stay ▪ Home health use ▪ IRF stay ▪ SNF stay ▪ No institutional use (inpatient ACH, SNF, IRF, LTCH).

Source: Medicare fee-for-service claims and beneficiary enrollment data.

Notes: ACH = acute care hospital, ESRD = end-stage renal disease, HCC = hierarchical condition category, IRF = inpatient rehabilitation facility, LTCH = long-term care hospital, SNF = skilled nursing facility.

C. Analytic sample

1. CJR participant hospitals compared to control group hospitals

We compared baseline characteristics of the 733 CJR participant hospitals to the 830 control group hospitals with any LEJR episodes during the baseline period. Baseline hospital characteristics were balanced across CJR and control group hospitals on nearly all characteristics (Exhibits E-14a and 14b). However, a higher percentage of CJR participant hospitals—compared to control group hospitals—previously participated in any Bundled Payments for Care Improvement episode (17.9% vs. 8.3%, $p < 0.05$). This was expected because we excluded hospitals with prior experience in a Bundled Payments for Care Improvement LEJR episode from the control group, but not from the CJR group. In addition, both CJR and control hospitals (regardless of Bundled Payments for Care Improvement participation) could have LEJR discharges at their facility that became Bundled Payments for Care Improvement episodes due to precedence rules for Bundled Payments for Care Improvement-participating physician group practices (PGPs) or PAC facilities. Furthermore, CJR participant hospitals were more likely to be safety-net hospitals (31.4% vs. 21.0%, $p < 0.01$). We did not observe any differences between CJR and control group hospitals in the averages of the baseline characteristics examined (volume, episode payment, first PAC discharge setting, bed count, Medicare days percent, Medical residents per 1,000 beds, and disproportionate share percent) (Exhibit E-14b).

Exhibit E-14a & E-14b: Characteristics of CJR hospitals compared with control group hospitals, among hospitals with any LEJR during baseline (2012 – 2014)

Baseline characteristic		CJR hospitals (N=733)	Control group hospitals (N=830)	p-value
		%	%	
Ownership	Non-profit	68.6	69.1	p=0.76
	For-profit	15.5	17.2	
	Government	15.8	13.7	
Census region	Northeast	17.4	14.6	p=0.84
	South	36.7	41.6	
	Midwest	24.0	29.3	
	West	22.0	14.5	
Part of chain	Yes	76.1	81.0	p=0.49
Teaching hospital	Yes	49.9	46.2	p=0.49
Prior Bundled Payments for Care Improvement experience	Ever participated in the Bundled Payments for Care Improvement initiative (LEJR or non-LEJR)	17.9	8.3	p<0.05
Safety-net	Safety-net hospital	31.2	20.8	p<0.01

Baseline characteristic	CJR hospitals (N=733)	Control group hospitals (N=830)	p-value
	Mean	Mean	
Number of LEJR episodes ^a	1,061	1,024	p=0.77
Standardized total episode allowed payment, inpatient stay plus 90 day post-discharge period ^a	\$27,200	\$26,533	p=0.31
First PAC SNF ^a	38.9%	38.4%	p=0.84
First PAC IRF ^a	9.5%	9.1%	p=0.86
First PAC home with HH ^a	37.4%	35.9%	p=0.58
First PAC home without HH ^a	14.2%	16.6%	p=0.32
Bed count	353.5	330.9	p=0.36
Medicare days percent	37.2%	38.4%	p=0.37
Medical residents per 1,000 beds	89.1	89.0	p=1.00
Disproportionate share percent	24.5%	22.4%	p=0.10

Source: Lewin analysis of December 2016 POS, December 2014 PECOS, FY 2016 CMS Annual IPPS, 2014 AHA Hospital Survey, and Medicare claims and enrollment data for episodes initiated in 2012 through 2014 that ended between April 2012 and March 2015.

Notes: CJR hospitals are defined as all hospitals located in CJR-participating metropolitan statistical areas (MSAs) as of December 2017, except hospitals that are participating in a Bundled Payments for Care Improvement LEJR episode. Control group hospitals are hospitals located in MSAs that were eligible to participate in the CJR model but not selected by CMS. Control group hospitals are paid under the inpatient prospective payment system (IPPS) and have never participated in a Bundled Payments for Care Improvement LEJR episode.

This exhibit includes CJR and control groups hospitals that had at least one LEJR episode during the baseline period. The control group is weighted by number of episodes and by the MSA sampling strata (probability of selection) to be representative of the CJR group.

Tests of significance for categorical variables use a design-based F-test, while tests of means use a t-test. The standard errors are adjusted for clustering of hospitals within MSAs. Differences that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

HH = home health, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, PAC = post-acute care, SNF = skilled nursing facility.

^a The baseline outcomes are not risk adjusted. Reporting standardized allowed payments.

2. Subgroup analyses

We also performed analyses on eleven subgroups of the CJR and control group populations to investigate variation in the impact of the CJR model on total episode payments based on MSA, hospital, and episode characteristics (Exhibit E-15).

Exhibit E-15: Subgroups based on MSA, hospital, and episode characteristics

Subgroup type	Name	Description
MSA characteristics	Low-payment	MSAs with low historical average episode payment (Strata 1, 2, 5, 6)
	High-payment	MSAs with high historical average episode payment (Strata 3, 4, 7, 8)
Hospital characteristics	Below 100 episodes	Hospitals with average annual episodes in the baseline below 100 episodes
	Between 100 and 200 episodes	Hospitals with average annual episodes in the baseline between 100 and 200 episodes
	Above 200 episodes	Hospitals with average annual episodes in the baseline above 200 episodes
Episode characteristic	HCC quartile 1	Episodes with an HCC in the first quartile of the HCC distribution.
	HCC quartile 2	Episodes with an HCC in the second quartile of the HCC distribution.
	HCC quartile 3	Episodes with an HCC in the third quartile of the HCC distribution.
	HCC quartile 4	Episodes with an HCC in the fourth quartile of the HCC distribution.
	Elective	Episodes that are elective
	Fracture	Episodes with a fracture

Notes: HCC = hierarchical condition category, MSA = metropolitan statistical area.

By splitting the hospitals into subgroups, we deviated from the original stratification design. Therefore we checked the balance of each subgroup to assess the risk of biased estimates. Each subgroup was tested for balance on the basis of the following assessments:

Balance of hospital and episode shares – We compared the share of CJR and control group hospitals in each subgroup to the expected shares due to the stratified random sampling methodology. In general, the subgroups exhibited good balance, with actual hospital and episode shares within 10% of their expected values, on average. The subgroup for hospitals with less than 100 average annual baseline episodes was the one exception; it exhibited fair balance, with hospital and episode shares averaging 13% and 14% different from their expected values, respectively.

Baseline differences in average episode payment – We compared the risk-adjusted baseline average episode payments of the CJR and control group. The percent difference in risk-adjusted baseline average episode payments was less than 2% for all subgroups with the exception of the subgroup for hospitals with less than 100 average annual baseline episodes, which had a 2.6% difference.

Parallel trends testing – We ran two statistical models to determine whether total episode payment of the CJR and control groups followed parallel trends during the baseline period. The first model is the more stringent version and includes dummy variables for each of the three baseline years; interaction terms between the CJR group dummy and each of the year dummies, along with risk-adjustment factors. We then tested whether any of the coefficients for the three interaction terms were statistically different from each other. A statistically significant difference between any two interaction terms is interpreted as evidence that outcomes for the two groups follow different trends. All subgroups passed this first parallel trends test except for the subgroup of hospitals with less than 100 average annual baseline episodes.

To illustrate the specification of the parallel trends model:

- $Y_{i,k,t}$ is the outcome for the i^{th} episode with an LEJR at hospital k in the baseline period in year t .
- $Year_{i,t}$ is an indicator that takes the value of 1 if the i^{th} episode was initiated during year t of the baseline period and takes the value of 0 otherwise
- $CJR_{i,k}$ is an indicator that takes the value of 1 if the i^{th} episode was initiated by a CJR participant hospital k and takes the value of 0 otherwise
- $X_{i,k}$ are hospital, market, and patient characteristics in the baseline period

$$Y_{i,k,t} = b_0 + b_1 \cdot Year_{1,i} + b_2 \cdot Year_{2,i} + b_3 \cdot Year_{3,i} + b_4 \cdot Year_{1,i} \cdot CJR_k + b_5 \cdot Year_{2,i} \cdot CJR_k + b_6 \cdot Year_{3,i} \cdot CJR_k + X_{i,k}' \cdot B + u_{i,k,t}$$

The second model is less difficult to pass than the first and includes a dummy variable indicating the CJR group; a linear annual time trend; and an interaction term between the CJR group dummy and the linear annual time trend, along with risk-adjustment factors. A statistically significant coefficient on the interaction term between the linear time trend and the CJR group dummy is interpreted as evidence that outcomes for the two groups follow different linear time trends. This test passed for all subgroups.

To illustrate the specification of the second parallel trends regression model:

$$Y_{i,k,t} = b_0 + b_1 \cdot t + b_2 \cdot CJR_k + b_3 \cdot t \cdot CJR_k + X_{i,k}' \cdot B + u_{i,k,t}$$

Where t represents the quarter in which the episode ended.

In summary, 10 of the 11 subgroups had optimal balance. The subgroup for hospitals with less than 100 baseline episodes annually did not perform as well—exhibiting only fair hospital share balance, the largest percent difference in risk-adjusted baseline average episode payments (2.6%), and failed the most stringent parallel trends test. So, the estimates from this subgroup should be interpreted with more caution than the others.

D. Methods

While the CJR and control group populations are overall quite similar in terms of market, hospital, and patient characteristics, there may be unobserved differences that impact outcomes. To control for both observed and unobserved differences and to isolate the impact of the CJR model on outcomes, we used a difference-in-differences (DiD) regression approach supplemented by risk adjustment.

1. DiD estimator

The DiD approach quantifies the impact of the CJR model by comparing changes in outcomes between the baseline and intervention periods for the CJR population and the control group population. One of the main advantages of this approach is that it can successfully isolate the effect of unobserved characteristics of treatment and control groups that are time invariant.⁵

a. Baseline period

The baseline period for our evaluation encompasses episodes that started between January 1, 2012 and December 31, 2014 and ended between April 1, 2012 and March 31, 2015.

b. Intervention period

The intervention period for this Annual Report follows the definition of the first and second performance years in the Final Rule: episodes starting on or after April 1, 2016 and ending by December 31, 2017.⁶

The DiD model uses an outcome measure, Y , and estimates the differential change in Y for beneficiaries receiving care from CJR participating hospitals between the baseline and the intervention periods relative to that same change for beneficiaries receiving care from hospitals in the control group.

To illustrate the DiD approach, we define:

- $Y_{i,k,t}$ is the outcome for the i^{th} episode with an LEJR at hospital k in period t (1 during the CJR intervention quarters and zero otherwise)
- $CJR_{i,k}$ is an indicator that takes the value of 1 if the i^{th} episode was initiated by a CJR participant hospital k and takes the value of 0 otherwise
- $X_{i,k,t}$ are hospital, market, and patient characteristics in period t
- $E[Y|t, CJR, X]$ is the expected value of outcome measure Y conditional on values of t , CJR , and X

⁵ While the DiD model controls for unobserved heterogeneity that is fixed over time, it does not control for unobserved heterogeneity that varies over time.

⁶ CMS. [Medicare Program; Comprehensive Care for Joint Replacement Payment Model for Acute Care Hospitals Furnishing Lower Extremity Joint Replacement Services: final rule \(42 CFR Part 510\)](#). *Fed Regist.* 2015; 80(226): 73273-73554.

The DiD estimator is:

$$DiD = [E(Y | t=1, CJR = 1, X) - (E(Y | t=0, CJR = 1, X))] - [E(Y | t=1, CJR = 0, X) - (E(Y | t=0, CJR = 0, X))] \quad (1)$$

To illustrate the calculation of the DiD, consider the linear model listed below:

$$Y_{i,k,t} = b_0 + b_1 \cdot t + b_2 \cdot CJR_{i,k} + b_3 \cdot CJR_{i,k} \cdot t + X_{i,k,t}' \cdot B + u_{i,k,t} \quad (2)$$

- The value of coefficient b_1 captures aggregate factors that could cause changes in outcome Y in the intervention period relative to the baseline period that are common across CJR and control group episodes.
- Coefficient b_2 captures the relative differences in outcomes between CJR and control group episodes.
- Coefficient b_3 determines the differential in outcome Y experienced by beneficiaries receiving services from CJR providers during the CJR intervention period relative to control group episodes in the intervention period, and represents the DiD estimator.
- The vector of coefficients B measures the differential effects of risk factors (X) on the outcome variable.

To calculate separate DiDs for PY1 intervention period and PY2 intervention period, Equation (2) was modified to include two time period indicators t_1 (equals 1 during PY1 intervention period and zero otherwise) and t_2 (equals 1 during PY2 intervention period and zero otherwise).

$$Y_{i,k,t} = b_0 + b_1 \cdot t_1 + b_2 \cdot t_2 + b_3 \cdot CJR_{i,k} + b_4 \cdot CJR_{i,k} \cdot t_1 + b_5 \cdot CJR_{i,k} \cdot t_2 + X_{i,k,t}' \cdot B + u_{i,k,t} \quad (3)$$

- Coefficient b_4 determines the differential in outcome Y experienced by beneficiaries receiving services from CJR providers during the CJR PY1 intervention period relative to control group episodes in the PY1 intervention period, and represents the DiD estimator for PY1.
- Coefficient b_5 determines the differential in outcome Y experienced by beneficiaries receiving services from CJR providers during the CJR PY2 intervention period relative to control group episodes in the PY2 intervention period, and represents the DiD estimator for PY2.

Finally, to calculate the DiD estimate for outcome measures that were risk-adjusted with non-linear models, we used the regression model's coefficient estimates to calculate each of the four conditional expectations that make up the DiD estimator in equation (1). In these cases, the standard errors were computed using the Delta method.⁷ For all DiD models, statistical significance was assessed at the 10% level.

⁷ The delta method expands a function of a random variable about its mean, usually with a Taylor approximation, and then takes the variance. Specifically, if $Y = f(x)$ is any function of a random variable X, we need only calculate the variance of X and the first derivative of the function to approximate the variance of Y. Let μ_x be the mean of X and $f'(x)$ be the first derivative, a Taylor expansion of $Y = f(x)$ about μ_x gives the approximation: $Y =$

c. Assumptions of DiD estimators

One critical assumption of an unbiased DiD estimate is that the treatment and control group outcomes follow parallel trends in the outcome of interest during the baseline period. Another assumption is that these parallel trends would have remained the same in the period when the policy is actually implemented in the absence of the policy intervention. While the first assumption can be tested if sufficient baseline data on the CJR and control groups are available, the second assumption is untestable.

We visually inspected trends for all outcomes and statistically tested that the CJR and control group outcomes follow parallel trends during the baseline period (described in the subgroup analysis section). All outcomes passed the stringent parallel trends test except home-health payments, pre-surgical physical therapy (PT) or occupational therapy (OT), and, for patients first discharged to SNF, the motion and toileting measures. Both claims-based outcomes and the assessment-based toileting measure passed the modified parallel trends tests, which used a linear time trend. For patients discharged to SNF, we rejected the null hypothesis that the CJR and control group outcome followed parallel trends for the motion measure ($p < 0.10$), which is required for an unbiased estimate. The motion results need to be interpreted with caution.

2. Risk adjustment to control for differences in beneficiary demographics and clinical risk factors

a. Claims-based risk adjustments

In the DiD models that we estimated, we controlled for potential differences in beneficiary demographics, clinical characteristics observed before hospitalization, and provider characteristics (represented by $X_{i,k,t}$ in equation (2) above). Demographic factors included age categories, sex, age and sex interactions, race/ethnicity information, Medicaid eligibility status, and disability status. All outcomes were risk adjusted for the episode's fracture status, procedure type (hip or knee), and MS-DRG (469 or 470).⁸ To control for participation in other Medicare initiatives, we used a dummy variable that indicated whether the beneficiary was in the Medicare Shared Savings Program (MSSP), Pioneer ACO Model, or Next Generation ACO Model during the episode. To control for prior health conditions, we used HCC indicators for the 12 months preceding the anchor hospitalization,⁹ as well as indicators for obesity, diabetes, and tobacco use. To further control for case-mix differences, we included measures of prior care use in the

$f(x) \approx f(\mu_x) + f'(\mu_x)(x - \mu_x)$. Taking the variance of both sides yields: $\text{Var}(Y) = \text{Var}(f(X)) \approx [f'(\mu_x)]^2 \text{Var}(X)$. For example, suppose $Y = X^2$. Then $f(x) = X^2$ and $f'(x) = 2x$, so that $\text{Var}(Y) \approx (2\mu_x)^2 \text{Var}(X)$.

⁸ Models were also estimated separately for fracture episodes and elective episodes in addition to risk adjusting for fracture in models that combined fracture and elective episodes.

⁹ The Hierarchical Condition Category (CMS-HCC) model is a prospective risk-adjustment model used by CMS to adjust Medicare Part C capitation payments for beneficiary health spending risk. The model adjusts for demographic and clinical characteristics. The clinical component of the model uses diagnoses from qualifying services grouped into numerous HCC indicators. Pope, Gregory C.; Kautter, John; Ellis, Randall P.; Ash, Arlene S.; Ayanian, John Z.; Iezzoni, Lisa I.; Ingber, Melvin J.; Levy, Jesse M.; and Robst, John, "Risk adjustment of Medicare capitation payments using the CMS-HCC model" (2004). *Quantitative Health Sciences Publications and Presentations*. Paper 723.

following settings: acute care IPPS hospital, long-term care hospital (LTCH), SNF, IRF, hospice, other Part A inpatient, custodial nursing facility, and HHA.

We also controlled for provider characteristics that might be related to the outcomes of interest, such as hospital bed count, for-profit status, and previous Bundled Payments for Care Improvement LEJR experience and previous Bundled Payments for Care Improvement initiative experience in a clinical episode other than LEJR. In addition, we included state dummies in all regression models to control for geographic differences in health care spending.

While the same demographic and enrollment status indicators are included for all outcomes, we considered alternative aggregation levels to control for prior care use, prior health conditions, and regional characteristics (Exhibit E-16). To assess different specifications, we split the sample into a model development and a validation sample and estimated each model using data from the model development sample. We then evaluated the models' goodness of fit (Akaike Information Criterion (AIC) and Bayesian Information criterion (BIC) criteria, R-square, t-tests on differences in conditional expectations by subgroup) in the model development sample and their predictive performance in the validation sample.

