Effects of Comprehensive Care for Joint Replacement Model on Hospitals Serving Low Socioeconomic Status Patients:

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Contents

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Study Population

For this study, we compared safety-net and non-safety-net hospitals participating in Comprehensive Care for Joint Replacement Model (CJR) with those in Metropolitan Statistical Areas (MSAs) that were eligible for CJR but were not randomly selected.

Data Source

Patient demographics was obtained from the Medicare Master Beneficiary Summary Files. Health care utilization and cost was calculated using the full 100% Medicare claims for inpatient, outpatient, skilled nursing facility, home health, and carrier (professional) claims.

Hospital receipt of bonus of bonus payment or penalty was obtained from the CJR website. Hospital target prices and regional historic prices were also obtained from the CJR website.

Definition of Safety-net hospital

We defined safety-net hospitals as those in the top quartile (25%) in percentage of dual eligible hip and knee LEJR patients prior to the implementation of CJR. We considered other safety-net hospital definitions as well.

Inclusions

- All lower extremity joint replacement surgery (LEJR) episodes eligible under CJR (DRG 469 or 470)
  - Episodes consist of the index hospitalization and subsequent 90 days
- Occurring in hospitals in CJR participating MSAs or eligible control MSAs
- Occurring in either the three years prior to start of the program (2012-2015) or the two years after (April 2016 - December 2017)

Exclusions

- LEJR at hospitals with < 10 LEJR each year
- LEJR at hospitals participating in BPCI model 1 or the risk bearing phase of BPCI models 2 or 4 for LEJR
- Patients without continuous Medicare enrollment
- Patients enrolled in Medicare Advantage
- Patients under the age of 66 at the time of the surgery
- LEJR where another qualifying LEJR occurred within 90 days

Sample Size

Our final sample included:

- 170 MSAs

- 1,165 hospitals
- 768,224 patients
- 836,027 surgeries

Methods

Effect of CJR

We used generalized linear models to assess the impact of CJR on black, white, and Latino/Latina patients on our primary outcomes of:

- Total episode spending
  - Standardized 2016 dollars
  - Tested using a negative binomial model
- Discharge to institutional post-acute care setting
  - Included discharges to skilled nursing facilities, long-term care hospitals, inpatient rehabilitation centers, and swing beds
  - Tested using logistic regression
- Relevant readmission rate
  - Readmissions Occurring in the 90 days following index discharge
  - Excludes readmissions deemed irrelevant to CJR by CMS
  - Tested using logistic regression

Tests of balance prior to CJR found no difference between treatment and control MSAs, so we were able to leverage the random selection of CJR and only compare outcomes in the post-period. We used the following model:

$$Y_{mhs} = f(\beta_0 + \beta_1 * Treatment_m + \beta_2 * SNH_h + \beta_3 * Treatment_m * SNH_h + \vec{\beta_x}\vec{X_s})$$

$m = MSA$
$h = Hospital$
$s = Surgery$

Models adjusted for:

- Type of surgery (Hip vs Knee)
- Fracture status
- Presence of major complications or comorbidities (MCC)
- Patient age
- Patient gender
- Hospital characteristics
  - Volume
  - Ownership
  - Teaching hospital status
- MSA level characteristics
  - Sampling strata
  - Post-acute care supply
  - Medicare Advantage penetration
  - Population
  - Market competitiveness for LEJR
- Year and month fixed effects

Reconciliation Payments

We examined the distribution of reported reconciliation payments from CMS for safety-net and non-safety-net hospitals for years 1 and 2 of the program.

Required savings to receive bonus

For each hospital, we estimated the required savings to receive a bonus in each year as the difference between that hospital's historic LEJR episode spending and the estimated target price for that year.

Target prices are

$$Target_{hosp} = d * (w * HistoricSpending_{hosp} + (1 - w) * HistoricSpending_{region})$$

Where:

- $Target_{hosp}$ is the hospital target price
- $HistoricSpending_{hosp}$ is the hospital historic episode spending
- $HistoricSpending_{region}$ is the region historic episode spending
- w is a weighting factor set to 2/3 in CJR years 1-2
- d is a deflationary factor set to $d = (1 - 0.03)$

In later years of the program, CMS changes the weighting factor to shift towards target prices being based only on the regional historic price:

Program Year	Hospital Historic	Region Historic
1	2/3	1/3
2	2/3	1/3
3	1/3	2/3
4	0	1
5	0	1

Characteristics of safety-net and non-safety-net hospitals

Characteristics	Safety-Net Hospital (n=873)	Non-Safety-Net Hospital (n=2,622)	P Value
Patient mix, mean (SD)			
Medicaid-enrolled patients, %	19.0(15.0)	4.5(3.1)	<0.001
Medically complex patients, %	16.0(7.9)	10.9(5.9)	<0.001
Nonwhite patients, %	21.1(20.3)	7.5(7.5)	<0.001
Female patients, %	68(7.5)	64.9(6.0)	<0.001
Age category			
Age 66-70, %	24.5(9.0)	27.2(7.5)	<0.001
Age 71-75, %	23.2(7.3)	25.4(5.9)	<0.001
Age 76-80, %	20.2(6.1)	20.7(4.8)	0.014
Age 81 or more, %	32.1(11.6)	26.7(9.8)	<0.001
Type of joint replacement			
Elective knee replacement, %	48.9(14.4)	55.1(12.2)	<0.001
Elective hip replacement, %	21.7(9.3)	26.7(9.4)	<0.001
Hip fracture surgery, %	29.4(16.4)	18.2(12.9)	<0.001
MS-DRG			
MS-DRG 469, %	9.9(7.1)	6.5(4.7)	<0.001
MS-DRG 470, %	90.1(7.1)	93.5(4.7)	<0.001
Hospital characteristics, No. (%)			
Volume of Medicare joint replacements			
Low (11-63)	485(55.6)	612(23.3)	<0.001
Medium (64-149)	288(33.0)	899(34.3)	
High (150-1462)	100(11.5)	1111(42.4)	
Major teaching hospital	194(22.2)	444(16.9)	<0.001
Ownership type			
For-profit	152(17.4)	538(20.5)	<0.001
Nonprofit	573(65.6)	1757(67)	
Public	146(16.7)	281(10.7)	
Others	2(0.2)	46(1.8)	
Operating margin, % mean(SD)	-2.3(20.5)	4.8(13.3)	<0.001

Limitations

- Costs do not include durable medical equipment
- We did not assess patient selection between hospitals within MSA. Some hospitals may shift their high complexity patients to other hospitals in order to avoid penalties.
- Other factors may have also influenced the disparity in bonus payments between safety-net and non-safety-net hospitals. Notably, target prices were adjusted for hospitals that met quality and reporting benchmarks.