

## Supplementary Online Content

Dummit LA, Kahvecioglu D, Marrufo G, et al. Association between hospital participation in a Medicare bundled payment initiative and payments and quality outcomes for lower extremity joint replacement episodes. *JAMA*. doi:10.1001/jama.2016.12717

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This supplementary material has been provided by the authors to give readers additional information about their work.

eFigure 1. Beneficiary Survey

**Health Care Experience Survey**



If the person this survey was mailed to cannot complete the survey, and there is no one else who can do so for him or her, please check here and return the blank survey in the enclosed postage-paid envelope. Thank you.

**Instructions:**

- Please read each question carefully and respond by shading the circle or box next to the response that most closely represents your opinion.
- Please shade only one circle for each question, unless it tells you to “Choose all that apply.”
- While you can use a pen, please use a PENCIL in case you want to change your answer.
- Please do NOT use felt tip pens.
- Please erase cleanly or white out any marks you wish to change.
- Please do not make any stray marks on the form.



We are interested in the quality of care you received in the hospital listed in the cover letter, and how your recovery has been going. We understand that this was probably a difficult time for you and your family. We appreciate you taking the time to tell us about your health care experiences. Please be assured that all responses are confidential.

There are four sections of this survey. The first section asks about how you were feeling just before you went into the hospital listed in the cover letter. The second section asks about how you are currently feeling. The third section asks about your experience and satisfaction in the hospital and other places you received care after you left the hospital.

The last part of the survey asks a few general questions about you.

1. Please indicate 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
  - Someone else who is not a family member, friend, or caregiver of the person named in the cover letter

**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.

2. Thinking about the week before you were hospitalized, how much help did you need from another person with bathing, dressing, using the toilet, or eating?
  - No help needed from another person
  - Some help needed from another person
  - Complete help needed from another person
  - Don't know/Don't remember

3. Thinking about the week before you were hospitalized, how much help did you need from another person with **planning regular tasks**, such as shopping or remembering to take medication?

- No help needed from another person
- Some help needed from another person
- Complete help needed from another person
- Don't know/Don't remember

4. Thinking about the week before you were hospitalized, what best describes your use of a mobility device such as a wheelchair, scooter, walker, or cane?

- I never used a mobility device
- I sometimes used a mobility device
- I always used a mobility device
- Don't know/Don't remember

5. Thinking about the week before you were hospitalized, what best describes your ability to walk by yourself without resting? That is, without the help of another person or the help of a mobility device.

- 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

6. Thinking about the week before you were hospitalized, 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

7. Thinking about the week before you were hospitalized, how often did your physical health or emotional problems interfere with your social activities (like visiting friends, relatives, etc.)?

- 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

8. Thinking about the week before you were hospitalized, how much did pain 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

## Section 2.

## After the Hospital

It has been a few months since you left the hospital and we would like to know how you have been doing **LATELY**.

9. Over the past two weeks, how often have you been bothered by feeling little interest or pleasure in doing things?

- Not at all
- Several days (1-7 days)
- More than half the days (8-11 days)
- Nearly every day (12 or more days)

10. Over the past two weeks, how often have you been bothered by feeling down, depressed or hopeless?

- Not at all
- Several days (1-7 days)
- More than half the days (8-11 days)
- Nearly every day (12 or more days)

Now we would like to know how you are doing TODAY.

11. How much help do you currently need from another person with bathing, dressing, using the toilet, or eating?

- No help needed from another person
- Some help needed from another person
- Complete help needed from another person
- Don't know/Don't remember

12. How much help do you currently need from another person with planning regular tasks, such as shopping or remembering to take medication?

- No help needed from another person
- Some help needed from another person
- Complete help needed from another person
- Don't know/Don't remember

13. What currently best describes your use of a mobility device such as a wheelchair, scooter, walker, or cane?

- I never use a mobility device
- I sometimes use a mobility device
- I always use a mobility device
- Don't know/Don't remember

14. 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 device.

- 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

15. Do you currently have difficulty 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

16. How often does your physical health or emotional problems currently interfere with your social activities (like visiting friends, relatives, etc.)?