Exhibit E-16: Predictive risk factors used to risk-adjust claims-based outcomes

Domain	Variables
Characteristics of the procedure	<ul style="list-style-type: none"> ▪ Anchor MS-DRG ▪ Fracture status^a ▪ Procedure type (hip or knee)
Patient demographics and enrollment	<ul style="list-style-type: none"> ▪ Age (under 65, 65-79, 80+) ▪ Sex ▪ Race/ethnicity ▪ Medicaid status ▪ Disability status ▪ Attribution to Medicare Shared Savings Program, Pioneer ACO Model, or Next Generation ACO Models during the CJR episode
Prior health conditions	<ul style="list-style-type: none"> ▪ CMS-HCC version 21 indicators from qualifying services and diagnoses (those meeting a threshold of at least 1%) from claims and data for 12 months preceding the anchor hospitalization ▪ Obesity indicator ▪ Diabetes indicator ▪ Tobacco use indicator
Prior use	<ul style="list-style-type: none"> ▪ Prior use variables used in risk adjustment varied by model^b ▪ Binary indicators for any acute care inpatient, SNF, IRF, HHA, hospice, other Part A inpatient, LTCH, and custodial nursing facility service utilization in the six months preceding the start of the episode ▪ Number of days of acute care inpatient, SNF, IRF, HHA, hospice, and other Part A inpatient service use in the one month preceding the start of the episode ▪ Number of days of acute care inpatient, SNF, IRF, HHA, hospice, other Part A inpatient, and LTCH service use in the six months preceding the start of the episode
Geography	<ul style="list-style-type: none"> ▪ State indicators
Hospital provider characteristics	<ul style="list-style-type: none"> ▪ Bed count ▪ For-profit status ▪ Bundled Payments for Care Improvement LEJR experience^c ▪ Bundled Payments for Care Improvement experience in a clinical episode other than LEJR

Notes: ACO = accountable care organization, HCC = hierarchical condition category, HHA = home health agency, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, LTCH = long-term care hospital, MS-DRG = Medicare severity-diagnosis related group, SNF = skilled nursing facility.

^a Models were also estimated separately for fracture episodes and elective episodes in addition to risk adjusting for fracture in models that combined fracture and elective episodes.

^b The optimal specification for each prior use variable was chosen using the goodness of fit criteria for each outcome.

^c CJR participant hospitals that previously participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR were included in the analysis. However, to be included in the control group, hospitals could not have participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR.

b. Assessment-based risk adjustment

We applied existing risk-adjustment models for the National Quality Forum (NQF) endorsed and CMS quality measures for the IRF (average change in mobility score),¹⁰ SNF (improved transfer,

¹⁰ RTI International (2015). Inpatient Rehabilitation Facility Quality Reporting Program: Specifications for the Quality Measures Adopted through Fiscal Year 2016 Final Rule. Available at: https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/IRF-Quality-Reporting/Downloads/IRF_Final_Rule_Quality_Measure_Specifications_7-29-2015.pdf

locomotion on unit, and walking in corridor),^{11,12} and HHA settings (improved ambulation/locomotion, improved bed transferring, and improvement in the frequency of pain when moving around).^{13,14,15} We made some modifications to the risk-adjustment models for these measures to better align with the needs of the evaluation. For all measures, we dropped certain assessment-based covariates from the existing risk adjustment models in the following three scenarios: first, if they had a low prevalence (less than 1%) in the CJR population and were not statistically significant risk factors, second, if they were perfect predictors of the outcome (i.e., the outcome was always the same for a given value of the covariate), or third, if they had p-values greater than 0.05 and did not significantly improve the model's goodness of fit (c-statistic and pseudo-R-squared for logistic regressions and R-squared, AIC, and BIC criteria for ordinary least squares (OLS) regressions).

All risk adjustment models controlled for the length of the anchor hospitalization and the patients' functional status at the start of care. All SNF and HHA outcomes controlled for whether the patients were readmitted to the SNF or HHA provider after the anchor hospitalization. We also controlled for potential differences in characteristics of the procedure, patient demographics and enrollment, prior health conditions, utilization measures preceding the start of the anchor hospitalization, geography, and hospital provider characteristics (Exhibit E-17). We considered alternative aggregation levels to control for prior service use (Exhibit E-17) and selected a specific subset of prior service use variables for each outcome that improved the model's goodness of fit. Finally, we controlled for the number of days (up to 14 days) between discharge from the anchor hospitalization and the start of home health care for patients who were discharged from the hospital directly to home health care. It is likely that patients' functional status will substantively improve over the days following their anchor hospitalization discharge.

For the SNF measures, we included additional Minimum Data Set (MDS)-based risk-factors to the NQF-endorsed risk-adjustment models based on t-tests and their ability to improve the model's goodness of fit. These additional factors spanned several MDS domains, including cognitive, mood and behavior status, bowel and bladder status, health condition, functional status, skin condition and psychiatric/mood disorder.

¹¹ RTI International (2016). MDS 3.0 Quality Measures User's manual, version 10.0. Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/MDS-30-QM-Users-Manual-V10.pdf>

¹² The without self-reported pain measure for the SNF setting is NQF-endorsed and not risk-adjusted.

¹³ CMS (2016). Home health agency quality measures: technical documentation of oasis-based patient outcome measures, Revision 5. Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/HHQIQualityMeasures.html>

¹⁴ Nuccio EJ, Richard AA, Hittle DF (2011). Home health agency quality measures: logistic regression models for risk adjustment. Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/Downloads/HHQILogisticRegressionModelsforRiskAdjustment.pdf>

¹⁵ Hittle DF, Nuccio EJ (2017). Home health agency patient-related characteristics reports: technical documentation of measures. Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HomeHealthQualityInits/Downloads/HHQILogisticRegressionModelsforRiskAdjustment.pdf>

The risk-adjustment model for the SNF measure “Improved Status in Toilet Use” was designed specifically for the CJR model evaluation. We relied on clinical and PAC experts to draft an exhaustive list of assessment-based risk factors to potentially control for, and used a stepwise regression approach to develop a parsimonious risk adjustment model for this outcome measure. The final model included covariates that had p-values less than 0.05 and significantly improved the model’s goodness of fit.

Exhibit E-17: Predictive risk factors used to risk-adjust assessment-based outcomes

Domain	Variables
Characteristics of the procedure	<ul style="list-style-type: none"> ▪ Anchor MS-DRG ▪ Fracture status^a ▪ Procedure type (hip or knee)
Patient demographics and enrollment	<ul style="list-style-type: none"> ▪ Age ▪ Sex ▪ Medicaid status ▪ Disability status ▪ Alignment to Medicare Shared Savings Program and Pioneer or NextGen ACO during CJR episode
Prior health conditions	<ul style="list-style-type: none"> ▪ HCC score from qualifying services and diagnoses from Medicare claims data for 12 months preceding admission to the anchor hospitalization
Prior use	<ul style="list-style-type: none"> ▪ Prior use variables used in risk adjustment varied by model^b ▪ Binary indicators for any acute care inpatient, SNF, IRF, HHA, hospice, other Part A inpatient, LTCH, and custodial nursing facility service utilization in the six months preceding the start of the episode ▪ Number of days of acute care inpatient, SNF, IRF, HHA, hospice, and other Part A inpatient service use in the one month preceding the start of the episode ▪ Number of days of acute care inpatient, SNF, IRF, HHA, hospice, other Part A inpatient, and LTCH service use in the six months preceding the start of the episode
Geography	<ul style="list-style-type: none"> ▪ State indicators
Hospital provider characteristics	<ul style="list-style-type: none"> ▪ Bundled Payments for Care Improvement LEJR experience^c ▪ Bundled Payments for Care Improvement experience in a clinical episode other than LEJR
Anchor inpatient stay	<ul style="list-style-type: none"> ▪ Length of inpatient stay, and length of stay squared
PAC assessment-based measures (MDS, OASIS, IRF-PAI) at the start of the PAC stay	<ul style="list-style-type: none"> ▪ SNF readmission or HHA resumption of care after being discharged from the anchor hospitalization ▪ Functional status at PAC admission with respect to the outcome being measured ▪ Days between discharge from the anchor hospitalization and the start of home health care ▪ Assessment-based variable used in risk adjustment varied by model^b ▪ Assessment-specific measures of factors related to cognitive status, mood and behavior status, bowel and bladder status, health conditions, functional status, skin condition, and psychiatric/mood disorders

Notes: ACO = accountable care organization, HCC = hierarchical condition category, HHA = home health agency, IRF = inpatient rehabilitation facility, IRF-PAI = Inpatient Rehabilitation Facility-Patient Assessment Instrument, LEJR = lower extremity joint replacement, LTCH = long-term care hospital, MDS = Minimum Data Set, MS-DRG = Medicare severity-diagnosis related group, OASIS = Outcome and Assessment Information Set, PAC = post acute care, SNF = skilled nursing facility.

^a Models were also estimated separately for fracture episodes and elective episodes in addition to risk adjusting for fracture in models that combined fracture and elective episodes.

^b The optimal specification for each prior use and assessment-based variable was chosen using the goodness of fit criteria for each outcome.

^c CJR participant hospitals that previously participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR were included in the analysis. However, to be included in the control group, hospitals could not have participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR.

3. Model types

We used a variety of models including logistic, Poisson, multinomial logit, OLS regressions, and two-part models (Exhibit E-18). Models were estimated depending on the type and characteristics of the outcome measure. For example, logistic models were estimated for the discrete quality outcomes (i.e., all claims-based quality of care measures and the assessment-based measures for improved functional status), and any pre-surgical PT/OT. A Poisson model was used to estimate inpatient length of stay. A multinomial logit model was applied to first-discharge setting. OLS models were estimated for the continuous total number of days measures (e.g., number of SNF days, number of IRF days, number of home health (HH) visits, and number of PT/OT visits) as well as total episode payments, part B payments, and the assessment-based quality measure for the average change in mobility score for IRF patients. Two-part models were favored for payment outcomes where more than 5% of individuals had zero payments for the particular outcome. These payment outcomes included the individual Part A payments that exhibited zero-mass and skewness.¹⁶

¹⁶ LTCH payments were not risk adjusted because of small sample sizes; only 61 CJR episodes had any LTCH payments in the 90 days post-discharge.

Exhibit E-18: Outcomes by model type

Model Type	Outcomes
Ordinary least squares (OLS)	<ul style="list-style-type: none"> ▪ Total episode payments ▪ Part B payments ▪ Number of IRF days ▪ Number of SNF days ▪ Number of HHA visits ▪ Number of PT/OT Visits, outpatient ▪ Number of PT/OT Visits, home health ▪ Average change in mobility score, IRF
Two part models (Probit/OLS)	<ul style="list-style-type: none"> ▪ Readmission payments ▪ IRF payments ▪ SNF payments ▪ HHA payments ▪ PEP payments
Multinomial logistic	<ul style="list-style-type: none"> ▪ First post-acute discharge was to IRF ▪ First post-acute discharge was to SNF ▪ First post-acute discharge was to HHA ▪ Discharge to home without home health
Logistic	<ul style="list-style-type: none"> ▪ Unplanned readmission ▪ Emergency department visit ▪ Complications, among elective episodes ▪ All-cause mortality ▪ Any pre-surgical PT/OT ▪ Improved status in transfer, locomotion, and walking in the corridor, SNF ▪ Improved status in toilet use, SNF ▪ Without self-reported moderate to severe pain, SNF ▪ Improved status in ambulation/locomotion, HHA ▪ Improved status in bed transferring, HHA ▪ Improvement in the frequency of pain when moving around, HHA
Poisson	<ul style="list-style-type: none"> ▪ Inpatient length of stay

Notes: HHA = home health agency, IRF = inpatient rehabilitation facility, OLS = ordinary least squares, OT = occupational therapy, PEP = post-episode period, PT = physical therapy, SNF = skilled nursing facility.

Estimates from the multivariate regression models were used to construct model-predicted outcomes under two scenarios (baseline and intervention) for both CJR and control group hospitals. To control for changes in service and case mix over time, as well as differences between CJR and non-CJR beneficiaries, we used the same reference population of beneficiaries to calculate quarterly predicted outcomes for CJR and control group episodes. The reference population used in this report is all CJR beneficiaries during the baseline and intervention period. Given the design of the CJR model (randomly sampling MSAs to participate), we accounted for clustering at the MSA level in our regression models.

4. Sensitivity analyses

A number of sensitivity analyses were performed on the findings for the claims-based outcomes in the main analysis. First, we observed the relative impact of the stratum-level weights by excluding

the weights from the DiD estimate and standard errors. Second, we excluded certain hospitals or episodes to identify whether these exclusions would change the DiD estimate, for example, hospitals that ever participated in the Bundled Payments for Care Improvement initiative and episodes by hospitals that self-selected into the CJR model by dropping out of the Bundled Payments for Care Improvement initiative on or after April 1, 2016, or episodes generated under MSSP, Pioneer ACO, or Next Generation ACO. We estimated the DiD estimate by excluding these episodes. Third, stratum fixed-effects are often implemented in the context of group randomized controlled trials. We tested the sensitivity of the DiD estimate to including stratum fixed-effects. Fourth, CMS adopted a policy to address episode spending for hospitals located in areas impacted by disasters or “extreme and uncontrollable circumstances,” such as wildfires, hurricanes, or tropical storms. We conducted an analysis excluding “disaster episodes.” The alternative specifications used in the sensitivity analyses did not materially affect any of the findings in the main analysis and thus provided evidence that the main analysis and the conclusions presented in this report were robust. Finally, roughly 4.9% of the LEJR episodes were not included in the risk-adjusted DiD estimation because they did not have information related to prior health care conditions because of the lack of FFS coverage prior to the anchor hospitalization. Unadjusted baseline and intervention mean outcomes including these episodes were comparable to mean outcomes that excluded these episodes.

Furthermore, we performed a sensitivity analysis on the findings for the assessment-based outcomes by including the number of days between the first and last PAC assessments as a factor in the risk adjustment models. Fewer days between the first and last PAC assessments would provide less time for patients to show functional improvement. Since the CJR model may impact the number of days between the first and last PAC assessment we do not include it as a causal factor in our main model, but only as a sensitivity (e.g., CJR participant hospitals may encourage SNFs to discharge CJR patients earlier, reducing the number of SNF days and the number of days between the first and last MDS assessment.)

IV. Savings to Medicare due to the CJR Model

We calculated Medicare savings by subtracting reconciliation payments from the change in non-standardized paid amounts due to the CJR model. Exhibit E-19 defines the measures used in this analysis.

Exhibit E-19: Definition of measures used in the analysis of savings to Medicare

Measure	Definition
DiD estimate of per episode decrease in standardized paid amounts	A per episode estimate of the decrease in Medicare payments attributable to the CJR model. The payment outcome was the standardized Medicare paid amounts for services that were included in the episode.
Total number of CJR episodes	The number of intervention episodes initiated by CJR participants according to an episode-level reconciliation payment dataset received from the CJR reconciliation contractor.
Standardized to non-standardized conversion factor	A ratio of non-standardized to standardized Medicare paid amounts based on CJR intervention episodes.
Total reduction in non-standardized paid amounts	Reduction in non-standardized Medicare paid amounts. This was calculated from the DiD estimate of per episode change in standardized paid amounts multiplied by the conversion factor and then multiplied by (-1). Non-standardized paid amounts reflect actual Medicare payments to providers because they are payments to providers that include adjustments for wages, practice expenses, and other initiatives (e.g., medical education). Total reduction in non-standardized paid amounts was calculated by multiplying the reduction in non-standardized paid amounts per episode by the total number of CJR episodes.
Reconciliation payments	Payments made to CJR participants by Medicare net of repayments from CJR participants to Medicare. Reconciliation payments can be positive or negative. In the program literature they are often referred to by the term “net payment reconciliation amounts” or “NPRA.” These data were provided by the CJR payment contractor. Reconciliation payments per episode was calculated by dividing reconciliation payments by the total number of CJR episodes.
Savings to Medicare	Total reduction in non-standardized paid amounts less reconciliation payments. A positive value indicates savings. Total savings to Medicare was calculated by multiplying the per episode savings to Medicare by the total number of CJR episodes.

Notes: DiD = difference-in-differences.

A. Probability statements

We also derive probabilities associated with savings. This is an alternative to the frequentist concepts of statistical significance and confidence intervals, which are used throughout this report. Theoretically, these probabilities are an *approximation* to results of a Bayesian analysis that uses an uninformative prior distribution.¹⁷ Unlike frequentist statistical significance which informs us about the likelihood that repeated samples would contain the true value of our estimate, Bayesian probabilities indicate the likelihood of a given value for the entire distribution of values the true estimate could take on.

¹⁷ Zyphur, M. J., & Oswald, F. L. (2015). Bayesian estimation and inference: A user’s guide. *Journal of Management*, 41(2), 390-420.

Knowing this approximate equivalence, we use our DiD impact estimates, calculated from frequentist statistical methods, to derive a posterior distribution. Specifically, we use a normal distribution with the mean and standard deviation equal to the DiD estimate and standard error. From this distribution, we calculate probabilities that Medicare savings was greater than or equal to zero. These probabilities help us gain an understanding of the likelihood of the CJR model resulting in Medicare savings, something frequentist p-values and confidence intervals are unable to inform us about.

B. Limitations

The estimate of Medicare savings used a ratio of standardized to non-standardized paid amounts during the intervention period to convert standardized payments to non-standardized payments. To the extent that the mix of services changes over time and differs by CJR and control group, this ratio may not accurately reflect the mix of services that contributed to the DiD estimate.

V. Impact of the CJR Model on Total Market Volume of Elective LEJR Discharges

We analyzed the impact of the CJR model on the volume of LEJR discharges in a market by testing whether MSAs selected to participate in the CJR model experienced larger or smaller increases in the LEJR discharge rate (discharges per 1,000 FFS population) than they would have otherwise.

We focused our analyses on elective LEJR discharges because CJR participant hospitals have more influence over elective episode volume than fracture episode volume.

A. Market definition

Markets are defined by the MSAs used in the design of the CJR model. There are 67 CJR MSAs and 104 control group MSAs. For this analysis, very large MSAs were split into smaller metropolitan divisions following the methodology of the geographic payment adjustment used in the IPPS.¹⁸

B. Time periods

The analysis covers October 2007 to December 2017 and includes a baseline period and two CJR post intervention periods.

- **The CJR baseline period (October 2007 – June 2015)** begins the date the hospital IPPS switched to the MS-DRG system (the LEJR episode is defined by MS-DRG 469 and MS-DRG 470) and ends prior to the announcement of the Bundled Payments for Care Improvement initiative.
- **CJR Post 1 (July 2015 – March 2016)** begins the date that the CJR model was announced (July 9, 2015) and ends the day before the model was implemented (March 31, 2016).
- **CJR Post 2 (April 2016 – December 2017)** begins the date that the CJR model took effect (April 1, 2016) and ends with the end of PY2.

C. Measures of CJR and Bundled Payments for Care Improvement “dose”

We measured CJR “dose” as the market share of LEJR discharges¹⁹ for hospitals that ever participated in the CJR model (i.e., the number of LEJR discharges from hospitals that ever participated in the CJR model divided by total LEJR discharges in the market). Similarly, we measured Bundled Payments for Care Improvement “dose” as the market share of LEJR discharges for providers (hospitals, PGPs, SNFs, and HHAs) that were ever in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for Models 2 through 4 for the LEJR clinical episode. The market share is calculated using the three year period prior to the first

¹⁸ Large MSAs that are split into smaller metropolitan divisions are Boston, Chicago, Dallas, Detroit, Los Angeles, Miami, New York, Philadelphia, San Francisco, and Seattle resulting in 67 CJR MSAs represented by 76 markets and 104 control group MSAs represented by 114 markets.

¹⁹ The number of discharges can be slightly greater than the number of episodes due to the exclusion criteria applied during the episode creation algorithm.

Bundled Payments for Care Improvement intervention time period (October 2009 through September 2012). We measured market share using this period since market share in the intervention periods of the Bundled Payments for Care Improvement initiative and CJR is endogenous to the model.

There are 28 CJR participant hospitals located across 12 markets that were formerly Bundled Payments for Care Improvement LEJR participants, and therefore their baseline market shares are included in both the CJR dose and the Bundled Payments for Care Improvement dose potentially overstating bundled payment penetration in these markets.

D. Statistical model

The impact of the CJR model and the Bundled Payments for Care Improvement initiative on LEJR volume is estimated using an OLS regression model, which incorporates market fixed effects, time fixed effects, and market-specific linear time trends:

$$[1] V_{i,t} = b_0 + b_{1i} + b_{2t} + b_{3i} + (b_4 \cdot Z_{it}) + (b_5 \cdot CJRdose_i \cdot CJRPost_1) + (b_6 \cdot CJRdose_i \cdot CJRPost_2) + (b_7 \cdot BPCIdose_i \cdot BPCIPost_1) + (b_8 \cdot BPCIdose_i \cdot BPCIPost_2) + (b_9 \cdot BPCIdose_i \cdot BPCIPost_3) + \varepsilon_{it}$$

Where:

- $V_{i,t}$ is the LEJR discharge rate (the number of LEJR discharges per 1,000 FFS beneficiaries) in market i and quarter t ;
- b_{1i} allows for market fixed effects that control for market-specific factors that are constant across time;
- b_{2t} allows for time fixed effects (measured in quarters) that control for time-specific factors that are common across markets;
- b_{3i} allows for markets to follow different linear time trends;
- Z_{it} controls for characteristics of the FFS population residing in market i in quarter t (age, sex, dual eligibility, disabled/not ESRD), the share of the Medicare beneficiary population enrolled in Medicare Advantage, and the share of the Medicare FFS beneficiary population aligned with accountable care organizations (ACOs);
- $CJRdose_i$ is the market share of ever-CJR participants in market i measured over a portion of the baseline time period (share of market discharges initiated by ever-CJR participant hospitals from October 2009 – September 2012).
- $CJRPost_1$ and $CJRPost_2$ equal 1 during each CJR intervention period, respectively (July 2015 – March 2016 and April 2016 – December 2017)
- $BPCIdose_i$ is the market share of participants that ever participated in the Bundled Payments for Care Improvement initiative in market i measured over a portion of the baseline period (share of market discharges initiated by participants that ever participated in the Bundled Payments for Care Improvement initiative from October 2009 – September 2012);

- ***BPCI*Post₁**, ***BPCI*Post₂**, and ***BPCI*Post₃** equal 1 during each Bundled Payments for Care Improvement intervention period, respectively (October 2012 – September 2013, October 2013 – September 2015, and October 2015 – December 2017).²⁰

The impact of the CJR model on LEJR volume is captured by coefficients ***b*₅** and ***b*₆**, which measure the average change in the LEJR discharge rate due to the CJR dose. The impact of the Bundled Payments for Care Improvement initiative on LEJR volume is captured by coefficients ***b*₇**, ***b*₈**, and ***b*₉**, which measure the average change in the LEJR discharge rate due to the Bundled Payments for Care Improvement dose as measured by Bundled Payments for Care Improvement market shares during the CJR baseline.

Standard errors are clustered at the market level to account for non-independence of observations within markets. We weight the regression by the FFS beneficiary population in the market and the inverse probability of selection into the CJR model.²¹

E. Limitations

A limitation of our analysis is that the measurement of CJR and Bundled Payments for Care Improvement “dose” does not vary based on the duration of Bundled Payments for Care Improvement participation within the market, nor does it vary as hospitals switch from Bundled Payments for Care Improvement to CJR participation. In all MSAs, a market is assigned the same Bundled Payments for Care Improvement dose from a given Bundled Payments for Care Improvement provider whether the provider was yet to participate, dropped out, or continued to participate through the end of the Bundled Payments for Care Improvement initiative. In CJR-eligible MSAs, each dose includes market share from Bundled Payments for Care Improvement and CJR participant hospitals even if they switched from Bundled Payments for Care Improvement to CJR participation during the intervention. This methodology can overestimate the Bundled Payments for Care Improvement dose in both control and CJR-participating MSAs, and can lead to overlap between the CJR and Bundled Payments for Care Improvement doses, either of which would bias estimates toward zero. However, constructing the measures in this way was necessary so that the CJR and Bundled Payments for Care Improvement doses are not endogenous to performance under the CJR and Bundled Payments for Care Improvement initiatives.

²⁰ *BPCI Post 1* is the Bundled Payments for Care Improvement initiative intervention period in which no Bundled Payments for Care Improvement Awardees were in the risk-bearing phase of the Bundled Payments for Care Improvement initiative. *BPCI Post 2* is the Bundled Payments for Care Improvement initiative intervention period in which some Bundled Payments for Care Improvement Awardees were in the risk-bearing phase of the Bundled Payments for Care Improvement initiative, some had not yet joined the Bundled Payments for Care Improvement initiative, and some had terminated participation. *BPCI Post 3* is the Bundled Payments for Care Improvement initiative intervention period in which all Bundled Payments for Care Improvement Awardees were either in the risk-bearing phase of the Bundled Payments for Care Improvement initiative or had terminated participation.

²¹ Angrist, Joshua D., and Jörn-Steffen Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist’s Companion*. Princeton: Princeton University Press.

VI. Patient Survey

We developed the CJR patient survey to explore differences in functional status and pain, caregiver help, care experience, and overall satisfaction between CJR and control patients. The patient-reported outcomes in the survey capture information that is not available from other data sources, such as claims or assessment data. Its design was based on a similar patient survey used for the Bundled Payments for Care Improvement evaluation.

A. Survey sample

The patient survey was administered in two waves to a random sample of CJR and control patients who had LEJR surgery during the second performance year. Each wave covered two months of LEJR episodes. Each wave sampled three overlapping groups of patients: all LEJR episodes, fracture episodes, and episodes initiated by hospitals with low historical volume of LEJR patients. These low LEJR volume hospitals represent hospitals that were unlikely to participate in a voluntary episode-based payment model because historical volume was the key predictor of whether a hospital joined a voluntary episode-based payment model. We sampled each group independently, so that a patient could be selected for more than one of the three groups (e.g., a fracture patient is also in the group of all LEJR patients). In such a case, the patient was mailed just one survey, but the survey response was used in multiple analyses. Exhibit E-20 describes the patient survey waves by group.

Exhibit E-20: Patient survey sample by group and survey wave

Wave	Discharge date	Group	CJR LEJR episodes	CJR patients sampled	Control LEJR episodes	Control patients sampled
1	March and April 2017	All LEJR	12,873	6,104	20,127	5,775
		Fracture	1,470	1,470	2,065	1,369
		Low volume	595	595	896	548
2	September and October 2017	All LEJR	15,304	1,500	18,793	1,413
		Fracture	1,832	1,201	1,959	1,095
		Low volume	872	872	902	815

Note: LEJR = lower extremity joint replacement.

We drew a stratified random sample of CJR and control patients with LEJR episodes in each group and wave combination. We used seven strata defined by hospital baseline volume of LEJR discharges and historical episode spending relative to the regional average (shown in Exhibit E-21). In Wave 1 we selected at least one patient from every hospital with at least one LEJR episode. The Wave 2 sample was stratified by patient age category (<65, 65–74; 75–84; 85+) and sex to prevent imbalance on key patient characteristics.

Exhibit E-21: Hospital-level sample strata

Strata number	Stratum
1	LEJR volume below median; ^a relative spending ratio less than 1.0
2	LEJR volume below median; ^a relative spending ratio 1.0-1.08
3	LEJR volume below median; ^a relative spending ratio above 1.08
4	LEJR volume above median; relative spending ratio less than 1.0
5	LEJR volume above median; relative spending ratio 1.0-1.08
6	LEJR volume above median; relative spending ratio above 1.08
7	Low volume: fewer than 63 annual LEJR discharges

Notes: LEJR = lower extremity joint replacement.

^a The median of the volume distribution is the median for hospitals not assigned to stratum 7 (i.e., conditional on LEJR volume greater than 63). The reference median was 191 annual LEJR discharges during the baseline. We defined the median according to the volume distribution across all hospitals that were eligible for selection into the CJR model (i.e., hospitals in MSAs chosen by CMS for the CJR model, and control hospitals in MSAs that were eligible for selection into the model but were not selected).

1. Identifying hospitals unlikely to participate in a voluntary episode-based payment model

To identify hospitals that probably would not have participated if the CJR model was voluntary, we analyzed predictors of participation in a previous LEJR bundled payment model, the Bundled Payments for Care Improvement initiative. The Bundled Payments for Care Improvement initiative was a large, voluntary initiative with several opportunities for hospitals to volunteer to participate in episode-based payments for LEJRs. We limited the sample to urban hospitals, because so few Bundled Payments for Care Improvement- and CJR-participating hospitals were rural. We used a logit model to predict non-participation in Bundled Payments for Care Improvement LEJR episodes among all acute-care hospitals based on observable hospital-level characteristics, such as historical LEJR volume, size, ownership type, and academic status. Only historical LEJR discharge volume strongly predicted Bundled Payments for Care Improvement participation. We defined low volume as hospitals with 63 or fewer historical LEJR patients annually.

2. Survey administration

We mailed surveys to patients between 60 and 120 days after their LEJR discharge. Reminder postcards were sent one week later. Four weeks after the initial mailing, we mailed non-respondents a second survey. Outbound telephone follow-up with non-respondents began approximately eight weeks after the first mailing.²²

²² Sensitivity analysis during Wave 1 did not find any evidence that average time between discharge and survey response differed between the CJR and control groups, nor did we find any evidence that results varied when we controlled for time between discharge and survey receipt.

3. Response rates and analytic samples

The response rate for the all LEJR episodes sample was 70.7% for CJR and 71.4% for control patients – a small and insignificant difference (Exhibit E-22).²³ The all LEJR CJR analytic sample consisted of 5,374 completed survey responses, or 19.1% of all CJR patients discharged during the sampling period and included patients from 557 of the 663 CJR participant hospitals. The analogous control analytic sample consisted of 5,129 completed survey responses, or 13.1% of all control patients, and included patients from 690 of 757 control hospitals.

Exhibit E-22: Sample size and response rate by group, Waves 1 and 2 combined

Group	Patients surveyed (starting sample)		Survey responses received (analytic sample)		Response rate	
	CJR	Control	CJR	Control	CJR	Control
All LEJR	7,604	7,188	5,374	5,129	70.7%	71.4%
Fracture	2,671	2,464	1,124	1,138	42.1%	46.2%**
Low volume	1,467	1,363	844	852	57.5%	62.5%

Source: Lewin analysis of survey data for patients with discharge from LEJR surgery in March, April (Wave 1), September, or October (Wave 2) 2017.

Notes: Significance of difference in response rate determined by t-test: ** p < 0.05).
LEJR = lower extremity joint replacement.

The response rate for fracture patients was 42.1% for CJR and 46.2% for the control group patients: a statistically significant difference (p<0.05). The fracture CJR analytic sample consisted of 34.0% of all CJR fracture patients discharged during the sampling period and included patients from 398 of the 553 CJR participant hospitals with a fracture episode.

In the low-volume hospital group, the response rate for CJR patients was 57.5% and 62.5% for the control group (the difference was not statistically significant). The survey included respondents from 182 out of 211 CJR participant low-volume hospitals and 178 out of 208 control hospitals.

B. Analytic methodology

1. Survey domains and measures

We analyzed the 20 survey measures, organized in four domains (functional status and pain, caregiver help, care experience, and overall status), described in Exhibit E-23.

²³ We dropped 63 hospitals from the control group after we fielded Waves 1 and 2, to be consistent with the control group used in the secondary data analyses. This resulted in the deletion of 422 unique observations from the control group analytic sample.

Exhibit E-23: Patient survey domains and measures

Domain	Survey measures ^a	Description of survey measures
Functional status and pain	Change in mobility ^b	Use of a mobility aid
		Ability to walk by self without rest
		Walking up or down stairs
		Difficulty rising from sitting
		Difficulty standing
	Change in toileting	Difficulty getting on/off toilet
	Change in pain	Pain interferes with normal activities
Change in medication	Medication intensity	
Caregiver help	Any caregiver help	Any caregiver help
	Caregiver help (composite)	Caregiver help with putting on/taking off clothes
		Caregiver help using toilet
		Caregiver help with bathing
Care transition	Discharged from hospital on time	Discharged from hospital on time
	Appropriate level of care after inpatient discharge	Appropriate level of care after inpatient discharge
	Received necessary durable medical equipment	Received necessary durable medical equipment
Satisfaction with care management	Satisfaction with care management (composite)	Satisfaction that health care providers listened to preferences about medical treatment
		Satisfaction with discharge destination
		Satisfaction with care coordination
		Satisfaction with treatment instructions for patient/caregiver
Overall satisfaction	Satisfaction with overall recovery	Satisfaction with overall recovery

Notes:

^a Items regarding pain and medication refer directly to the joint that received surgery. All other items refer directly to the anchor hospitalization.

^b For the eight functional status and pain measures, we modeled the change in functional status, where change was the difference between recalled status the week prior to the LEJR surgery, and reported status at the time the survey was completed.

2. Composite measures

We created composite measures for two domains. Reliance on caregiver help, conditional on having any caregiver help, summarizes responses to three questions. Satisfaction with care management summarizes responses to four questions. To create the composite measure, we translated response items into numeric scores and set them so that zero represented “the most negative amount of the construct being measured” (e.g., most amount of caregiver help). Response categories were added, so that the composite measure for a given domain was the sum of scores for its individual questions. For example, the “caregiver help” summarizes three survey questions that each have three possible answers (0 – ‘complete help needed’, 1 – ‘some help needed’, or 2 – ‘no help needed’). The composite measure of “caregiver help” therefore ranges from zero (maximum help needed) to six (no help needed for any of the three tasks). Consistent

with the Consumer Assessment of Health Providers and Systems (CAHPS) scoring, we re-scaled the composite items so that scores ranged from zero to 100, where 0 again indicates the least favorable outcome of the construct being measured (i.e., greatest reliance on caregiver help, and least satisfaction with care management).

Exploratory factor analysis of early returns from wave 1 (which comprised approximately 85% of the total wave 1 responses) indicated that the survey items we grouped into composites are internally consistent and, for each composite, reflect a single construct that we can summarize with one number.

3. Weighting

Standard nonresponse weights generalized respondents to the sample drawn, and sampling weights generalized the sample to the population. The relevant population for our analysis was all CJR eligible LEJR patients (and separately, all fracture patients) discharged from CJR participant and control hospitals.

We employed entropy balancing to address potential differences in key patient characteristics across the CJR and control groups. The weights minimize differences between the CJR and control groups on key factors, and minimize differences in observable patient characteristics between CJR or control respondents relative to the full CJR population.

C. Results estimation

For each of the patient survey measures, we estimated the difference between CJR and control patients by group (i.e. all LEJR, hip-fracture, low volume).

To illustrate the calculation of the differences, consider the non-linear model listed below for beneficiaries i , hospitals k , and wave t :

$$Y_{i,k,t} = f(b_1 + b_2 \cdot CJR_i + \sum_{j=1}^7 b_{3,j} \cdot S_{j_i} + X_{i,k,t}' \cdot B + u_{i,k,t}) \quad (2)$$

- $f(\bullet)$ is a general functional form
- Coefficient b_2 captures the difference in outcomes between CJR and control group episodes.
- S_j indicates fixed effects for the seven survey strata
- $X_{i,k,t}$ indicates risk factors controlled for in our model.

D. Risk adjustment to control for differences in patient demographics and clinical risk factors

We controlled for potential differences in characteristics of the procedure, patient demographics and enrollment, prior health conditions, prior utilization measures, hospital provider characteristics, and whether the survey was completed by proxy (represented in Exhibit E-24). We selected a set of patient-level characteristics to serve as covariates for all survey analyses,

based on our experience with the Bundled Payments for Care Improvement patient survey, conceptual considerations (i.e., factors predicted to be important based on theory), and congruence with claims and assessment-based analyses.

Exhibit E-24: Risk adjustment to control for differences in patient demographics and clinical risk factors

Domain	Variables
Characteristics of the procedure	<ul style="list-style-type: none"> ▪ Fracture^a ▪ Knee procedure^a ▪ MS-DRG
Patient demographics and enrollment	<ul style="list-style-type: none"> ▪ Age ▪ Sex ▪ Dual Medicare/Medicaid eligibility ▪ Originally qualified for Medicare due to disability ▪ Assignment to NextGen or Track 3 SSP ACO^c ▪ Assignment to other ACO ▪ Self-reported race/ethnicity^b ▪ Self-reported education^b ▪ Self-reported pre-hospital functional status^b
Prior health conditions	<ul style="list-style-type: none"> ▪ HCC score ▪ Stay in skilled nursing facility or nursing home in six months prior to admission
Survey dimensions	<ul style="list-style-type: none"> ▪ Wave of survey ▪ Proxy status (patient had help from someone else in responding to the survey)
Optional patient, hospital, and MSA-level covariates ^d	<ul style="list-style-type: none"> ▪ Survey mode (phone/mail) ▪ Self-reported income ▪ Hospital size (staffed beds) ▪ Hospital academic affiliation ▪ Hospital ownership type ▪ Hospital prior Bundled Payments for Care Improvement Experience (LEJR)^e ▪ Hospital prior Bundled Payments for Care Improvement experience (non-LEJR) ▪ LEJR market competitiveness in MSA ▪ Medicare Advantage penetration in MSA (%)

Notes: ACO = accountable care organization, HCC = hierarchical condition category, LEJR = lower extremity joint replacement, MS-DRG = Medicare severity-diagnosis related group, MSA = metropolitan statistical area, SSP = Shared Savings Program.

^a The fixed set of variables for the fracture sample excluded “hip fracture” and “knee procedure” since, by definition, everyone in this sample had a hip fracture.

^b For risk adjustment measures that are self-reported (i.e., pre-hospital functional status; race/ethnicity; education), we coded all missing responses as 0 and included an additional binary variable indicating “missing item” (e.g., missing race/ethnicity).

^c Patients in NextGen or Track 3 ACOs were not eligible for CJR during Wave 2. However, this exclusion had not been applied prior to Wave 1. We controlled for these patients analytically.

^d While the first four domains acted as fixed covariates for our models, each measure’s final risk-adjusted model included some unique combination of these optional variables, as well as squared and interaction terms.

^e CJR participant hospitals that previously participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR were included in the analysis. However, to be included in the control group, hospitals could not have participated in the risk-bearing phase of the Bundled Payments for Care Improvement initiative for LEJR.