- 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

17. How much does pain 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

18. In general, how would you rate your physical health?

- Excellent
- Very good
- Good
- Fair
- Poor

19. In general, how would you rate your mental health today, including your mood and your ability to think?

- Excellent
- Very good
- Good
- Fair
- Poor

Section 3.	Health Care Experiences
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Now, we would like to hear about your experiences while you were in the hospital listed in the cover letter and any other place where you received care following that stay in the hospital.

In the following questions, the term "medical staff" 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. For example, after leaving the hospital, you may have received care from medical staff in a nursing home, rehabilitation facility, skilled nursing facility, an assisted living facility, or at home.

20. Thinking about all of the care you received in the hospital and afterwards, how often did you, your family, or your caregiver get conflicting advice from medical staff about your treatment?

- Never
- Sometimes
- Usually
- Always

21. Thinking about all of the care you received in the hospital and afterwards, how often were the services you got appropriate for the level of care you needed?

- Never
- Sometimes
- Usually
- Always

22. What is your preferred language?

- English
- Spanish
- Other

23. Thinking about all of the care you received in the hospital and afterwards, how often did medical staff speak to you in your preferred language?

- Never
- Sometimes
- Usually
- Always

We'd like to learn about your experience as you were leaving the hospital in the cover letter.

24. Thinking about when you left the hospital, were you discharged at the right time?

- No, I was discharged too early
- No, I was discharged too late
- Yes, it was the right time

How much do you agree or disagree with the following statement?

25. Thinking about when you left the hospital listed in the cover letter, the medical staff took your preferences and those of your family or your caregiver into account in deciding what health care services you should have after you left the hospital.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Don't Know/Don't Remember
- Not Applicable

26. Where do you reside now?

- At my own home, in someone else's home, or in an assisted living facility (CONTINUE WITH Question 27)
- In a rehabilitation center, nursing home, or other health care facility (GO TO Question 31 located on the bottom of page 11)

27. Before you prepared to go home (or to someone else's home, or to an assisted living facility), you and your family or caregiver had a good understanding of how to take care of yourself.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Don't Know/Don't Remember
- Not Applicable

28. Before you prepared to go home (or to someone else's home, or to an assisted living facility), medical staff clearly explained how to take your medications.

- Strongly Disagree
- Disagree
- Agree
- Strongly Agree
- Don't Know/Don't Remember
- Not Applicable, did not receive new medications

*If you currently reside in a rehabilitation center, nursing home, or other health care facility, start at Question 31*

29. Before you prepared to go home (or to someone else's home, or to an assisted living facility), medical staff clearly explained what follow-up appointments or treatments would be needed.
- Strongly Disagree
  - Disagree
  - Agree
  - Strongly Agree
  - Don't Know/Don't Remember
  - Not Applicable
30. Overall, since you returned home (or to someone else's home, or to an assisted living facility), you and your caregivers have been able to manage your health needs.
- Strongly Disagree
  - Disagree
  - Agree
  - Strongly Agree
  - Don't Know/Don't Remember
  - Not applicable
31. Overall, how satisfied are you with your recovery since you left the hospital?
- Not at all satisfied
  - Slightly satisfied
  - Moderately satisfied
  - Quite a bit satisfied
  - Extremely satisfied

*Continue onto back cover*

Section 4.

Personal Characteristics



The last set of questions is about you.

32. Who do you live with?
- Live alone
  - Live with other(s)
  - Live with a paid helper
33. Are you male or female?
- Male
  - Female
34. What is the highest grade or level of school that you completed?
- 8th grade or less
  - 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
35. Are you of Hispanic, Latino, or Spanish origin?
- No, not of Hispanic, Latino, or Spanish origin
  - Yes, of Hispanic, Latino, or Spanish origin