We used a stepwise regression to select a set of potential additional patient-level variables (i.e., survey mode and self-reported income); hospital-level variables (i.e., hospital size, academic affiliation, ownership type, prior Bundled Payments for Care Improvement LEJR experience, prior Bundled Payments for Care Improvement non-LEJR experience); and MSA-level variables (i.e., LEJR Herfindahl-Hirschman Index and Medicare Advantage Penetration) for each outcome, in each population (all-LEJR, fracture, and low-volume hospitals). Fourteen covariates were fixed across all regressions, and we also tested squared and interacted terms from among these.

E. Comparing recalled functional status in the week prior to hospitalization between CJR and control respondents

As described above, we compared changes in self-reported functional status between CJR and control respondents. We defined change as the difference between recalled status the week prior to the LEJR surgery and reported status at the time the survey was completed. Although we controlled for recalled pre-hospital functional status, our results may still be biased if CJR and control respondents had substantially different functional status prior to surgery. For each of the eight functional status measures, we conducted two analyses to test for this possibility.

We first tested the null hypothesis that average pre-hospital functional status was identical between the CJR and control respondent groups. We regressed pre-hospital functional status on CJR, with standard errors clustered at the MSA level. This test is equivalent to a t-test of equal means. We next tested the null hypothesis of equal distributions of pre-hospital functional status between CJR and control respondents. We ran a multinomial logistic regression on CJR, with the response options for the given measure as the dependent variable, and standard errors clustered at the MSA level. This test is analogous to a χ^2 test of equal distributions. All tests were weighted for sampling design and nonresponse.

We did not find any evidence of substantive differences between CJR and control respondents in their pre-hospital functional status, in any of the three analytic samples (Exhibit E-25).

Exhibit E-25: Comparing test-statistic p-values for pre-hospital functional status between CJR and control respondents

Measure	LEJR		Fracture		Low Volume	
	Equal means test (p-value)	Equal distributions test (p-value)	Equal means test (p-value)	Equal distributions test (p-value)	Equal means test (p-value)	Equal distributions test (p-value)
Pain limiting regular activities	0.93	1.00	0.35	0.72	0.64	0.27
Medication intensity	0.51	0.62	0.39	0.55	0.94	0.76
Use of a mobility device	0.84	0.48	0.41	0.70	0.57	0.44
Walking without rest	0.96	0.99	0.19	0.74	0.92	0.88
Going up or down stairs	0.98	0.44	0.23	0.59	0.29	0.74
Rising from sitting	0.70	0.73	0.38	0.13	0.45	0.27
Standing	0.92	0.69	0.82	0.88	0.95	0.96
Getting on or off the toilet	0.74	0.51	0.68	0.90	0.88	0.16

Source: Lewin analysis of patient survey data for episodes with discharge in March, April, September, and October 2017.

Notes: This exhibit shows results from two tests. The first tests the null hypothesis that CJR and control respondents in a given population (all LEJR or fractures) have equal pre-hospital functional status, on average. The second tests the null hypothesis that CJR and control respondents in a given population have equal distributions of pre-hospital functional status across all response options. Both tests are run separately for all eight functional status measures, for the all-LEJR and fracture populations. The table reports p-values for each test. Insignificant p-values indicate a failure to reject equality between CJR and control respondents.

LEJR = lower extremity joint replacement.

F. Limitations

The patient survey does not include every LEJR patient and is limited to four months of intervention period data. Although CJR and control survey samples were well matched, CJR patients with fractures were less likely to respond than control patients. This suggests that there could be differences in unobservable characteristics between CJR and control respondents that are not accounted for by our weighting and risk-adjustment.

VII. Hospital Survey

This section describes the CJR hospital survey data collection and analysis process.

A. Survey sample and administration

1. Identifying survey respondents and contact information

The survey was administered to a POC at each CJR participant hospital that provided LEJR during PY1. There were 798 CJR participant hospitals included in the July 2017 CJR participant list; 28 hospitals were excluded because they did not have POC information. Another, 110 hospitals were excluded because they did not perform LEJR surgeries during PY1. The final sample included 660 (82.7%) CJR participant hospitals.

2. Survey administration

The survey instrument was designed, in collaboration with CMS and clinicians, to address questions about hospital implementation of care redesign activities and the influence of the CJR model on the adoption of these activities, and perceptions of the impact of the model on outcomes. The web-based instrument was pilot tested with 12 CJR participant hospitals (of 19 that were contacted) and fielded from August 15 to October 6, 2017. An invitation containing a link to the survey was sent to each POC in the sample (excluding respondents to the pilot survey); non-responders received up to three follow-up reminder emails and up to eight telephone calls. A total of 196 hospitals responded to the survey (29.7% response rate).

B. Methods

1. Domains and measures

The survey instrument (Appendix M) included five domains of questions: respondent's role, the hospital's participation in value-based payment models, implementation of care redesign activities, influence of the CJR model on care redesign, and impact of the CJR model on key outcomes (e.g., complications, readmissions, patient satisfaction). Composite index scores were created for the two primary domains of interest to CMS. Exhibit E-26 provides information about these two main domains and the associated composite scores.

Exhibit E-26: Analytic measures constructed using responses to the CJR hospital survey

Domain	Measures
Care redesign implementation (14 activities)	Hospitals reported whether they had already implemented, were planning to implement, or had not implemented 14 care redesign activities. We created binary measures reflecting whether hospitals had or had not currently implemented each activity. A composite index score was calculated by summing the number of activities reported as currently implemented, out of 14 activities overall, and was normalized to reflect a total possible score of 100 percentage points (Cronbach’s alpha = 0.70).
Influence of the CJR model on care redesign (13 activities)²⁴	For each care redesign activity that was currently implemented or planned to be implemented, respondents reported the influence of the CJR model on their decision to adopt. Binary measures were created for each activity reflecting whether the CJR model was at all influential (little, somewhat, very or extremely influential vs. not influential). A composite index score was calculated by summing the number of activities reported as the CJR model being influential in their adoption, out of 13 activities overall, and normalized to reflect a total possible score of 100 points (Cronbach’s alpha = 0.84).

Information on hospital characteristics and financial performance from secondary data sources, including: POS (December 2016); Annual IPPS (FY 2016); Provider, Enrollment, Chain, and Ownership System (PECOS) (December 2014); Medicare claims; and CJR programmatic data, supplement the survey measures (Exhibit E-27).

Exhibit E-27: Hospital characteristics and performance to supplement the hospital survey

Hospital characteristics	Definition
Hospital ownership	Not-for-profit, for-profit, vs. government
Bed size	Small (≤ 99 beds), medium (100-399 beds), vs. large (≥ 400 beds)
Chain ownership	Owned by a chain (yes vs. no)
Safety-net hospital	Designated safety-net hospital (yes vs. no)
Teaching hospital	Any affiliation with a medical school (yes vs. no)
LEJR share	Proportion of LEJR discharges relative to all hospital Medicare discharges during the baseline period (4% or greater vs. less than 4%)
Low volume	Hospitals with fewer than 20 episodes or no episodes during the baseline period (yes vs. no) ²⁵
Mandatory MSA	One of the 34 MSAs in which hospitals would be required to continue participation in the CJR model in PY3 and beyond (yes vs. no)
Change in payment	Change in average total Medicare episode payment from baseline to PY2 (continuous)
NPRA	Average NPRA amount per episode in PY2 (continuous)

Notes: LEJR = lower extremity joint replacement, MSA = metropolitan statistical area, NPRA = net payment reconciliation amount, PY = performance year.

²⁴ This domain was only asked for 13 of the 14 care redesign activities, because identification of CJR patients in the electronic health record (EHR) was excluded from this domain as redundant.

²⁵ The definition of “low volume” was taken from the CJR Final Rule and is used by CMS to set hospital quality-adjusted target prices.

2. Weighting

A non-response analysis was conducted to assess the generalizability of the hospital respondents to CJR participant hospitals eligible to participate in the survey (n=660). Statistical significance of factors associated with survey response was determined using chi-square tests. We identified three hospital characteristics that were the strongest predictors of non-response: bed size, LEJR share, and hospital ownership. Non-response weights were calculated for each of the hospital characteristics and applied to our descriptive and bivariate analyses to generalize results to CJR participant hospitals eligible to participate in the survey.²⁶

3. Results estimation

For survey measures, we calculated frequencies and summary statistics for all of the close-ended questions included in the survey. For open-text items, we report the number of hospitals responding in each thematic category. Bivariate Poisson regressions were conducted to evaluate the relationship between the individual composite index scores and different hospital characteristics and financial performance using F-tests to assess significance.

C. Limitations

The response rate to the hospital survey was approximately 30%, and, before applying non-response weights, the hospital representatives responding to this survey did not reflect the sample of CJR participant hospitals eligible to participate in this survey. Although the characteristics of hospitals responding to the survey were similar to the broader population on most measures after applying non-response weights, it is possible that respondents and non-respondents differed on other key unobserved factors. Further, it is possible that the qualifications and knowledge of respondents varied across hospitals. Lastly, the study design was a cross-sectional survey and thus analyses conducted for the hospital survey cannot inform statements about cause and effect.

²⁶ Non-response weights were calculated as the inverse probability of responding to the Hospital Survey within each cell. For example, if a cell (e.g., small, for-profit, high proportion of LEJR discharges) had 100 hospitals and 40 responded to the survey, the response rate for that group would be 0.40 and the non-response weight would be the inverse of 0.40, or $1/0.40 = 2.5$.

VIII. Qualitative and Mixed Methods Analysis

A. Data collection

We took notes during site visit and telephone interviews and, if the interviewee agreed, recorded the interview. Site visit recordings were transcribed, reviewed for accuracy, and edited to remove provider names and other identifiers. Site visit interviews were staffed with at least one interviewer and one note taker. Provider telephone interview recordings were used to enhance interviewer notes. Provider telephone interviews were staffed with one interviewer and one note taker. Notes and transcripts from both site visits and telephone interviews were organized and entered into ATLAS.ti software (version 7.5.18; Scientific Software Development GmbH, Berlin, Germany) for coding and analysis.

B. Thematic analysis

We developed analytic codebooks based on the protocols developed for site visits and telephone interviews. The codebooks contained categories to use in the ATLAS.ti software to characterize transcripts from site visits and notes from telephone interviews and identify key themes across hospitals and markets. Throughout the analysis the codebooks were refined (i.e., codes were dropped, consolidated, added, or revised) to better capture patterns as they emerged.

All staff involved in coding notes received systematic training from an experienced analyst. Coders began their training by reviewing and coding one interview. Their codes were then compared to those of the trainer. Discrepancies in coding were discussed, and this review process was repeated until consistency was established. The coding team met regularly to discuss the application of codes and potential modifications to the codebook.

1. Limitations

The analysis of the site visit and telephone interview data provide descriptions of themes, patterns, or taxonomies in response to our protocols, which may not represent all CJR participants. For both site visits and interviews, we intentionally oversampled hospitals that had historically high average episode payments relative to their quality-adjusted target price. This was to ensure that we heard about the widest range of strategies implemented in response to the model from hospitals with the most need to respond.

C. Case study approach

We used a case study approach to provide an in-depth description of start-up and implementation experiences for each hospital that participated in site visits. After each site visit, we reviewed the interview data and identified which strategy or set of strategies the hospital implemented in response to the CJR model. Where possible, we included other evaluation data sources in the case studies to provide quantitative characteristics about the hospitals and MSAs. We used claims-based outcomes to assess how payments and utilization may have shifted under the CJR model.

We also incorporated the case study findings into the annual report to provide contextual examples when appropriate. The inclusion of case studies in this way allows a more comprehensive understanding of the effects of the CJR model on hospitals and their associated PAC providers and orthopedic surgery groups. The 11 PY2 case studies are located in the case study supplement.

D. Clinical review panel

Information obtained from five Clinical Review Panels provided clinician insights into the impact of the CJR model on payments, utilization or patterns of care, and quality of care identified through quantitative data analysis or qualitative findings. Specific panel topics are listed in Exhibit E-28. Six panelists of various backgrounds and expertise participated in all Clinical Review Panels, who were identified through professional contacts and vetted by CMS. Specifically, the panel was comprised of a private practice orthopedic surgeon, an academic orthopedic surgeon, a physical therapist with home health expertise, a gerontological nurse practitioner, an orthopedic nurse, and a geriatrician with SNF expertise.

The objectives of the Clinical Review Panels were to:

- Review and comment upon changes in patterns of care and quality outcomes identified in the quarterly reports.
- Report on changes in clinical practice that may affect the CJR model.
- Present medical or provider community feedback on the CJR model.
- Raise questions for further analysis.
- Corroborate qualitative findings.
- Provide additional insight into utilization and quality patterns we might expect given the incentives of the program.
- Identify practice patterns changes that may differentially impact subpopulations of Medicare patients.
- Aid in the identification of promising practices and unintended consequences.
- Assist in the detection of the CJR model's overlap with other Centers for Medicare and Medicaid Innovations (CMMI) models and demonstrations.

All Clinical Review Panels were administered in the same manner and convened via webinar. Panelists received CMS-approved packet to review prior to each webinar. This packet consisted of relevant CJR model background information, an agenda, general expectations for the Clinical Review Panel, and presentation slides that included evaluation results and the probing questions for discussion. Dr. Christine LaRocca, a geriatric medicine physician and medical director at Telligen, led a discussion structured on questions based on the evaluation results to date. Each question was discussed for approximately 20 minutes and all participants were given an opportunity to answer. The meetings were recorded and transcribed to ensure accurate records of the discussions. Key

takeaways from each Clinical Review Panel were used to inform our analyses and interpretations of results.

Exhibit E-28: Clinical Review Panel topics

Panel	Topic(s)
1 (July 2017)	Introduction to the CJR model and Clinical Review Panel responsibilities
2 (October 2017)	Early findings from claims-based analysis and qualitative data
3 (January 2018)	Claims- and assessment-based findings for elective episodes
4 (May 2018)	Claims- and assessment-based findings for fracture episodes
5 (August 2018)	Selected qualitative findings: rehabilitation and discharge planning

Appendix F: Characteristics of CJR Participant Hospitals that did and did not Receive Reconciliation Payments

Exhibit F-1: Characteristics of CJR participant hospitals by whether or not they received reconciliation payments in PY1 and PY2

Domain	Measure	Reconciliation payments in both years (n=300) [1]	Never received reconciliation payments (n=157) [2]	Reconciliation payments in PY1, not PY2 (n=54) [3]	Reconciliation payments in PY2, not PY1 (n=167) [4]	p-value	Significant differences between groups
Ownership	Percent not-for-profit	68.3%	49.7%	57.4%	62.9%	p<0.01	NA
	Percent for-profit	16.3%	35.0%	22.2%	18.0%		
	Percent government	15.3%	15.3%	20.4%	19.2%		
Census region	Percent Northeast	22.0%	16.6%	31.5%	20.4%	p=0.30	NA
	Percent South	30.0%	36.9%	25.9%	26.9%		
	Percent Midwest	23.0%	19.1%	18.5%	21.0%		
	Percent West	25.0%	27.4%	24.1%	31.7%		
Other hospital characteristics	Mean bed count	336.6	305.2	343.2	321.3	p=0.65	NA
	Percent teaching hospital	44.0%	40.1%	50.0%	42.5%	p=0.63	NA
	Percent part of a chain	79.3%	80.1%	64.8%	77.1%	p=0.10	NA
	Mean DSH patient percentage	26.1%	36.8%	37.3%	32.3%	p<0.01	1-2,1-3,1-4
	Percent with historical episode payments below their PY1 quality-adjusted target price	45.3%	23.9%	21.6%	32.7%	p<0.01	NA
MSA characteristics	Percent located in historically high-payment MSA	62.3%	77.1%	72.2%	66.5%	p<0.05	NA
	Mean SNF beds per 10,000 population	51.3	48.2	48.8	50.7	p=0.30	NA
LEJR episodes	Mean annual baseline LEJR volume	177.9	96.2	81.8	128.5	p<0.01	1-2, 1-3, 1-4
	Mean baseline LEJR market share	13.3%	6.6%	4.7%	8.0%	p<0.01	1-2, 1-3, 1-4
	Mean baseline hospital LEJR share	9.2%	3.6%	3.5%	6.1%	p<0.01	1-2, 1-3, 1-4
	Mean total PY1 and PY2 episodes	307.0	126.2	99.4	174.0	p<0.01	1-2, 1-3, 1-4

Domain	Measure	Reconciliation payments in both years (n=300) [1]	Never received reconciliation payments (n=157) [2]	Reconciliation payments in PY1, not PY2 (n=54) [3]	Reconciliation payments in PY2, not PY1 (n=167) [4]	p-value	Significant differences between groups
Baseline patient complexity	Percent fracture, mean	16.7%	26.8%	27.5%	24.2%	p<0.01	1-2, 1-3, 1-4
	HCC score, mean	1.08	1.31	1.28	1.20	p<0.01	1-2, 1-3, 1-4, 2-4
PY1 patient complexity	Percent fracture, mean	15.4%	29.6%	31.8%	23.7%	p<0.01	1-2, 1-3, 1-4
	HCC score, mean	1.06	1.38	1.27	1.30	p<0.01	1-2, 1-3, 1-4
PY2 patient complexity	Percent fracture, mean	15.5%	29.3%	37.0%	22.8%	p<0.01	1-2, 1-3, 1-4, 2-4, 3-4
	HCC score, mean	1.06	1.40	1.38	1.18	p<0.01	1-2, 1-3, 1-4, 2-4, 3-4
Quality performance	PY1 CJR quality composite score, mean	12.4	7.2	9.7	9.6	p<0.01	1-2, 1-3, 1-4, 2-3, 2-4
	PY2 CJR quality composite score, mean	12.4	7.0	7.5	10.6	p<0.01	1-2, 1-3, 1-4, 2-4, 3-4

Source: Lewin analysis of CMS payment contractor and CJR quality performance data for CJR participating hospitals in performance year 1 (episodes starting on or after April 1, 2016 and ending on or before December 31, 2016) and performance year 2 (episodes ending between January 1 and December 31, 2017), and Medicare claims and enrollment data for episodes included in PYs 1 and 2.

Notes: ANOVAs for continuous variables and chi-square tests for categorical variables were used to evaluate differences between NPRA groups at the 99%, 95%, or 90% significance levels, as indicated by dark, medium, and light orange shaded bars, respectively.

Group Definitions: CJR-participant hospitals with positive NPRA in a performance year receive reconciliation payments under the CJR model. Hospitals with no or negative NPRA included hospitals with episode payments above their quality-adjusted target price (43% in PY1 and 24% in PY2) and hospitals with episode payments below their quality-adjusted target price but with quality composite scores “below acceptable quality” making them ineligible for positive NPRA (5% in PY1 and 7% in PY2).

Forty-three hospitals were excluded from the analysis because they had no episodes in PYs 1 and/or 2.

The CJR quality composite score is comprised of: total hip arthroplasty (THA)/total knee arthroplasty (TKA) complications rate; Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) linear mean roll-up measure; and submission of CJR patient reported outcome (PRO) data. Measure data are updated annually.

DSH = disproportionate share hospital, HCC = hierarchical condition category, LEJR = lower extremity joint replacement, MSA = metropolitan statistical area, NA = not applicable, NPRA = net payment reconciliation amount, PY = performance year, SNF = skilled nursing facility.