36. What is your race? (Choose all that apply.)

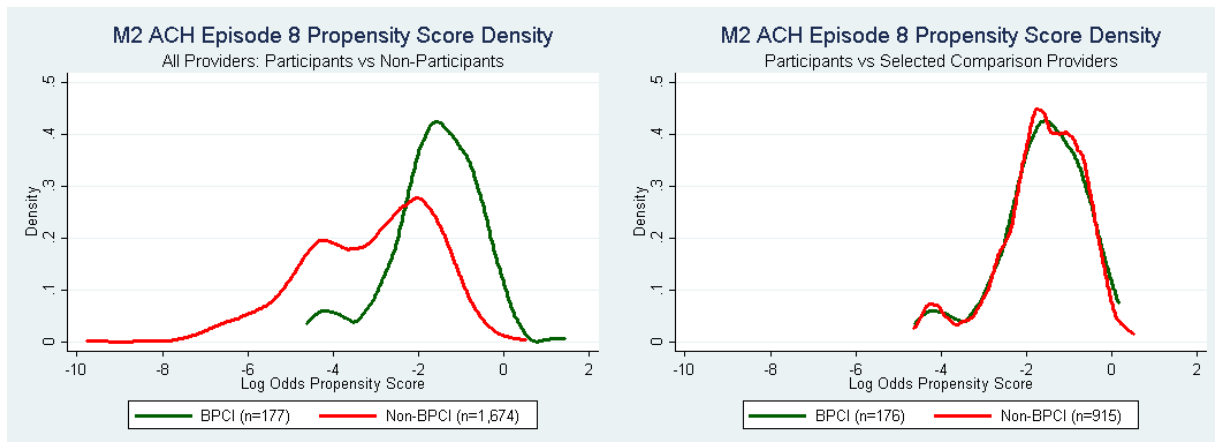
- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Other Pacific Islander

*Thank you for completing the survey and mailing it back in the enclosed envelope.*

Analyses of survey data were based on cross-sectional comparisons. We calculated the risk-adjusted rate of improvement or decline in functional status from before the anchor hospitalization to the time of the survey. The impact of BPCI was estimated by the difference in risk-adjusted rates of improvement/decline between BPCI respondents and respondents in the matched comparison sample.

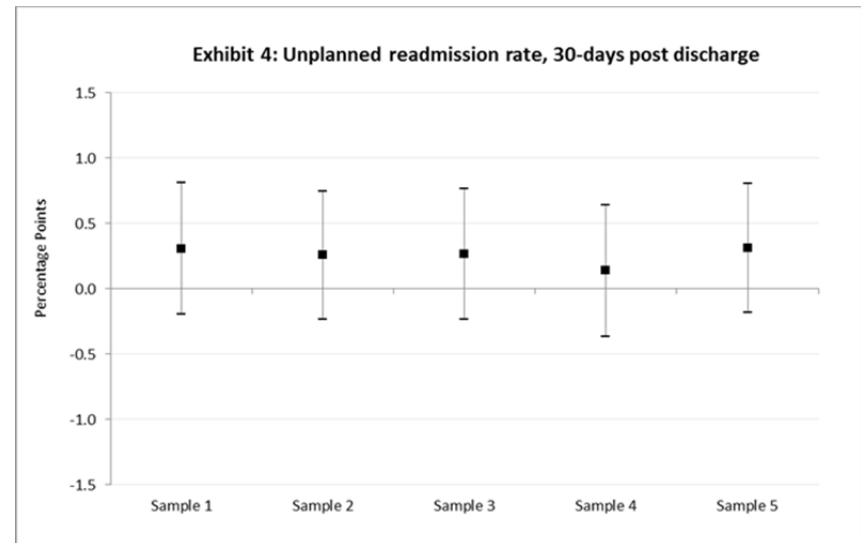
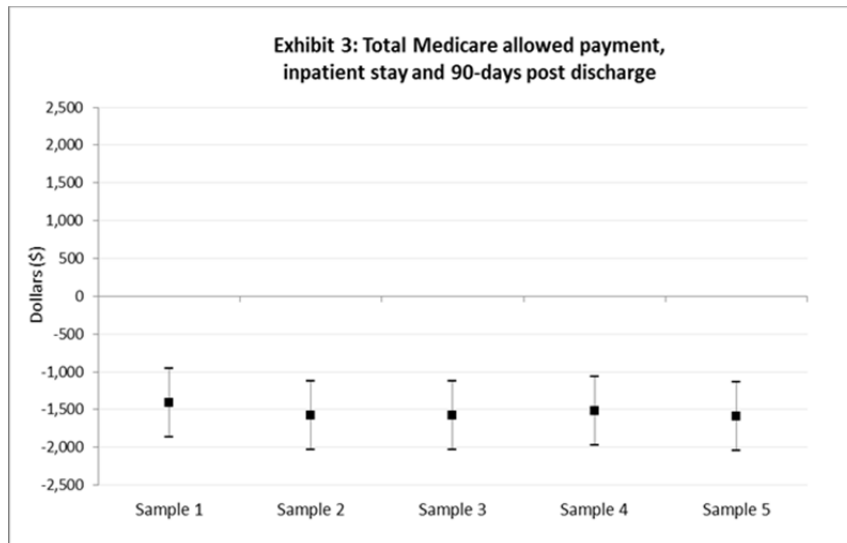
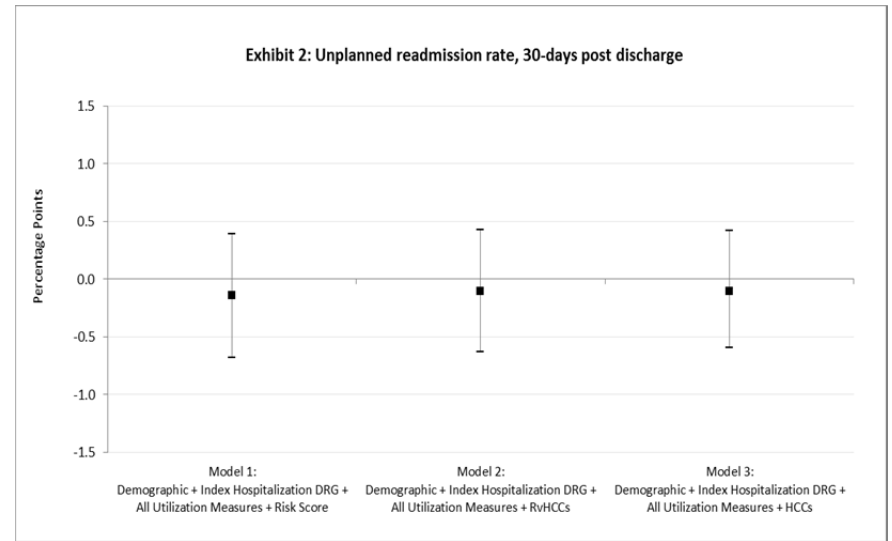
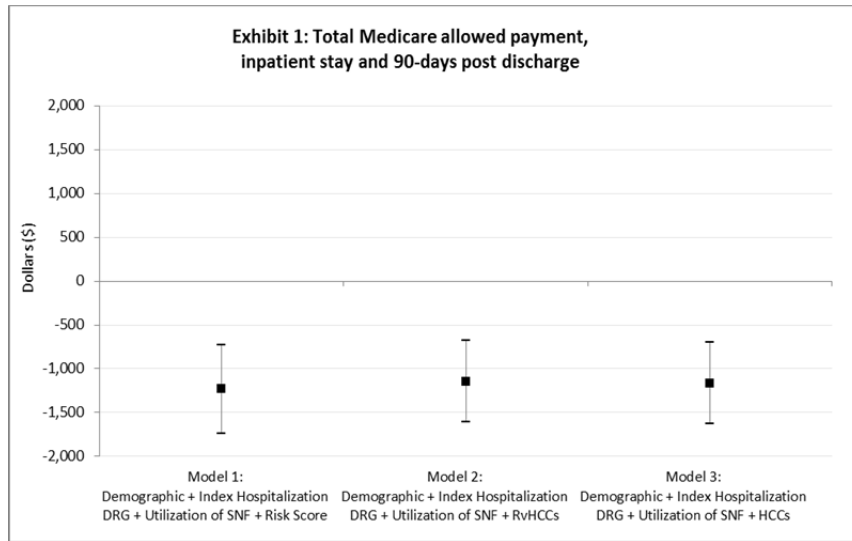


eFigure 2. Log Odds Propensity Score Density of BPCI-Participating and Nonparticipating Hospitals