Appendix G: Outcome Definitions

Exhibit G-1: Claims-based outcome definitions

Measure category	Outcome name	Definition	Measurement period(s)	Eligible sample ¹
Medicare payments	Total Medicare standardized allowed amounts per episode ²	The sum of Medicare payment and beneficiary out-of-pocket amounts for related items and services covered by Medicare Part A and Part B ³ performed during the acute inpatient hospitalization (anchor stay) through the 90-day post-discharge period that are included in the episode.	Inpatient anchor stay through 90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have non-zero anchor hospitalization payments and Part B payments included in the episode.
	Medicare Part A standardized allowed amounts per episode, by service	The sum of Medicare payment and beneficiary out-of-pocket amounts for readmissions, SNF, IRF, and LTCH services covered under Medicare Part A. Includes all costs incurred during the 90 days following discharge	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have non-zero anchor hospitalization payments and total Part A and Part B payments.
	Medicare standardized allowed amounts for HHA services per episode	The sum of Medicare payment and beneficiary out-of-pocket amounts for HHA services covered under Medicare Part A or Part B HHA.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have non-zero anchor hospitalization payments and total Part A and Part B payments.

¹ The eligible sample column notes the inclusion criteria for episodes as defined by the Final Rule and additional measure-specific inclusion criteria required for the evaluation.

² Standardized payments remove wage adjustments and other Medicare payment adjustments (e.g., GME, IME, and DSH). Allowed amounts include beneficiary cost sharing.

³ Episode-related items and services paid under Medicare Part A or Part B, after exclusions are applied, include: physician services; inpatient hospital services (including readmissions with certain exceptions discussed in the Final Rule); inpatient psychiatric facility (IPF) services; LTCH services; IRF services; SNF services; HHA services; hospital outpatient services; outpatient therapy services; clinical laboratory services; DME; Part B drugs; and hospice.

Measure category	Outcome name	Definition	Measurement period(s)	Eligible sample ¹
Medicare payments	Medicare Part B standardized allowed amounts per episode	The sum of Medicare payment and beneficiary out-of-pocket amounts for related items and services covered under Medicare Part B (except HHA services) including physician evaluation and management services, outpatient therapy services (speech, occupation, and physical therapy), imaging and lab services, procedures, DME, all other non-institutional services, and other institutional services.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have non-zero anchor hospitalization payments and total Part A and Part B payments.
	Medicare standardized allowed amounts for services provided in the 30 day PEP per episode	The sum of Medicare payment and beneficiary out-of-pocket amounts for all health care services covered under Medicare Part A or B performed during the 30-day PEP	30-day post-episode period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have non-zero anchor hospitalization payments and total Part A and Part B payments.
Utilization	First discharge to IRF	The percent of all episodes with beneficiaries initially discharged to an IRF. The first PAC setting is an IRF (a freestanding facility or a distinct unit within an acute hospital) if admission to the IRF occurred within the first five days of hospital discharge and no other PAC use occurred prior to IRF admission. If the beneficiary is directly transferred to another ACH after the anchor stay, then the first PAC setting was defined within five days of the transfer discharge.	1 st to 5 th day after discharge from the anchor/transfer hospitalization	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017.
	First discharge to SNF	The percent of all episodes with beneficiaries initially discharged to a SNF. The first PAC setting is a SNF if admission to the SNF occurred within the first five days of hospital discharge and no other PAC use occurred prior to SNF admission. If the beneficiary is directly transferred to another ACH after the anchor stay, then the first PAC setting was defined within five days of the transfer discharge.	1 st to 5 th day after discharge from the anchor/transfer hospitalization	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017.

Measure category	Outcome name	Definition	Measurement period(s)	Eligible sample ¹
Utilization	First discharge to HHA	The percent of all episodes with beneficiaries initially discharged to a HHA. The first PAC setting is an HHA if admission to the HHA occurred within 14 days of hospital discharge and no other PAC use occurred prior to HHA admission. If the beneficiary is directly transferred to another ACH after the anchor stay, then the first PAC setting was defined within 14 days of the transfer discharge.	1 st to 14 th day after discharge from the anchor/transfer hospitalization	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017.
	First discharge to home without HHA	The percent of all episodes with beneficiaries initially discharged to home without HHA services. The first PAC setting is home without HHA if the beneficiary is not admitted to a SNF or IRF within 5 days of hospital discharge and is not admitted to an HHA within 14 days of hospital discharge. If the beneficiary is directly transferred to another ACH after the anchor stay, then the first PAC setting was defined within 14 days of the transfer discharge.	1 st to 14 th day after discharge from the anchor/transfer hospitalization	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017.
	Number of IRF days	The average number of IRF days of care during the 90-days post-discharge period.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have at least one IRF day during this period.
	Number of SNF days	The average number of SNF days of care during the 90-day post-discharge period.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have at least one SNF day during this period.

Measure category	Outcome name	Definition	Measurement period(s)	Eligible sample ¹
Utilization	Number of HHA visits	The average number of HHA visits during the 90-day post-discharge period.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have at least one HHA visit during this period.
	Number of HHA PT/OT visits	The average number of HHA physical therapy and occupational therapy visits during the 90-day post-discharge period.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have at least one HHA visit during this period.
	Number of PT/OT visits	The average number of outpatient physical therapy and occupational therapy (PT/OT) visits during the 90-day post-discharge period.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) have at least one outpatient PT/OT visit during this period.
	Prehabilitation	Any pre-surgical outpatient physical therapy or occupational therapy visits during the 30 days before the anchor hospitalization.	30-day pre-anchor hospitalization	Beneficiaries who: 1) have an elective procedure (non-fracture); 2) have a complete FFS enrollment history six months prior to the anchor stay; 3) have consistent, reliable sex and age data (age <115); 4) maintain Parts A and B enrollment throughout the measurement period; 5) have a measurement period that ends on or before December 31, 2017.
	Anchor length of stay (LOS)	The number of days between the admission date and the discharge date for the LEJR anchor stay. Anchor LOS is winsorized by MS-DRG and quarter at the 1 st and 99 th percentiles.	Acute anchor stay	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before October 3, 2017.

Measure category	Outcome name	Definition	Measurement period(s)	Eligible sample ¹
Quality	Unplanned readmission rate	The proportion of episodes with one or more unplanned readmissions for any eligible condition. This measure was based on specifications for the NQF-endorsed all-cause unplanned readmission measure (NQF measure 1789). Following these specifications, we excluded planned admissions, based on AHRQ Clinical Classification System Procedure and Diagnoses codes.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) are discharged from the anchor hospital stay in accordance with medical advice.
	Emergency department visit rate	The proportion of episodes with one or more ED visits during the 90-day post-discharge period for which the beneficiary required medical treatment but was not admitted to the hospital. Eligible ED visits are outpatient claims with a code indicating the beneficiary used the emergency department but was not admitted to the hospital.	90-day post-discharge period	Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have a measurement period that ends on or before December 31, 2017; 5) are discharged from the anchor hospital stay in accordance with medical advice.
	All-cause mortality rate	Death from any cause during the anchor hospitalization or 90-day post-discharge period. For beneficiaries with multiple LEJR hospitalizations during the baseline and intervention periods, one hospitalization was randomly selected across the baseline and intervention periods for inclusion in this measure.	Anchor stay and 90-day post-discharge period	Under the CJR model, death during the anchor stay or 90-day PDP cancels the episode. Therefore, this analysis includes CJR and control group episodes as well as beneficiaries at CJR participant and control group hospitals that would have been identified as episodes if they had not died during the episode of care. Beneficiaries who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age <115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) have not received hospice care in the six months prior to admission; 5) have a measurement period that ends on or before December 31, 2017; 6) are discharged from the anchor hospital stay in accordance with medical advice.

Measure category	Outcome name	Definition	Measurement period(s)	Eligible sample ¹
Quality	Incidence of any complications	<p>The proportion of elective episodes with incidence (during the anchor stay or a readmission) of: acute myocardial infarction (AMI), pneumonia, or sepsis/septicemia within the 7-day PDP; or surgical site bleeding or pulmonary embolism within the 30-day PDP; or mechanical complications, periprosthetic joint infection, or wound infection within the 90-day PDP.</p> <p>This measure was based on specifications for the NQF-endorsed THA/TKA complications measure (NQF measure 1550). Death in the 30 days after discharge is part of the technical definition, but is not included in our analysis because beneficiaries who died during the anchor stay or in the 90-day PDP are excluded from the CJR model.</p>	90-day post-discharge period	Beneficiaries who: 1) have an elective procedure (non-fracture); 2) have a complete FFS enrollment history six months prior to the anchor stay; 3) have consistent, reliable sex and age data (age <115); 4) maintain Parts A and B enrollment throughout the measurement period; 5) have a measurement period that ends on or before December 31, 2017; 6) are discharged from the anchor hospital stay in accordance with medical advice.

Notes: ACH = acute care hospital, AHRQ = Agency for Healthcare Research and Quality, DME = durable medical equipment, DSH = disproportionate share hospital, ED = emergency department, FFS = fee-for-service, GME = graduate medical education, HHA = home health agency, IME = indirect medical education, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, LOS = length of stay, LTCH = long-term care hospital, MS-DRG = Medicare severity-diagnosis related group, NQF = National Quality Forum, OT = occupational therapy, PAC = post-acute care, PDP = post-discharge period, PEP = post-episode payments, PT = physical therapy, SNF = skilled nursing facility, THA = total hip arthroplasty, TKA = total knee arthroplasty.

Exhibit G-2: Assessment-based quality outcome definitions

First PAC setting	Outcome name	Definition	Measurement period(s)	Eligible sample ⁴
HHA	Improved ambulation/locomotion	Percent of patients who improve status in ambulation/locomotion over the measurement period (i.e., change in performance score that was negative).	From start or resumption of HHA care to HHA discharge, if HHA discharge is within 90 days of hospital discharge. Else, from start or resumption of HHA care to the 60-day recertification assessment.	Beneficiaries whose first PAC setting is HHA who: 1) have a complete FFS enrollment history six months prior to the anchor hospitalization; 2) have consistent, reliable sex and age data (age<115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) had a valid start or resumption of care assessment and at least one follow-up OASIS assessment within 90 days of hospital discharge; 5) were not transferred from HHA care to an inpatient facility during the HHA episode or at discharge; 6) could not perform the ADL independently (had pain) at start or resumption of care; 7) had no missing data used to calculate the performance score.
	Improved bed transferring	Percent of patients who improve status in bed transferring over the measurement period (i.e., change in performance score that was negative).		
	Reduced pain	Percent of patients whose frequency of pain when moving around reduced.		
SNF	Improved transfer, locomotion on unit, and walking in corridor	Percent of patients whose cumulative status in transfer, locomotion on unit, and walk in corridor improved over the measurement period (i.e., change in performance score that was negative).	SNF admission to SNF discharge, if SNF discharge is within 90 days of hospital discharge. Else, from SNF admission to the most recent MDS PPS assessment within 90 days of hospital discharge.	Beneficiaries whose first PAC setting is a SNF who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age<115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) had a valid 5-day MDS assessment and at least one follow-up MDS assessment within 90 days of hospital discharge; 5) were not indicated as comatose, whose life expectancy was greater than six months, and were not in hospice as of the 5-day MDS assessment; 6) were not independent in all three ADLs (for the first measure) and dressing (for the second measure) at the 5-day MDS assessment; 7) had no missing data used to calculate the performance score.
	Improved toilet use	Percent of patients with improved status in toilet use over the measurement period (i.e., change in performance score that was negative).		
	Without self-reported pain	Percent of patients who did not self-report moderate to severe pain in the first five days of their SNF stay.		

⁴ The eligible sample column notes the inclusion criteria for episodes as defined by the Final Rule and additional measure-specific inclusion criteria required for the evaluation.

First PAC setting	Outcome name	Definition	Measurement period(s)	Eligible sample ⁴
IRF	Average change in mobility score	Average change in a composite mobility score over the measurement period. The composite score ranges from 4 (worst) to 28 (best).	From IRF admission to IRF discharge	Beneficiaries whose first PAC setting is an IRF who: 1) have a complete FFS enrollment history six months prior to the anchor stay; 2) have consistent, reliable sex and age data (age<115); 3) maintain Parts A and B enrollment throughout the measurement period; 4) had a valid IRF-PAI assessment with discharge at or before 90 days after hospital discharge; 5) were not diagnosed with the following conditions on the IRF-PAI assessment: coma, persistent vegetative state, complete tetraplegia, locked-in syndrome, severe anoxic brain damage, cerebral edema, or compression of brain; 6) were not independent in mobility (for the first measure) and lower body dressing (for the second measure) at the time of admission; 7) had a length of stay longer than three days; 8) were not discharged from the IRF against medical advice; 9) had no missing data used to calculate the performance score.

Notes: ADL = activities of daily living, DiD = difference-in-differences, FFS = fee-for-service, HHA = home health agency, IRF = inpatient rehabilitation facility, IRF-PAI = Inpatient Rehabilitation Facility-Patient Assessment Instrument, MDS = Minimum Data Set, OASIS = Outcome and Assessment Information Set, PAC = post-acute care, PPS = prospective payment system, SNF = skilled nursing facility.

Appendix H: Payment, Utilization, Quality, and Activities of Daily Living Results

Exhibit H-1: Risk-adjusted claims-based difference-in-differences results for payment, utilization, and quality metrics, LEJR episodes, PY1-2

Domain	Measure	CJR	Control Group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Payments	Total payments	139,661	177,262	\$27,082	\$25,059	\$26,754	\$25,729	-\$997	-3.7%	p<0.01	-\$1,412	-\$583
	SNF payments	139,661	177,262	\$5,459	\$3,986	\$5,453	\$4,489	-\$508	-9.3%	p<0.01	-\$778	-\$238
	IRF payments	139,661	177,262	\$1,524	\$888	\$1,416	\$1,137	-\$357	-23.4%	p<0.01	-\$555	-\$159
	HH payments	139,661	177,262	\$2,161	\$2,221	\$2,051	\$2,049	\$62	2.9%	p=0.45	-\$73	\$198
	Readmission payments	139,661	177,262	\$1,063	\$943	\$1,015	\$1,001	-\$107	-10.0%	p=0.20	-\$242	\$29
	Part B payments	139,661	177,262	\$4,615	\$4,588	\$4,573	\$4,584	-\$39	-0.8%	p=0.44	-\$122	\$45
	30-day PEP payments	139,661	177,262	\$1,296	\$1,299	\$1,278	\$1,299	-\$18	-1.4%	p=0.25	-\$45	\$8
Utilization	Anchor hospitalization LOS	139,089	175,237	3.4	2.8	3.3	2.7	0.0	-0.5%	p=0.69	-0.1	0.0
	First PAC SNF	139,700	177,264	38.7%	29.3%	39.3%	30.8%	-0.9	-2.37%	p=0.35	-2.5	0.7
	First PAC IRF	139,700	177,264	9.6%	4.6%	8.7%	6.3%	-2.6	-27.4%	p<0.01	-3.9	-1.3
	First PAC HH	139,700	177,264	37.5%	45.4%	35.1%	39.1%	4.0	10.6%	p<0.10	0.4	7.5
	First PAC home without HH	139,700	177,264	14.2%	20.7%	16.9%	23.8%	-0.4	-3.0%	p=0.80	-3.2	2.4
	SNF days	42,563	52,346	25.7	21.6	25.4	23.6	-2.3	-9.0%	p<0.01	-3.1	-1.6
	IRF days	7,133	11,092	11.4	11.4	11.5	11.4	0.1	0.6%	p=0.60	-0.2	0.3
	HH visits	93,417	108,565	15.9	15.1	15.4	15.4	-0.8	-4.8%	p<0.01	-1.2	-0.3
	HH PT/OT visits	93,417	108,565	9.9	10.1	9.8	10.2	-0.3	-3.3%	p=0.22	-0.8	0.1
	Outpatient PT/OT visits	96,074	121,385	12.4	13.1	12.8	13.5	0.1	0.5%	p=0.59	-0.1	0.3

Domain	Measure	CJR	Control Group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Quality	Unplanned readmission rate	139,674	177,227	8.9%	7.2%	8.7%	7.1%	-0.1	-0.9%	p=0.55	-0.3	0.1
	ED use	139,674	177,227	13.2%	13.9%	13.1%	14.0%	-0.1	-1.0%	p=0.54	-0.5	0.2
	Mortality rate	142,288	180,283	2.3%	2.2%	2.4%	2.3%	0.0	-0.7%	p=0.80	-0.1	0.1

Source: Lewin 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 December 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The change in separate provider payments do not sum to the change in total episode payments because separate models were estimated for total payments and each component payment.

DiD = Difference-in-Differences, ED = emergency department, HH = home health, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, LOS = length of stay, OT = occupational therapy, PAC = post-acute care, PEP = post-episode period, PT = physical therapy, PY = performance year, SNF = skilled nursing facility.

Exhibit H-2: Risk-adjusted assessment-based difference-in-differences results for activities of daily living metrics, LEJR episodes, April 2016-September 2017

First PAC setting	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
IRF	Average change in mobility score	4,929	7,900	10.7	10.9	10.2	10.8	-0.3	-2.7%	p<0.10	-0.6	0.0
SNF	Improved transfer, locomotion on unit, and walking in corridor ^a	27,103	33,472	68.3%	67.3%	69.8%	71.7%	-2.9	-4.2%	p<0.05	-4.9	-0.9
	Improved toilet use	27,065	33,314	47.1%	42.7%	47.8%	48.9%	-5.6	-11.9%	p<0.05	-9.2	-2.0
	Without self-reported pain	25,996	31,929	55.2%	69.1%	52.0%	63.5%	2.3	4.2%	p=0.11	-0.1	4.8
HHA	Improved ambulation/locomotion	44,267	51,421	89.3%	89.5%	89.1%	90.1%	-0.8	-0.9%	p<0.10	-1.5	0.0
	Improved bed transferring	43,854	50,959	81.9%	82.9%	81.9%	84.3%	-1.4	-1.7%	p<0.05	-2.6	-0.3
	Reduced pain	44,020	51,227	74.5%	80.9%	73.5%	80.5%	-0.5	-0.7%	p=0.58	-2.2	1.1

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

DiD = Difference-in-Differences, HHA = home health agency, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, PAC = post-acute care, SNF = skilled nursing facility.

^a Results for the improved transfer, locomotion on unit, and walking in corridor measure need to be interpreted with caution because the measure fails the parallel trends test.