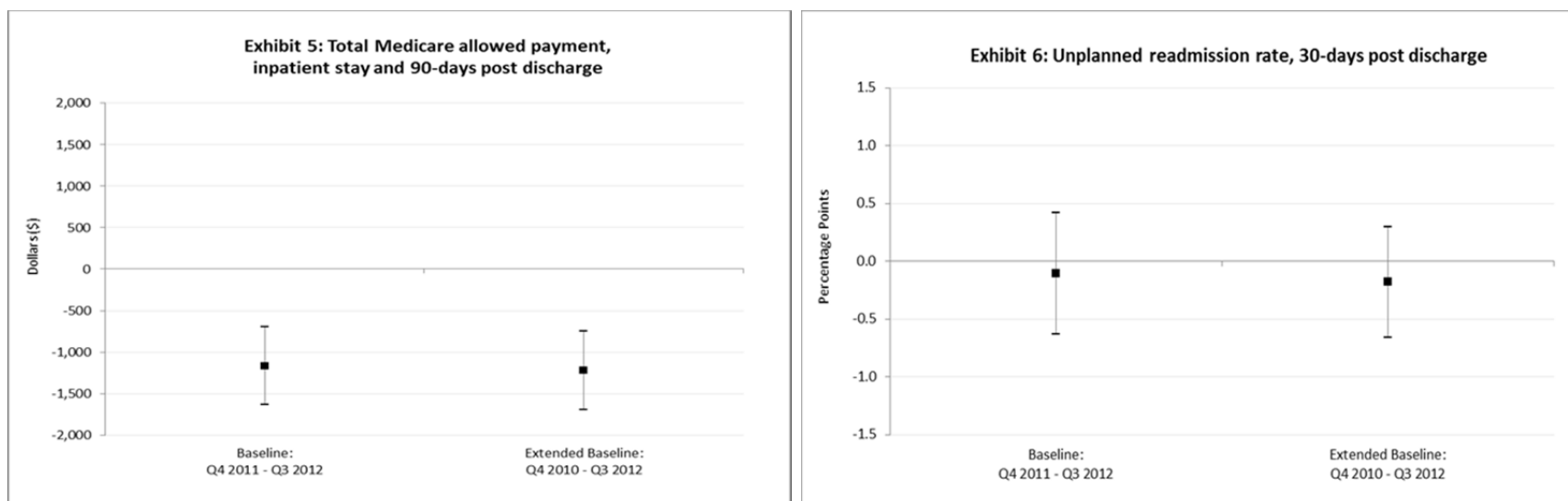


eFigure 2 displays the density of the log odds propensity scores for each BPCI-participating and nonparticipating hospital before and after matching. BPCI-participating hospitals were matched to up to 15 comparison hospitals within a caliper of 0.515 (one-third the standard deviation of the log odds propensity scores) using nearest neighbor propensity score matching. The figure on the left shows the distribution of the log odds propensity scores for the full population of BPCI-participating hospitals and potential comparison hospitals, including an outlier BPCI-participating hospital that has a log odds propensity score of 1.424. The largest log odds propensity score among nonparticipating hospitals is .500. Because there were no nonparticipating hospitals within the caliper for the outlier hospital, it was not included in the matched sample, thereby reducing the sample size by 10% of BPCI lower extremity joint replacement episodes. The figure on the right compares the distribution of log odds propensity scores for only those BPCI-participating hospitals that were matched to at least one comparison hospital.

eFigure 3. Sensitivity Analyses of Claims Measures<sup>a</sup>



eFigure 3 (continued). Sensitivity Analyses of Claims Measures<sup>a</sup>



Abbreviations: index hospitalization DRG = MS-DRG of the index hospitalization, HCCs = Hierarchical Condition Categories, Hierarchical Condition Categories are aggregated per CMS-Hierarchical Condition Category risk-adjustment model<sup>b</sup>

<sup>a</sup> Analysis of Medicare enrollment and claims data. These exhibits show difference-in-differences estimates using the conditional means and differential changes in payments and readmission rates for the BPCI population relative to their baseline and to the comparison population. Exhibit 1 and 2 show alternative risk-adjustment specifications. Exhibit 3 and 4 each use five different sets of randomly drawn beneficiary samples from the matched comparison hospitals. Exhibit 5 and 6 compare existing results to an extended two year baseline period.

<sup>b</sup> National Quality Forum. NQF #1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR) Measure Information. Last updated April 1, 2014.

eTable 1. Predictive Risk Factors Used in Claims Analysis

Domain	Variables
Patient Demographics and Enrollment	Age brackets (under 65, 65-80, 80+) Gender Medicaid status Disability Status
Hospital Characteristics	Hospital bed size For profit status
Clinical Factors	Alternative specifications <sup>a</sup> <ul style="list-style-type: none"> <li>• Hierarchical Condition Category indicators from qualifying services and diagnoses<sup>b</sup> from claims for months preceding the index hospitalization</li> <li>• Hierarchical Condition Category aggregated to 45 risk variable groups (RV-HCC) according to NQF measure 1789<sup>c</sup></li> <li>• Hierarchical Condition Category index, Hierarchical Condition Category indicators weighted by their relative weight in the CMS- Hierarchical Condition Category model</li> <li>• MS-DRG</li> </ul>
Utilization measures preceding the start of the index hospitalization <sup>d</sup>	Alternative specifications <ul style="list-style-type: none"> <li>• Binary indicators for utilization of ED, inpatient, SNF, IRF, HHA services in the six months preceding the start of the index hospitalization and ever in a NF or SNF in the six months preceding the start of the index hospitalization</li> <li>• Number of days of ED, inpatient, SNF, IRF, HHA service use in the one month preceding the start of the index hospitalization, and ever in a NF or SNF in the six months preceding the start of the index hospitalization</li> <li>• Number of days of ED, inpatient, SNF, IRF, HHA service use in the six months preceding the start of the index hospitalization, and ever in a NF or SNF in the six months preceding the start of the index hospitalization</li> </ul>
Location	Alternative specifications <ul style="list-style-type: none"> <li>• State dummies</li> <li>• Census region dummies</li> </ul>

Abbreviations: CMS = Centers for Medicare & Medicaid Services; MS-DRG = Medicare Severity-Diagnosis Related Group; NQF = National Quality Forum; ED= emergency department visit; SNF = skill nursing facility; IRF=inpatient rehabilitation facility; NF= Nursing Facility

<sup>a</sup> While the same demographic, enrollment status and hospital characteristics were included for all measures, alternative specifications were used to control for clinical factors, prior care use, and location.

<sup>b</sup> The CMS- Hierarchical Condition Category 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 several Hierarchical Condition Category 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- Hierarchical Condition Category model" (2004). Quantitative Health Sciences Publications and Presentations. Paper 723.

<sup>c</sup> National Quality Forum. NQF #1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR) Measure Information. Last updated April 1, 2014.

<sup>d</sup> The only utilization measure included in the payment models was an indicator for NF or SNF use in the six months preceding the start of the index hospitalization.

eTable 2. Tests for Equal Trends in Outcomes During Baseline Period, BPCI and Comparison Populations<sup>a</sup>

Covariate	30-day Readmission Rate			Medicare Standardized Part A and B Payments for the Inpatient Stay and the 90-day post-discharge period		
	Coefficient	Standard error	P-value	Coefficient	Standard error	P-value
BPCI	0.140	0.202	0.49	523.014	688.868	0.45
Time trend	0.0004	0.023	0.99	-189.737	68.984	0.01
BPCI*time trend	-0.026	0.031	0.39	-25.067	98.522	0.80

<sup>a</sup>This is an analysis of Medicare enrollment and claims data. It includes episodes initiated between October 2011 and September 2012 (baseline period). Regression coefficients are for indicators for the BPCI population, a time trend, and an interaction term between these two terms. Additional covariates (coefficients not shown here) included risk factors observed before the index hospitalization (age, sex, Medicaid eligibility, disability status, Hierarchical Condition Category indicators), prior health care use, and provider characteristics. None of the coefficients indicating trend differences (i.e, BPCI\*time trend) are statistically significant at 5%.

eTable 3. Number of Lower Extremity Joint Replacement Discharges, Difference-in-Differences Between Baseline and Intervention Periods for BPCI and Comparison Providers<sup>a</sup>