Exhibit H-3: Risk-adjusted claims-based difference-in-differences results for payment, utilization, and quality metrics, elective episodes, PY1-2

Domain	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Payments	Total payments	123,358	158,598	\$24,333	\$22,251	\$23,958	\$22,869	-\$994	-4.1%	p<0.01	-\$1,434	-\$553
	SNF payments	123,358	158,598	\$3,759	\$2,338	\$3,735	\$2,805	-\$491	-13.1%	p<0.01	-\$744	-\$238
	IRF payments	123,358	158,598	\$1,089	\$513	\$1,005	\$723	-\$295	-27.0%	p<0.01	-\$465	-\$124
	HH payments	123,358	158,598	\$2,140	\$2,186	\$2,024	\$2,007	\$63	2.9%	p=0.49	-\$85	\$212
	Readmission payments	123,358	158,598	\$865	\$749	\$822	\$804	-\$98	-11.3%	p=0.26	-\$241	\$45
	Part B payments	123,358	158,598	\$4,446	\$4,394	\$4,408	\$4,399	-\$44	-1.0%	p=0.41	-\$131	\$44
	30-Day PEP payments	123,358	158,598	\$1,025	\$1,032	\$1,007	\$1,031	-\$17	-1.6%	p=0.24	-\$40	\$7
Utilization	Anchor hospitalization LOS	122,780	156,579	3.1	2.5	3.0	2.4	0.0	-0.7%	p=0.61	-0.1	0.0
	First PAC SNF	123,388	158,600	34.4%	23.2%	34.8%	25.1%	-1.5	-4.44%	p=0.15	-3.3	0.2
	First PAC IRF	123,388	158,600	7.7%	2.8%	7.0%	4.4%	-2.4	-30.73%	p<0.01	-3.6	-1.2
	First PAC HH	123,388	158,600	42.2%	50.9%	39.4%	43.8%	4.4	10.41%	p<0.10	0.6	8.2
	First PAC home without HH	123,388	158,600	15.7%	23.1%	18.8%	26.7%	-0.5	-3.18%	p=0.80	-3.7	2.7
	SNF days	30,346	39,103	19.9	16.2	19.6	18.4	-2.4	-12.31%	p<0.01	-3.4	-1.5
	IRF days	4,100	6,841	10.2	10.5	10.3	10.4	0.2	2.06%	p=0.16	0.0	0.5
	HH visits	82,847	96,650	15.3	14.4	14.8	14.7	-0.8	-5.44%	p<0.01	-1.3	-0.3
	HH PT/OT visits	82,847	96,650	9.7	9.7	9.5	9.9	-0.4	-4.1%	p=0.17	-0.9	0.1
	Outpatient PT/OT visits	91,515	116,308	12.4	13.2	12.9	13.6	0.0	0.4%	p=0.69	-0.2	0.2
Pre-surgical outpatient PT/OT visits	123,388	158,600	7.4	11.8	9.6	10.6	3.5	47.1%	p<0.01	2.1	4.8	

Domain	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Quality	Unplanned readmission rate	123,367	158,569	7.3%	5.7%	7.1%	5.7%	-0.1	-1.4%	p=0.45	-0.3	0.1
	ED use	123,367	158,569	12.3%	13.1%	12.3%	13.1%	-0.1	-0.8%	p=0.61	-0.4	0.2
	Mortality rate	123,899	159,220	0.5%	0.5%	0.5%	0.5%	0.0	2.4%	p=0.67	0.0	0.1
	Complications	123,367	158,569	2.1%	2.0%	2.0%	2.0%	-0.1	-3.8%	p=0.16	-0.2	0.0

Source: Lewin 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 December 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The change in separate provider payments do not sum to the change in total episode payments because separate models were estimated for total payments and each component payment.

DiD = Difference-in-Differences, ED = emergency department, HH = home health, IRF = inpatient rehabilitation facility, LOS = length of stay, OT = occupational therapy, PAC = post-acute care, PEP = post-episode period, PT = physical therapy, PY = performance year, SNF = skilled nursing facility.

Exhibit H-4: Risk-adjusted assessment-based difference-in-differences results for activities of daily living metrics, elective episodes, April 2016-September 2017

First PAC setting	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
IRF	Average change in mobility score	2,688	4,725	11.1	11.5	10.7	11.3	-0.2	-2.2%	p=0.19	-0.6	0.0
SNF	Improved transfer, locomotion on unit, and walking in corridor	18,887	24,807	69.5%	67.8%	71.1%	72.8%	-3.4	-4.8%	p<0.05	-5.8	-0.9
	Improved toilet use	18,805	24,644	51.3%	45.8%	51.8%	53.0%	-6.7	-13.1%	p<0.01	-11.0	-2.5
	Without self-reported pain	18,499	24,113	51.9%	66.5%	48.9%	60.4%	3.1	6.0%	p<0.10	0.2	6.0
HHA	Improved ambulation/locomotion	43,357	50,385	89.5%	89.7%	89.4%	90.3%	-0.8	-0.9%	P=0.10	-1.6	0.0
	Improved bed transferring	42,950	49,932	82.1%	83.0%	82.1%	84.5%	-1.5	-1.9%	p<0.05	-2.7	-0.4
	Reduced pain	43,133	50,223	74.5%	80.9%	73.4%	80.4%	-0.6	-0.7%	p=0.61	-2.1	1.1

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

DiD = Difference-in-Differences, HHA = home health agency, IRF = inpatient rehabilitation facility, PAC = post-acute care, SNF = skilled nursing facility.

Exhibit H-5: Risk-adjusted claims-based difference-in-differences results for payment, utilization, and quality metrics, fracture episodes, PY1-2

Domain	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Payments	Total payments	16,303	18,664	\$45,160	\$44,325	\$45,026	\$45,458	-\$1,267	-2.8%	p<0.01	-\$1,863	-\$671
	SNF payments	16,303	18,664	\$16,639	\$16,109	\$16,783	\$16,599	-\$347	-2.1%	p=0.27	-\$868	\$175
	IRF payments	16,303	18,664	\$4,267	\$3,675	\$4,035	\$4,06019	-\$625	-14.7%	p<0.01	-\$957	-\$293
	HH payments	16,303	18,664	\$2,294	\$2,467	\$2,219	\$2,371	\$21	0.9%	p=0.55	-\$36	\$78
	Readmission payments	16,303	18,664	\$2,351	\$2,301	\$2,289	\$2,369	-\$130	-5.5%	p<0.10	-\$259	-\$1
	Part B payments	16,303	18,664	\$5,738	\$5,905	\$5,666	\$5,855	-\$22	-0.4%	p=0.74	-\$133	\$89
	30-day PEP payments	16,303	18,664	\$3,106	\$3,045	\$3,081	\$3,079	-\$59	-1.9%	p=0.41	-\$177	\$59
Utilization	Anchor hospitalization LOS	16,309	18,658	5.4	5.0	5.4	5.0	0.0	-0.6%	p=0.49	-0.1	0.0
	First PAC SNF	16,312	18,664	67.4%	70.2%	68.7%	69.0%	2.5	3.7%	p<0.05	0.6	4.3
	First PAC IRF	16,312	18,664	22.2%	17.0%	20.9%	19.4%	-3.7	-16.6%	p<0.01	-5.4	-2.0
	First PAC HH	16,312	18,664	6.5%	8.6%	6.5%	7.5%	1.1	16.5%	p<0.05	0.4	1.8
	First PAC home without HH	16,312	18,664	3.9%	4.3%	4.0%	4.2%	0.1	3.7%	p=0.69	-0.5	0.8
	SNF days	12,217	13,243	42.2	37.1	41.9	38.5	-1.7	-4.1%	p<0.01	-2.5	-0.9
	IRF days	3,033	4,251	13.8	13.4	13.8	13.5	-0.2	-1.2%	p=0.33	-0.5	0.1
	HH visits	10,570	11,915	20.2	20.3	19.6	20.0	-0.3	-1.6%	p=0.36	-0.9	0.3
	HH PT/OT visits	10,570	11,915	11.8	12.5	11.8	12.6	0.0	-0.1%	p=0.94	-0.3	0.3
	Outpatient PT/OT visits	4,559	5,077	10.6	11.2	11.0	11.2	0.3	2.7%	p=0.22	-0.1	0.7

Domain	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Quality	Unplanned readmission rate	16,307	18,658	19.4%	17.4%	19.3%	17.2%	0.0	-0.1%	p=0.96	-0.7	0.7
	ED use	16,307	18,658	18.5%	19.4%	18.8%	20.1%	-0.4	-2.3%	p=0.46	-1.4	0.5
	Mortality rate	18,389	21,063	13.1%	12.5%	13.7%	13.4%	-0.2	-1.9%	p=0.60	-1.0	0.5

Source: Lewin 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 December 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The change in separate provider payments do not sum to the change in total episode payments because separate models were estimated for total payments and each component payment.

DiD = Difference-in-Differences, ED = emergency department, HH = home health, IRF = inpatient rehabilitation facility, LOS = length of stay, OT = occupational therapy, PAC = post-acute care, PEP = post-episode period, PT = physical therapy, PY = performance year, SNF = skilled nursing facility.

Exhibit H-6: Risk-adjusted assessment-based difference-in-differences results for activities of daily living metrics, fracture episodes, April 2016-September 2017

First PAC setting	Measure	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
IRF	Average change in mobility score	2,241	3,175	9.8	10.0	9.3	9.9	-0.3	-3.1%	p=0.12	-0.6	0.0
SNF	Improved transfer, locomotion on unit, and walking in corridor	8,216	8,665	64.6%	65.6%	65.6%	68.3%	-1.7	-2.6%	p<0.05	-3.1	-0.3
	Improved toilet use	8,260	8,670	34.9%	33.2%	35.8%	36.6%	-2.5	-7.3%	p<0.05	-4.6	-0.5
	Without self-reported pain	7,497	7,816	65.8%	75.3%	63.6%	73.1%	-0.0	-0.1%	p=0.98	-2.1	2.1
HHA	Improved ambulation/locomotion	910	1,036	79.6%	78.0%	79.6%	78.1%	-0.1	-0.2%	p=0.95	-3.4	3.1
	Improved bed transferring	904	1,027	75.1%	77.2%	74.4%	73.6%	2.8	3.7%	p=0.28	-1.4	6.9
	Reduced pain	887	1,004	75.0%	79.8%	74.7%	81.6%	-2.1	-2.9%	p=0.42	-6.6	2.3

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

DiD = Difference-in-Differences, HHA = home health agency, IRF = inpatient rehabilitation facility, PAC = post-acute care, SNF = skilled nursing facility.

Exhibit H-7: Risk-adjusted claims-based difference-in-differences results for total payments, LEJR episodes, stratified analysis, PY1-2

Domain	Stratification	CJR	Control group	CJR		Control group		DiD	DiD % of baseline	p-value	90 th percentile LCI	90 th percentile UCI
		Intervention episodes (N)	Intervention episodes (N)	Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average					
Baseline volume	< 100 episodes ^a	21,111	25,013	\$31,406	\$29,245	\$30,596	\$29,296	-\$861	-2.7%	p<0.05	-\$1,427	-\$295
	100 – 200 episodes	32,547	39,765	\$27,926	\$25,841	\$27,748	\$26,847	-\$1,184	-4.2%	p<0.01	-\$1,670	-\$697
	> 200 episodes	86,003	112,484	\$25,702	\$23,891	\$25,530	\$24,658	-\$939	-3.7%	p<0.01	-\$1,403	-\$474
MSA historical payments	Low payment MSA	49,265	90,190	\$24,660	\$23,090	\$24,630	\$23,759	-\$700	-2.8%	p<0.01	-\$1,042	-\$358
	High payment MSA	90,396	87,072	\$28,444	\$26,305	\$28,097	\$27,167	-\$1,209	-4.2%	p<0.01	-\$1,759	-\$658
Elective or fracture	Elective	123,358	158,598	\$24,333	\$22,251	\$23,958	\$22,869	-\$994	-4.1%	p<0.01	-\$1,434	-\$553
	Fracture	16,303	18,664	\$45,160	\$44,325	\$45,026	\$45,458	-\$1,267	-2.8%	p<0.01	-\$1,863	-\$671
HCC quartiles	HCC 1	37,067	49,634	\$20,620	\$19,023	\$20,317	\$19,369	-\$650	-3.2%	p<0.01	-\$982	-\$318
	HCC 2	31,126	41,049	\$23,063	\$21,041	\$22,710	\$21,657	-\$969	-4.2%	p<0.01	-\$1,460	-\$478
	HCC 3	34,337	43,164	\$27,346	\$25,181	\$27,030	\$25,974	-\$1,109	-4.1%	p<0.01	-\$1,660	-\$558
	HCC 4	37,131	43,415	\$36,146	\$34,207	\$35,783	\$35,174	-\$1,330	-3.7%	p<0.01	-\$1,763	-\$897

Source: Lewin 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 December 2017 (intervention).

Notes: The estimates in this exhibit are the result of a difference-in-differences (DiD) model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The change in separate provider payments do not sum to the change in total episode payments because separate models were estimated for total payments and each component payment.

DiD = Difference-in-Differences, HCC = hierarchical condition category, LEJR = lower extremity joint replacement, MSA = metropolitan statistical area, PY = performance year.

^a Results for the <100 episodes stratification need to be interpreted with caution because the measure failed the parallel trends test.

Appendix I: Patient Survey Questions

1. Who is completing this survey?
 - Person named in the cover letter
 - Person named in the cover letter, with help from a family member, friend or caregiver
 - A family member, friend, or caregiver of the person named in the cover letter
 - If the person to whom this was mailed cannot complete the survey, and there is no one else who can do it for him or her, please mark this response and return the blank survey

Section 1. Before the Hospital

We would like to know how you were doing before you went to the hospital listed in the cover letter to have your joint replaced.

2. Did you have any sessions with a physical therapist for the joint you had replaced in the two weeks or so before your joint replacement surgery?
 - Yes
 - No
 - Don't know/Don't remember

The next questions ask about the week before your joint replacement surgery.

3. Thinking about the week before your joint replacement surgery, how often did pain in the joint that you had replaced interfere with your normal activities?
 - All of the time
 - Most of the time
 - Some of the time
 - A little of the time
 - None of the time
 - Don't know/Don't remember
4. Thinking about the week before your joint replacement surgery, were you taking any of the following types of medications specifically for pain in the joint that you had replaced?
 - Prescription pain medication only
 - Over the counter pain medication only
 - Both prescription and over the counter pain medications
 - No medication for pain in the joint that was replaced
 - Don't know/Don't remember

5. Thinking about the week before your joint replacement surgery, what best describes your use of a mobility aid such as a wheelchair, scooter, walker, or cane?
- I never used a mobility aid
 - I sometimes used a mobility aid
 - I always used a mobility aid
 - Don't know/Don't remember
6. Thinking about the week before your joint replacement surgery, what best describes your ability to walk by yourself without resting? That is, walk without the help of another person or the help of a mobility aid.
- I could walk more than several blocks by myself without resting
 - I could walk several blocks by myself without resting
 - I could walk one block by myself without resting
 - I could walk from one room to another by myself without resting
 - I was not able to walk by myself without resting
 - Don't know/Don't remember
7. Thinking about the week before your joint replacement surgery, how much difficulty did you have walking up or down 12 stairs?
- I had no difficulty walking up or down 12 stairs
 - I had some difficulty walking up or down 12 stairs
 - I had a lot of difficulty walking up or down 12 stairs
 - I was not able to walk up or down 12 stairs
 - Don't know/Don't remember
8. Thinking about the week before your joint replacement surgery, how much difficulty did you have rising from sitting?
- Extreme
 - Severe
 - Moderate
 - Mild
 - None
 - Don't know/Don't remember
9. Thinking about the week before your joint replacement surgery, how much difficulty did you have standing?
- Extreme
 - Severe
 - Moderate
 - Mild
 - None
 - Don't know/Don't remember

10. Thinking about the week before your joint replacement surgery, how much difficulty did you have getting on/off the toilet?
- Extreme
 - Severe
 - Moderate
 - Mild
 - None
 - Don't know/Don't remember

Section 2. After the Hospital

Now we'd like to learn about your experience after you left the hospital listed in the cover letter, and the weeks immediately after.

11. Thinking about when you left the hospital for your joint replacement surgery, would you say that you were...
- Discharged too early
 - Discharged at the right time or
 - Discharged too late
 - Don't know/Don't remember
12. Thinking about the care you received – in the two weeks after your joint replacement surgery – from doctors, nurses and therapists, at home, in a doctor or therapist's office or in a medical facility – how would you rate the level of care overall?
- Level of care during two weeks after surgery was more than I needed
 - Level of care during two weeks after surgery was about right
 - Level of care during two weeks after surgery was not enough
 - Don't know/Don't remember
13. Do you live in your own home, in someone else's home, or in an assisted living facility?
- Yes
 - No, **Go To Section 3 on page I-5**
14. When you went home after your joint replacement surgery, did you have all the medical equipment you needed (for example, walker, elevated commode, grabber, shower chair, device to help put on socks)?
- Yes
 - No
 - Don't know/Don't remember

We would like to learn about the help you received from other people when you went home after your joint replacement surgery, or to someone else's home or an assisted living facility.

15. Thinking back to the people who helped you, who was your main caregiver, that is, the person who helped you the most after your joint replacement surgery?
- Spouse/partner
 - Adult child
 - Another relative
 - Paid caregiver
 - Friend, neighbor, or someone else
 - No help at home after joint replacement surgery
16. When you went home after joint replacement surgery, how much help did you need from your main caregiver with putting on or taking off your clothes?
- No help needed
 - Some help needed
 - Complete help needed
 - Don't know/Don't remember
17. When you went home after joint replacement surgery, how much help did you need from your main caregiver with using the toilet?
- No help needed
 - Some help needed
 - Complete help needed
 - Don't know/Don't remember
18. When you went home after joint replacement surgery, how much help did you need from your main caregiver with bathing?
- No help needed
 - Some help needed
 - Complete help needed
 - Don't know/Don't remember

Section 3. Health Care Experiences in-Hospital and After

We want to learn about your experiences while you were in the hospital listed in the cover letter and any other place where you received medical care following that hospitalization.

In the following questions, the term "healthcare providers" means doctors, nurses, physical or occupational therapists and any other medical professionals who helped take care of you during your time in the hospital and afterwards, in other facilities or at home in any capacity.

Please think of all these types of providers and locations when rating your level of satisfaction in the next few questions.

19. How satisfied or dissatisfied were you with the extent to which healthcare providers listened to your thoughts and preferences about your medical treatment?
- Very dissatisfied
 - Somewhat dissatisfied
 - Neither satisfied nor dissatisfied
 - Somewhat satisfied
 - Very satisfied
20. How satisfied or dissatisfied were you with the place you were sent after you left the hospital, for example, home, rehabilitation facility, nursing home, long-term care hospital?
- Very dissatisfied
 - Somewhat dissatisfied
 - Neither satisfied nor dissatisfied
 - Somewhat satisfied
 - Very satisfied
21. How satisfied or dissatisfied were you with the coordination of your care among doctors, nurses, and therapists in the hospital and after discharge?
- Very dissatisfied
 - Somewhat dissatisfied
 - Neither satisfied nor dissatisfied
 - Somewhat satisfied
 - Very satisfied
 - Don't know
22. How satisfied or dissatisfied were you with the instructions you received from doctors, nurses, and therapists about your treatment?
- Very dissatisfied
 - Somewhat dissatisfied
 - Neither satisfied nor dissatisfied
 - Somewhat satisfied
 - Very satisfied
23. How satisfied or dissatisfied were you with your overall recovery from joint replacement surgery since you left the hospital?
- Very dissatisfied
 - Somewhat dissatisfied
 - Neither satisfied nor dissatisfied
 - Somewhat satisfied
 - Very satisfied

Section 4. How are you Feeling Today?