	Means				Difference-in-Differences Estimate (95% CI)
	Matched BPCI-Participating Hospitals		Comparison Hospitals		
	Baseline Period (April 2012 – June 2012)	Intervention Period (April 2015 – June 2015)	Baseline Period (April 2012 – June 2012)	Intervention Period (April 2015 – June 2015)	
Number of hospitals	176	176	915	915	
Lower extremity joint replacement Discharges Per Quarter	61.5	64.6	59.6	59.2	3.38 (-2.4 to 9.2)

<sup>a</sup> Means and differential changes in lower extremity joint replacement discharges for the BPCI population relative to their baseline and to the comparison population. The baseline period is from April 2012 through June 2012. The intervention period is from April 2015 through June 2015.

eTable 4. BPCI and Comparison Survey Respondent Characteristics, Lower Extremity Joint Replacement Episodes, October 2014, February 2015, and May 2015

Beneficiary Characteristics	BPCI Survey Respondents (N=1,098)	Comparison Survey Respondents (N=1,095)	P-values <sup>e</sup>
	No.(%) <sup>a</sup>	No.(%) <sup>a</sup>	
Age (years)			
<65	82 (10.7)	68 (10.2)	0.78
65-74	576 (49.0)	571 (48.1)	0.71
75-84	349(28.8)	362 (30.0)	0.55
>85	91(11.5)	94 (11.7)	0.92
Sex			
Male	364 (32.2)	363 (32.0)	0.93
Female	734 (67.8)	732 (68.0)	0.93
Race <sup>b</sup>			
White	980 (91.7)	986 (92.4)	0.59
Black	69 (6.7)	61 (5.7)	0.38
Other	16 (1.6)	20 (1.9)	0.63
Hispanic origin <sup>c</sup>	35 (3.5)	33 (3.3)	0.83
Education level <sup>d</sup>			
Less than high school	86 (8.6)	108 (10.1)	0.28
High school	313 (29.1)	300 (28.9)	0.92
Some college	291 (27.4)	333 (31.1)	0.07
College degree or greater	385 (34.9)	338 (29.9)	0.02
With lower joint fractures	70 (6.9)	97 (10.3)	0.01
Medicaid eligible	83 (8.4)	94 (9.3)	0.48
	Mean (SD)	Mean (SD)	
	[25 <sup>th</sup> , 50 <sup>th</sup> , 75 <sup>th</sup> percentile]	[25 <sup>th</sup> , 50 <sup>th</sup> , 75 <sup>th</sup> percentile]	
HCC index	0.26(0.51)	0.24 (0.44)	0.29
	[0.0,0.0,0.34]	[0.0, 0.0, 0.35]	

<sup>a</sup> Survey results were weighted to adjust for sampling and nonresponse. The first number reports the total number of survey respondents with a given characteristic. Weighted rates are reported in parentheses.

<sup>b</sup> The number of nonmissing responses for race was 1,065 and 1,067 for the BPCI and comparison groups, respectively.

<sup>c</sup> The number of nonmissing responses for Hispanic origin was 1,053 and 1,046 for the BPCI and comparison groups, respectively.

<sup>d</sup> The number of nonmissing responses for education level was 1,075 and 1,079 for the BPCI and comparison groups, respectively.

<sup>e</sup> Chi-squared tests were used to conduct tests for categorical and binary measures, and t-tests were used for continuous variables.

eTable 5. Patient and Location Characteristics, BPCI and Comparison Populations, Baseline and Intervention Periods: Alternative Risk-Adjustment Factors<sup>a</sup>