24. In the past week, how much does pain in the joint that you had replaced currently interfere with your normal activities?
- All of the time
 - Most of the time
 - Some of the time
 - A little of the time
 - None of the time
 - Don't know/Don't remember
25. Thinking about the past week, have you been taking any of the following types of medications specifically for pain in the joint you had replaced?
- Prescription pain medication only
 - Over the counter pain medication only
 - Both prescription and over the counter pain medications
 - No medication for pain in the joint that was replaced
 - Don't know/Don't remember
26. What best describes your use of a mobility aid over the past week, such as a wheelchair, scooter, walker or cane?
- I never use a mobility aid
 - I sometimes use a mobility aid
 - I always use a mobility aid
 - Don't know/Don't remember
27. What best describes your current ability to walk by yourself without resting? That is, without the help of another person or the help of a mobility aid?
- I can walk more than several blocks by myself without resting
 - I can walk several blocks by myself without resting
 - I can walk one block by myself without resting
 - I can walk from one room to another by myself without resting
 - I am not able to walk by myself without resting
 - Don't know/Don't remember
28. How much difficult do you currently have walking up or down 12 stairs?
- I have no difficulty walking up or down 12 stairs
 - I have some difficulty walking up or down 12 stairs
 - I have a lot of difficulty walking up or down 12 stairs
 - I am not able to walk up or down 12 stairs
 - Don't know/Don't remember

29. Continuing to think about the past week, how much difficulty did you have rising from sitting?
- Extreme
 - Severe
 - Moderate
 - Mild
 - None
 - Don't know/Don't remember
30. Continuing to think about the past week, how much difficulty did you have standing?
- Extreme
 - Severe
 - Moderate
 - Mild
 - None
 - Don't know/Don't remember
31. Continuing to think about the past week, how much difficulty did you have getting on/off toilet?
- Extreme
 - Severe
 - Moderate
 - Mild
 - None
 - Don't know/Don't remember

Section 5. About You

32. What is the highest grade or level of school that you completed?
- Some high school, but did not graduate
 - High school graduate or GED
 - Some college or 2-year degree
 - 4-year college degree
 - More than 4-year college degree
 - I prefer not to answer
33. What was your total household income before taxes during the past 12 months?
- Less than \$12,500
 - \$12,500-\$19,999
 - \$20,000-\$29,999
 - \$30,000-\$49,999
 - \$50,000-\$75,000
 - Greater than \$75,000
 - I prefer not to answer

34. Are you of Hispanic, Latino, or Spanish origin?
- No, not of Hispanic, Latino, or Spanish origin
 - Yes, of Hispanic, Latino, or Spanish origin
 - I prefer not to answer

35. What is your race? **Choose all that apply.**
- White
 - Black or African American
 - American Indian or Alaska Native
 - Asian
 - Native Hawaiian or Other Pacific Islander
 - I prefer not to answer

Appendix J: Activities of Daily Living Sensitivity Analyses

Exhibit J-1: Change in days between beginning and ending patient assessments by discharge setting, LEJR episodes, PY1-2

First PAC setting	CJR		Control group		CJR		Control group		Net differences	p-value
	Baseline episodes (N)	Intervention episodes (N)	Baseline episodes (N)	Intervention episodes (N)	Baseline average	Intervention average	Baseline average	Intervention average		
IRF	25,006	4,976	28,666	7,974	10.9	11.4	10.8	11.0	0.3	p<0.10
SNF	92,707	27,366	113,449	33,737	24.2	21.4	22.9	22.0	-1.9	p<0.01
HHA	94,297	44,319	111,696	51,488	22.8	20.4	22.5	22.1	-2.0	p<0.01

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively. HHA = home health agency, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, PAC = post-acute care, PY = performance year, SNF = skilled nursing facility.

Exhibit J-2: Change in days between beginning and ending patient assessments by discharge setting, fracture episodes, PY1-2

First PAC setting	CJR		Control group		CJR		Control group		Net differences	p-value
	Baseline episodes (N)	Intervention episodes (N)	Baseline episodes (N)	Intervention episodes (N)	Baseline average	Intervention average	Baseline average	Intervention average		
IRF	8,235	2,267	9,618	3,202	13.1	12.8	13.0	12.7	0.0	p=0.92
SNF	23,655	8,298	25,884	8,716	36.5	32.0	35.8	33.3	-2.0	p<0.01
HHA	2,049	919	2,414	1,050	33.5	30.9	33.5	34.1	-3.2	p<0.05

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively. HHA = home health agency, IRF = inpatient rehabilitation facility, PAC = post-acute care, PY = performance year, SNF = skilled nursing facility.

Exhibit J-3: Risk-adjusted assessment-based difference-in-differences results for activities of daily living metrics by discharge setting, reported ADL results and sensitivity estimate, LEJR episodes, PY1-2

First PAC setting	Measure	Main / sensitivity analysis	CJR		Control group		DiD	DiD % of baseline	p-value
			Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average			
IRF	Average change in mobility score	Reported Results	10.7	10.9	10.2	10.8	-0.3	-2.7	p<0.10
		Controlling for Days Between Assessments	10.7	11.0	10.2	10.8	-0.3	-2.6	p<0.10
SNF	Improved transfer, locomotion on unit, and walking in corridor ^a	Reported Results	68.3%	67.3%	69.8%	71.7%	-2.9 pp	-4.2	p<0.05
		Controlling for Days Between Assessments	67.8%	69.3%	69.5%	72.0%	-1.1 pp	-1.6	p=0.30
	Improved toilet use	Reported Results	47.1%	42.7%	47.8%	48.9%	-5.6 pp	-11.9	p<0.05
		Controlling for Days Between Assessments	46.7%	44.4%	47.5%	49.4%	-4.2 pp	-9.0	p<0.05
HHA	Improved ambulation/ locomotion	Reported Results	89.3%	89.5%	89.1%	90.1%	-0.8 pp	-0.9	p<0.10
		Controlling for Days Between Assessments	89.2%	89.6%	89.2%	90.1%	-0.6 pp	-0.7	p=0.21
	Improved bed transferring	Reported Results	81.9%	82.9%	81.9%	84.3%	-1.4 pp	-1.7	p<0.05
		Controlling for Days Between Assessments	81.9%	83.0%	81.9%	84.3%	-1.3 pp	-1.5	p<0.10
	Reduced pain	Reported Results	74.5%	80.9%	73.5%	80.5%	-0.5 pp	-0.7	p=0.58
		Controlling for Days Between Assessments	74.4%	81.1%	73.5%	80.5%	-0.3 pp	-0.4	p=0.76

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

Because the CJR model may impact both the length of PAC care and ADL outcomes, the number of days between assessments is not included as a causal risk factor in the risk adjustment models for the main analysis.

One measure, self-reported moderate to extreme pain for patients first discharged to SNF is not included in this exhibit because it is not risk-adjusted.

ADL = activities of daily living, DiD = difference-in-differences, HHA = home health agency, IRF = inpatient rehabilitation facility, LEJR = lower extremity joint replacement, PAC = post-acute care, PY = performance year, SNF = skilled nursing facility.

Exhibit J-4: Risk-adjusted assessment-based difference-in-differences results for activities of daily living metrics by discharge setting, reported ADL results and sensitivity estimate, fracture episodes, PY1-2

First PAC setting	Measure	Main / sensitivity analysis	CJR		Control group		DiD	DiD % of baseline	p-value
			Baseline risk-adjusted average	Intervention risk-adjusted average	Baseline risk-adjusted average	Intervention risk-adjusted average			
IRF	Average change in mobility score	Reported Results	9.8	10.0	9.3	9.9	-0.3	-3.1	p=0.12
		Controlling for Days Between Assessments	9.7	10.1	9.3	9.9	-0.3	-2.7	p=0.17
SNF	Improved transfer, locomotion on unit, and walking in corridor ^a	Reported Results	64.6%	65.6%	65.6%	68.3%	-1.7 pp	-2.6	p<0.05
		Controlling for Days Between Assessments	64.2%	67.2%	65.3%	68.9%	-0.7 pp	-1.1	p=0.38
	Improved toilet use	Reported Results	34.9%	33.2%	35.8%	36.6%	-2.5 pp	-7.3	p<0.05
		Controlling for Days Between Assessments	34.5%	34.4%	35.5%	37.2%	-1.8 pp	-5.2	p=0.15
HHA	Improved ambulation/ locomotion	Reported Results	79.6%	78.0%	79.6%	78.1%	-0.1 pp	-0.2	p=0.95
		Controlling for Days Between Assessments	79.6%	78.0%	79.6%	78.1%	-0.2 pp	-0.2	p=0.94
	Improved bed transferring	Reported Results	75.1%	77.2%	74.4%	73.6%	2.8 pp	3.7	p=0.28
		Controlling for Days Between Assessments	75.2%	77.1%	74.3%	73.6%	2.6 pp	3.4	p=0.31
	Reduced pain	Reported Results	75.0%	79.8%	74.7%	81.6%	-2.1 pp	-2.9	p=0.42
		Controlling for Days Between Assessments	75.1%	79.7%	74.7%	81.6%	-2.2 pp	-2.9	p=0.41

Source: Lewin analysis of Medicare claims and enrollment data, Minimum Data Set (MDS) data, Outcome and Assessment Information Set (OASIS) data, and Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of a DiD model. DiD estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

Because the CJR model may impact both the length of PAC care and ADL outcomes, the number of days between assessments is not included as a causal risk factor in the risk adjustment models for the main analysis.

One measure, self-reported moderate to extreme pain for patients first discharged to SNF is not included in this exhibit because it is not risk-adjusted.

ADL = activities of daily living, DiD = difference-in-differences, HHA = home health agency, IRF = inpatient rehabilitation facility, PAC = post-acute care, PY = performance year, SNF = skilled nursing facility.

Exhibit J-5: Change in transfer, locomotion on unit, and walking in corridor scores from admission to discharge, LEJR episodes first discharged to a skilled nursing facility, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=95,243)	Intervention average (N=28,180)	Baseline average (N=116,077)	Intervention average (N=35,185)			
Improvement	69.1%	66.1%	69.1%	69.7%	-3.6	-5.2	p<0.01
No change	27.4%	29.5%	27.0%	25.6%	3.4	12.2	p<0.05
No change and score of 0-6 at admission (best)	8.0%	8.7%	10.3%	10.9%	0.1	0.9	p=0.91
No change and score of 7-12 at admission (worst)	19.5%	20.8%	16.7%	14.8%	3.3	16.9	p<0.05
Decline	3.5%	4.4%	3.9%	4.6%	0.2	6.4	p=0.42

Source: Lewin analysis of Medicare claims and enrollment data and Minimum Data Set 3.0 (MDS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

LEJR = lower extremity joint replacement, PY = performance year.

Exhibit J-6: Change in toilet use scores from admission to discharge, LEJR episodes first discharged to a skilled nursing facility, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=95,453)	Intervention average (N=28,292)	Baseline average (N=116,583)	Intervention average (N=35,273)			
Improvement	46.9%	40.3%	47.7%	47.8%	-6.7	-14.3	p<0.01
No change	51.7%	58.3%	50.7%	50.5%	6.9	13.4	p<0.01
No change and score of 0-2 at admission (best)	13.3%	14.3%	16.7%	17.6%	0.2	1.3	p=0.83
No change and score of 3-4 at admission (worst)	38.4%	44.0%	34.0%	32.8%	6.7	17.5	p<0.01
Decline	1.4%	1.4%	1.6%	1.8%	-0.2	-13.3	p=0.23

Source: Lewin analysis of Medicare claims and enrollment data and Minimum Data Set 3.0 (MDS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

LEJR = lower extremity joint replacement, PY = performance year.

Exhibit J-7: Change in ambulation/locomotion scores from admission to discharge, LEJR episodes first discharged to a home health agency, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=100,245)	Intervention average (N=46,820)	Baseline average (N=118,611)	Intervention average (N=54,206)			
Improvement	87.4%	92.8%	87.5%	93.5%	-0.6	-0.7	p=0.37
No change	12.3%	7.0%	12.2%	6.3%	0.6	5.0	p=0.34
No change and score of 0-2 at admission (best)	11.1%	5.5%	11.0%	4.7%	0.6	5.6	p=0.34
No change and score of 3-6 at admission (worst)	1.2%	1.6%	1.2%	1.6%	0.0	0.3	p=0.99
Decline	0.3%	0.1%	0.3%	0.2%	0.0	-5.2	p=0.66

Source: Lewin analysis of Medicare claims and enrollment data and Outcome and Assessment Information Set (OASIS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

LEJR = lower extremity joint replacement, PY = performance year.

Exhibit J-8: Change in bed transfer scores from admission to discharge, LEJR episodes first discharged to a home health agency, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=100,245)	Intervention average (N=46,820)	Baseline average (N=118,611)	Intervention average (N=54,206)			
Improvement	76.2%	87.1%	76.5%	88.9%	-1.5	-2.0	p<0.10
No change	23.3%	12.7%	23.0%	10.9%	1.6	7.0	p<0.10
No change and score of 0-2 at admission (best)	23.2%	12.6%	22.9%	10.7%	1.6	7.1	p<0.10
No change and score of 3-5 at admission (worst)	0.1%	0.1%	0.1%	0.1%	0.0	-15.2	p=0.68
Decline	0.5%	0.2%	0.4%	0.2%	-0.1	-17.4	p=0.19

Source: Lewin analysis of Medicare claims and enrollment data and Outcome and Assessment Information Set (OASIS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

LEJR = lower extremity joint replacement, PY = performance year.

Exhibit J-9: Change in pain interfering with activity scores from admission to discharge, LEJR episodes first discharged to a home health agency, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=100,245)	Intervention average (N=46,820)	Baseline average (N=118,611)	Intervention average (N=54,206)			
Improvement	71.8%	82.7%	71.4%	83.2%	-0.9	-1.2	p=0.52
No change	25.7%	16.2%	26.3%	15.8%	1.0	4.0	p=0.42
No change and score of 0-2 at admission (best)	3.0%	1.7%	3.0%	1.3%	0.4	11.9	P=0.17
No change and score of 3-4 at admission (worst)	22.7%	14.5%	23.3%	14.5%	0.7	3.0	p=0.57
Decline	2.6%	1.1%	2.3%	1.0%	-0.1	-5.8	p=0.47

Source: Lewin analysis of Medicare claims and enrollment data and Outcome and Assessment Information Set (OASIS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

LEJR = lower extremity joint replacement, PY = performance year.

Exhibit J-10: Change in transfer, locomotion on unit, and walking in corridor scores from admission to discharge, fracture episodes first discharged to a skilled nursing facility, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=23,861)	Intervention average (N=8,438)	Baseline average (N=26,000)	Intervention average (N=9,062)			
Improvement	65.6%	65.4%	64.9%	67.1%	-2.4	-3.7	p<0.01
No change	29.8%	29.3%	29.8%	27.1%	2.1	7.2	p<0.05
No change and score of 0-6 at admission (best)	2.1%	2.1%	2.5%	2.5%	-0.0	-0.8	p=0.96
No change and score of 7-12 at admission (worst)	27.7%	27.1%	27.3%	24.6%	2.2	7.8	p<0.05
Decline	4.6%	5.3%	5.4%	5.8%	0.3	6.2	p=0.48

Source: Lewin analysis of Medicare claims and enrollment data and Minimum Data Set 3.0 (MDS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

PY = performance year.

Exhibit J-11: Change in toilet use scores from admission to discharge, fracture episodes first discharged to a skilled nursing facility, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=23,946)	Intervention average (N=8,489)	Baseline average (N=26,119)	Intervention average (N=9,083)			
Improvement	35.4%	32.9%	35.1%	36.5%	-3.8	-10.6	p<0.01
No change	63.1%	65.5%	63.0%	61.9%	3.5	5.5	p<0.05
No change and score of 0-2 at admission (best)	4.7%	5.4%	5.7%	6.1%	0.2	4.4	p=0.69
No change and score of 3-4 at admission (worst)	58.3%	60.1%	57.3%	55.8%	3.2	5.5	p<0.05
Decline	1.6%	1.5%	1.9%	1.6%	0.3	18.2	p=0.16

Source: Lewin analysis of Medicare claims and enrollment data and Minimum Data Set 3.0 (MDS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

PY = performance year.

Exhibit J-12: Change in ambulation/locomotion scores from admission to discharge, fracture episodes first discharged to a home health agency, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=2,090)	Intervention average (N=944)	Baseline average (N=2,455)	Intervention average (N=1,075)			
Improvement	77.6%	82.6%	77.2%	83.5%	-1.2	-1.6	p=0.54
No change	21.2%	16.8%	21.1%	15.7%	1.0	4.9	p=0.63
No change and score of 0-2 at admission (best)	13.1%	5.9%	13.1%	7.0%	-1.0	-7.9	p=0.53
No change and score of 3-6 at admission (worst)	8.1%	10.9%	8.0%	8.8%	2.1	25.4	p=0.18
Decline	1.2%	0.5%	1.7%	0.8%	0.2	18.1	p=0.64

Source: Lewin analysis of Medicare claims and enrollment data and Outcome and Assessment Information Set (OASIS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

PY = performance year.

Exhibit J-13: Change in bed transfer scores from admission to discharge, fracture episodes first discharged to a home health agency, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=2,090)	Intervention average (N=944)	Baseline average (N=2,455)	Intervention average (N=1,075)			
Improvement	70.8%	81.3%	70.8%	79.9%	1.5	2.1	p=0.55
No change	28.0%	17.4%	28.0%	19.0%	-1.7	-6.0	p=0.47
No change and score of 0-2 at admission (best)	26.5%	15.6%	26.6%	16.4%	-0.7	-2.6	p=0.76
No change and score of 3-5 at admission (worst)	1.5%	1.8%	1.3%	2.5%	-1.0	-64.1	p<0.10
Decline	1.2%	1.3%	1.2%	1.1%	0.2	17.4	p=0.76

Source: Lewin analysis of Medicare claims and enrollment data and Outcome and Assessment Information Set (OASIS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

PY = performance year.

Exhibit J-14: Change in pain interfering with activity scores from admission to discharge, fracture episodes first discharged to a home health agency, PY1-2

Change from admission to discharge	CJR		Control group		Net differences	Net differences % of baseline	p-value
	Baseline average (N=2,090)	Intervention average (N=944)	Baseline average (N=2,455)	Intervention average (N=1,075)			
Improvement	72.0%	79.8%	70.2%	80.6%	-2.5	-3.5	p=0.30
No change	25.3%	18.7%	26.5%	17.9%	2.0	7.7	p=0.39
No change and score of 0-2 at admission (best)	6.1%	3.8%	5.7%	3.7%	-0.2	-3.3	p=0.83
No change and score of 3-4 at admission (worst)	19.2%	14.8%	20.8%	14.2%	2.2	11.2	p=0.29
Decline	2.7%	1.5%	3.3%	1.6%	0.6	21.8	p=0.49

Source: Lewin analysis of Medicare claims and enrollment data and Outcome and Assessment Information Set (OASIS) 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 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the net difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

The relative change from CJR baseline is calculated as the DiD estimate as a percent of the CJR baseline level.

PY = performance year.

Appendix K: Patient Survey Results

Exhibit K-1: Risk-adjusted survey-based results for change in functional status, overall satisfaction with recovery, satisfaction with care management, care transitions, and caregiver help, LEJR episodes

Domain	Measure	CJR respondents (N)	Control respondents (N)	CJR risk-adjusted average	Control risk-adjusted average	Estimated difference	p-value
Change in pain and functional status ^a	Ability to walk by yourself without resting ^b	5055	4807	0.8	0.8	0.0	p=0.30
	Difficulty walking up or down 12 stairs ^c	4921	4707	0.8	0.8	0.0	p=0.97
	Difficulty rising from sitting ^b	5158	4905	1.3	1.3	0.0	p=0.59
	Difficulty standing ^b	5156	4903	1.2	1.2	0.0	p=0.71
	Use of a mobility aid ^d	5138	4882	0.2	0.2	-0.0	p=0.28
	Difficulty getting on/off the toilet ^b	5174	4914	1.4	1.4	0.0	p=0.42
	Frequency that pain interferes with normal activities ^b	5165	4928	2.0	2.1	-0.0	p=0.22
	Medication use for pain in the joint you had replaced ^c	5052	4829	0.6	0.6	-0.0	p=0.16
Overall satisfaction with recovery	Overall satisfaction with recovery since leaving the hospital ^e	5220	4990	80.8	81.9	-1.1	p=0.15
Satisfaction with care management	Summary Composite Score	5059	4827	82.5	82.6	-0.0	p=0.98
	Healthcare providers listened to preferences ^e	5206	4975	79.2	78.9	0.3	p=0.67
	Satisfaction with discharge destination ^e	5177	4953	82.7	82.2	0.5	p=0.46
	Satisfaction with care coordination ^e	5196	4960	82.6	82.2	0.4	p=0.63
	Satisfaction with treatment instructions ^e	5227	4992	84.5	85.0	-0.5	p=0.49
Care transitions	Discharged on time ^f	5169	4921	88.4	88.1	0.3	p=0.66
	Appropriate level of care after discharge ^f	5188	4942	86.4	86.9	-0.5	p=0.39
	Access to durable medical equipment ^f	4977	4726	92.8	91.6	1.2	p=0.10

Domain	Measure	CJR respondents (N)	Control respondents (N)	CJR risk-adjusted average	Control risk-adjusted average	Estimated difference	p-value
Caregiver help	Received any caregiver help ^f	5020	4740	94.9	95.8	-0.9	p=0.14
	Summary Composite Score ^g	4941	4662	70.1	71.5	-1.4	p<0.05
	Needed help putting on or taking off clothes ^g	5004	4730	62.0	64.3	-2.3	p<0.01
	Needed help bathing ^g	4985	4703	67.3	68.1	-0.8	p=0.36
	Needed help using the toilet ^g	4977	4714	82.4	82.7	-0.3	p=0.63

Source: Lewin analysis of patient survey data for episodes with discharge in March, April, September, and October 2017.

Notes: The estimates in this exhibit are the result of a cross-sectional regression model, weighted for sampling and nonresponse. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

LEJR = lower extremity joint replacement.

^a The change in a given measure of functional status refers to the difference between a respondent’s self-reported status at the time of the survey and the respondent’s recalled status in the week prior to hospitalization. Estimated changes, and the difference between changes in the CJR and control group, are reported in “level” terms.

^b Indicates question has 5 possible responses.

^c Indicates question has 4 possible responses.

^d Indicates question has 3 possible responses.

^e Satisfaction outcomes are scaled from 0 to 100 points, where 0 = very dissatisfied, 25 = dissatisfied, 50 = neutral, 75 = satisfied, and 100 = very satisfied. The composite summarizes the level of satisfaction across the four measures of care management. Differences between CJR and control outcomes are reported in point terms.

^f Indicates binary measure, reported as the percent of respondents reporting “Yes” to a given measure. Differences between CJR and control outcomes are reported in percentage point terms.

^g Respondents were only asked about the amount of help needed with a given activity of daily living if they indicated that they received caregiver help. Measures of caregiver help required among respondents who received any help are scaled from 0 to 100 points, where 0 = complete help needed, 50 = some help needed, and 100 = no help needed. The composite summarizes the amount of help needed across all three activities of daily living. Differences between CJR and control outcomes are reported in point terms.

Exhibit K-2: Risk-adjusted survey-based results for change in functional status, overall satisfaction with recovery, satisfaction with care management, care transitions, and caregiver help, fracture episodes

Domain	Measure	CJR respondents (N)	Control respondents (N)	CJR risk-adjusted average	Control risk-adjusted average	Estimated difference	p-value
Change in pain and functional status ^a	Ability to walk by yourself without resting ^b	956	944	-0.8	-0.8	-0.0	p=0.85
	Difficulty walking up or down 12 stairs ^c	883	875	-0.6	-0.5	-0.0	p=0.69
	Difficulty rising from sitting ^b	983	975	-0.2	-0.4	0.1	p<0.05
	Difficulty standing ^b	993	967	-0.3	-0.3	0.0	p=0.82
	Use of a mobility aid ^d	982	986	-0.7	-0.6	-0.0	p=0.21
	Difficulty getting on/off the toilet ^b	987	984	-0.1	-0.1	0.0	p=0.44
	Frequency that pain interferes with normal activities ^b	970	973	-0.3	-0.3	-0.0	p=0.64
	Medication use for pain in the joint you had replaced ^c	956	945	-0.4	-0.3	-0.1	p=0.21
Overall satisfaction with recovery	Overall satisfaction with recovery since leaving the hospital ^e	1066	1069	73.5	74.2	-0.6	p=0.70
Satisfaction with care management	Summary Composite Score	1028	1023	74.8	76.2	-1.4	p=0.28
	Healthcare providers listened to preferences ^e	1068	1068	72.7	72.0	0.7	p=0.67
	Satisfaction with discharge destination ^e	1067	1077	72.9	73.8	-0.9	p=0.63
	Satisfaction with care coordination ^e	1064	1058	72.8	76.5	-3.7	p<0.05
	Satisfaction with treatment instructions ^e	1069	1070	76.4	79.9	-3.4	p<0.05
Care transitions	Discharged on time ^f	1005	1009	82.6	85.2	-2.7	p=0.17
	Appropriate level of care after discharge ^f	1041	1043	77.4	77.5	-0.1	p=0.94
	Access to durable medical equipment ^f	933	929	90.5	89.7	0.9	p=0.58
Caregiver help	Received any caregiver help ^f	958	944	96.2	94.7	1.4	p=0.20
	Summary Composite Score ^g	920	911	56.0	56.9	-0.9	p=0.50
	Needed help putting on or taking off clothes ^g	942	937	50.9	53.4	-2.5	p<0.10
	Needed help bathing ^g	940	928	48.3	49.6	-1.2	p=0.42
	Needed help using the toilet ^g	937	926	67.7	68.4	-0.6	p=0.70

Source: Lewin analysis of patient survey data for episodes with discharge in March, April, September, and October 2017.

Notes: The estimates in this exhibit are the result of a cross-sectional regression model, weighted for sampling and nonresponse. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

- ^a The change in a given measure of functional status refers to the difference between a respondent’s self-reported status at the time of the survey and the respondent’s recalled status in the week prior to hospitalization. Estimated changes, and the difference between changes in the CJR and control group, are reported in “level” terms.
- ^b Indicates question has 5 possible responses.
- ^c Indicates question has 4 possible responses.
- ^d Indicates question has 3 possible responses.
- ^e Satisfaction outcomes are scaled from 0 to 100 points, where 0 = very dissatisfied, 25 = dissatisfied, 50 = neutral, 75 = satisfied, and 100 = very satisfied. The composite summarizes the level of satisfaction across the four measures of care management. Differences between CJR and control outcomes are reported in point terms.
- ^f Indicates binary measure, reported as the percent of respondents reporting “Yes” to a given measure. Differences between CJR and control outcomes are reported in percentage point terms.
- ^g Respondents were only asked about the amount of help needed with a given activity of daily living if they indicated that they received caregiver help. Measures of caregiver help required among respondents who received any help are scaled from 0 to 100 points, where 0 = complete help needed, 50 = some help needed, and 100 = no help needed. The composite summarizes the amount of help needed across all three activities of daily living. Differences between CJR and control outcomes are reported in point terms.

Exhibit K-3: Risk-adjusted survey-based results for change in functional status, overall satisfaction with recovery, satisfaction with care management, care transitions, and caregiver help, low-volume hospitals

Domain	Measure	CJR respondents (N)	Control respondents (N)	CJR risk-adjusted average	Control risk-adjusted average	Estimated difference	p-value
Change in pain and functional status ^a	Ability to walk by yourself without resting ^b	789	796	0.4	0.4	0.0	p=0.85
	Difficulty walking up or down 12 stairs ^c	767	773	0.6	0.5	0.1	p<0.10
	Difficulty rising from sitting ^b	809	814	1.0	0.9	0.1	p=0.34
	Difficulty standing ^b	810	819	0.9	0.9	0.0	p=0.98
	Use of a mobility aid ^d	807	812	0.0	0.0	-0.1	p=0.21
	Difficulty getting on/off the toilet ^b	813	813	1.2	1.1	0.1	p=0.12
	Frequency that pain interferes with normal activities ^b	810	813	1.5	1.6	-0.1	p<0.10
Medication use for pain in the joint you had replaced ^c	795	798	0.4	0.4	-0.0	p=0.98	
Overall satisfaction with recovery	Overall satisfaction with recovery since leaving the hospital ^e	814	833	78.7	77.2	1.5	p=0.39
Satisfaction with care management	Summary Composite Score	798	800	81.5	81.2	0.4	p=0.80
	Healthcare providers listened to preferences ^e	816	831	76.8	76.3	0.5	p=0.79
	Satisfaction with discharge destination ^e	817	828	78.4	78.8	-0.4	p=0.84
	Satisfaction with care coordination ^e	816	823	79.6	79.9	-0.3	p=0.83
	Satisfaction with treatment instructions ^e	819	835	81.8	81.9	-0.1	p=0.95
Care transitions	Discharged on time ^f	803	813	86.0	85.5	0.5	p=0.80
	Appropriate level of care after discharge ^f	816	817	82.4	81.8	0.6	p=0.62
	Access to durable medical equipment ^f	773	781	87.9	85.8	2.1	p=0.26
Caregiver help	Received any caregiver help ^f	777	788	96.9	96.0	1.0	p=0.31
	Summary Composite Score ^g	759	771	65.1	62.1	3.1	p<0.05
	Needed help putting on or taking off clothes ^g	772	780	58.9	54.1	4.8	p<0.01
	Needed help bathing ^g	772	782	60.8	57.6	3.2	p=0.11
	Needed help using the toilet ^g	765	781	76.2	74.2	2.0	p=0.25

Source: Lewin analysis of patient survey data for episodes with discharge in March, April, September, and October 2017.

Notes: The estimates in this exhibit are the result of a cross-sectional regression model, weighted for sampling and nonresponse. Estimates that are significant at the 99%, 95%, or 90% significance level are indicated by dark, medium, and light orange shaded cells, respectively.

- ^a The change in a given measure of functional status refers to the difference between a respondent’s self-reported status at the time of the survey and the respondent’s recalled status in the week prior to hospitalization. Estimated changes, and the difference between changes in the CJR and control group, are reported in “level” terms.
- ^b Indicates question has 5 possible responses.
- ^c Indicates question has 4 possible responses.
- ^d Indicates question has 3 possible responses.
- ^e Satisfaction outcomes are scaled from 0 to 100 points, where 0 = very dissatisfied, 25 = dissatisfied, 50 = neutral, 75 = satisfied, and 100 = very satisfied. The composite summarizes the level of satisfaction across the four measures of care management. Differences between CJR and control outcomes are reported in point terms.
- ^f Indicates binary measure, reported as the percent of respondents reporting “Yes” to a given measure. Differences between CJR and control outcomes are reported in percentage point terms.
- ^g Respondents were only asked about the amount of help needed with a given activity of daily living if they indicated that they received caregiver help. Measures of caregiver help required among respondents who received any help are scaled from 0 to 100 points, where 0 = complete help needed, 50 = some help needed, and 100 = no help needed. The composite summarizes the amount of help needed across all three activities of daily living. Differences between CJR and control outcomes are reported in point terms.

Appendix L: Change in Patient Characteristics

Exhibit L-1: Changes in patient characteristics between baseline and intervention by MS-DRG and fracture status, PY1-2

Patient characteristics		Net differences in average values			
		MS-DRG 470, elective	MS-DRG 469, elective	MS-DRG 470, fracture	MS-DRG 469, fracture
Age	20-64 (pp)	-0.4	-0.3	0.2	1.1
	65-79 (pp)	0.4	-2.1	-0.9	-1.0
	80+ (pp)	0.0	2.4	0.8	-0.1
Gender	Female (pp)	0.2	1.1	-1.0	-2.6
Race/ethnicity	White (pp)	0.0	1.0	-0.2	-1.6
	Black (pp)	-0.3	-1.7	0.5	1.5
	Hispanic (pp)	0.1	0.9	-0.3	-0.5
	Other (pp)	0.0	0.1	-0.2	0.7
	Unknown (pp)	0.2	-0.3	0.1	-0.1
Medicaid & disability	Eligible for Medicaid (pp)	-0.5	-0.5	0.5	3.6
	Disability, no ESRD (pp)	-0.8	0.8	-0.2	1.8
Health status	HCC score	0.00	0.01	0.05	0.06
	Smoking (pp)	-0.1	-0.7	-0.2	0.7
	Obesity (pp)	-0.8	0.3	-0.6	1
	Diabetes (pp)	0.5	-0.6	0.4	1.5
Utilization in the six months prior to the anchor hospitalization	Inpatient acute care hospitalization (pp)	-0.4	0.1	1.6	0.3
	HHA use (pp)	-0.3	1.5	0.3	-1.1
	IRF stay (pp)	-0.1	-0.9	0.4	-1.3
	SNF stay (pp)	-0.2	0.8	0.1	1.6
	Any institutional stay (pp)	-0.8	2.0	0.4	0.4

Source: Lewin 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 December 2017 (intervention).

Notes: The estimates in this exhibit are the result of calculating the difference-in-differences of the unadjusted baseline and intervention averages for the CJR and control groups (net differences). Estimates that are significant at the 99%, 95%, or 90% significance levels are indicated by dark, medium, and light orange shaded cells, respectively.

The MS-DRG 469 is assigned at the anchor hospitalization discharge for major joint replacement or reattachment of lower extremity *with* major complications or comorbidities (MCC), while MS-DRG 470 is *without* MCC.

Fracture is defined based on ICD codes for hip fracture provided by CMMI on the CJR model website: <https://innovation.cms.gov/Files/worksheets/cjr-icd10hipfracturecodes.xlsx>.

ESRD = end-stage renal disease, HCC = hierarchical condition category, HHA = home health agency, IRF = inpatient rehabilitation facility, MS-DRG = Medicare Severity Diagnosis Related Group, pp = percentage point, SNF = skilled nursing facility.

Appendix M: Hospital Survey Questions

I. Paper Version of the Web Survey Instrument

1. What is your primary role at your hospital?
 - a. Director/manager of orthopedic surgery service line
 - b. CJR coordinator
 - c. Director/manager of case management
 - d. Other role, please specify: _____

2. Is your hospital **currently** participating in any value-based payment models with...

	Yes, currently	No, but expected	No, and not expected	Don't know
a. Commercial payers (including private insurance and Medicare advantage)				
b. Medicaid payers				
c. Other Medicare models				

3. Hospital implementation of clinical redesign

Instruction: For Question 3 table below (3.1 – 3.14), you only need to answer items in 3.b. (the shaded columns) if you answered the question on the same topic in 3.a.

Processes or procedures		3.a. Hospitals perform many different processes and procedures to implement CJR. In the following questions, please think about processes or procedures that your hospital is implementing or is planning to implement. Has your hospital currently implemented...			3.b. For those activities that you are currently implementing (or plan to implement), please indicate the degree to which CJR influenced your decision to implement. How influential was CJR in your decision to implement or enhance...				
		No, and not planning to implement	No, but we are planning to implement	Yes	Not at all influential	Slightly influential	Somewhat influential	Very influential	Extremely influential
Clinical practice at your hospital	3.1. ...vendor practices that narrow options of implants/prostheses								
	3.2. ...immediate (same day) post-surgery ambulation & physical therapy for joint replacement patients								
	3.3. ...pain management practices that allow for early patient mobility								
	3.4. ...specialized care plans according to patient risk stratification								
Patient/caregiver screening and education	3.5. ...standardized assessments of environmental factors influencing patient recovery prior to scheduling the procedure (e.g. home environment, social support system, access to transportation)								
	3.6. ...classes that are strongly encouraged for patients prior to the joint replacement admission								

Processes or procedures		3.a. Hospitals perform many different processes and procedures to implement CJR. In the following questions, please think about processes or procedures that your hospital is implementing or is planning to implement. Has your hospital currently implemented...			3.b. For those activities that you are currently implementing (or plan to implement), please indicate the degree to which CJR influenced your decision to implement. How influential was CJR in your decision to implement or enhance...				
		No, and not planning to implement	No, but we are planning to implement	Yes	Not at all influential	Slightly influential	Somewhat influential	Very influential	Extremely influential
Discharge and Follow-up	3.7. ...follow up appointments scheduled for all lower extremity joint replacement patients prior to discharge								
	3.8. ...repeated telephonic follow-up and tracking of patients throughout the entire 90 day episode								
	3.9. ...a preferred provider network for post-acute care (PAC) providers								
Data Reporting and Analysis	3.10. ...identification of CJR patients in the electronic health record (EHR)				<i>Do not ask question (b) for this item</i>				
	3.11. ...collection and reporting of patient reported outcomes in the EHR (i.e. PROMIS, KOOS, HOOS)?								
	3.12. ...routine reporting of patient outcomes (e.g. readmissions, ED visits, SNF length of stay, total episode costs) to individual surgeons								
	3.13. ...allowing post-acute providers access to all lower extremity joint replacement patients' EHRs								
	3.14. ...regular meetings between your hospital and post-acute providers to share financial or clinical status updates for lower extremity joint replacement patients								

3.15. Were there any additional changes at your hospital that occurred in response to the CJR model?

a. Yes, please specify: _____

b. No

4. How much have the following changed at your hospital between now and the beginning of CJR in April 2016? Please focus your responses to changes associated with the care and management of Medicare lower extremity joint replacement patients in your responses.

	Became much worse	Became a little worse	Stayed the same	Became a little better	Became much better	No basis to judge
a. Clinical outcomes during the 90-day episode	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Shorter term recovery (surgery pain, hospital length of stay, time to standing etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Longer term recovery (pain, functioning, independence, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Complications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Readmissions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Access to care for high-risk beneficiaries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Overall patient satisfaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. Post-discharge communication with patients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. Patient engagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. Internal costs for management and treatment of lower extremity joint replacement patients, (including all CJR-related planning and care redesign)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. Communication between hospital and PAC staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. Executive engagement in care redesign activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. Surgeon and other physician engagement in care redesign activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n. Staff engagement in care redesign activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o. Staff burden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. Is there any additional information you would like to share with the CMS about the CJR model?

a. Yes, please specify: _____

b. No