	BPCI Population		Comparison Population		Difference-in-Difference Estimate (95% CI)	p-Value
	Baseline Period (Oct. 2011 - Sep. 2012) n=29,441	Intervention Period (Oct. 2013-Jun. 2015) n=31,700	Baseline Period (Oct. 2011-Sep. 2012) n=29,440	Intervention Period (Oct. 2013-Jun. 2015) n=31,696		
<b>Patient Characteristics</b>						
Days utilization six months prior to index hospitalization						
	Mean (standard deviation) [min, median, max]		Mean (standard deviation) [min, median, max]			
Home health	5.6 (22.3) [0.0, 0.0, 180]	4.2 (18.3) [0.0, 0.0, 180]	5.8 (22.9) [0.0, 0.0, 180]	5.3 (21.3) [0.0, 0.0, 180]	-0.9 (-1.3, -0.4) <sup>b</sup>	<0.001
Skilled nursing facility	1.5 (8.4) [0.0, 0.0, 117]	1.2 (7.6) [0.0, 0.0, 180]	1.4 (8.0) [0.0, 0.0, 120]	1.3 (7.8) [0.0, 0.0, 118]	-0.2 (-0.4, -0.0) <sup>b</sup>	0.04
Inpatient acute care hospital	0.7 (2.6) [0.0, 0.0, 79]	0.6 (2.3) [0.0, 0.0, 72]	0.7 (2.6) [0.0, 0.0, 59]	0.6 (2.3) [0.0, 0.0, 87]	-0.0 (-0.1, 0.0)	0.33
Long-term care hospital	0.0 (0.7) [0.0, 0.0, 61]	0.0 (0.9) [0.0, 0.0, 65]	0.0 (0.9) [0.0, 0.0, 54]	0.0 (0.9) [0.0, 0.0, 64]	0.0 (-0.0, 0.0)	0.52
Inpatient rehabilitation facility	0.2 (1.6) [0.0, 0.0, 59]	0.1 (1.4) [0.0, 0.0, 48]	0.1 (1.5) [0.0, 0.0, 82]	0.1 (1.3) [0.0, 0.0, 37]	0.0 (-0.0, 0.0)	0.84
Hospice	0.3 (6.1) [0.0, 0.0, 180]	0.2 (4.8) [0.0, 0.0, 180]	0.3 (6.2) [0.0, 0.0, 180]	0.2 (5.3) [0.0, 0.0, 180]	-0.0 (-0.2, 0.1)	0.45
Other inpatient facility	0.1 (1.2) [0.0, 0.0, 75]	0.1 (1.5) [0.0, 0.0, 120]	0.1 (1.4) [0.0, 0.0, 72]	0.1 (1.1) [0.0, 0.0, 62]	0.0 (-0.0, 0.0)	0.30
Any utilization one month prior to index hospitalization						
	N (%)		N (%)			
Home health	1,321 (4.5)	1,053 (3.3)	1,340 (4.6)	1,293 (4.1)	-0.7 (-1.1, -0.2) <sup>b</sup>	0.002
Skilled nursing facility	449 (1.5)	408 (1.3)	366 (1.2)	360 (1.1)	-0.1 (-0.4, 0.1)	0.31
Inpatient acute care hospital	583 (2.0)	558 (1.8)	526 (1.8)	519 (1.6)	-0.1 (-0.4, 0.2)	0.64
Total hospital	617 (2.1)	594 (1.9)	575 (2.0)	550 (1.7)	-0.0 (-0.3, 0.3)	0.98



eTable 5 (continued). Patient and Location Characteristics, BPCI and Comparison Populations, Baseline and Intervention Periods: Alternative Risk-Adjustment Factors<sup>a</sup>

	BPCI Population		Comparison Population		Difference-in-Difference Estimate (95% CI)	p-Value
	Baseline Period (Oct. 2011 - Sep. 2012) n=29,441	Intervention Period (Oct. 2013-Jun. 2015) n=31,700	Baseline Period (Oct. 2011-Sep. 2012) n=29,440	Intervention Period (Oct. 2013-Jun. 2015) n=31,696		
Aggregated Hierarchical Care Category variables <sup>c,d</sup>						
	N (%)		N (%)			
Severe cancer	578 (2.0)	610 (1.9)	588 (2.0)	621 (2.0)	0.0 (-0.3, 0.3)	1.00
Other major cancers	1,795 (6.1)	1,904 (6.0)	1,839 (6.2)	1,904 (6.0)	0.1 (-0.4, 0.7)	0.59
Diabetes mellitus	5,127 (17.4)	5,321 (16.8)	5,158 (17.5)	5,379 (17.0)	-0.1 (-0.9, 0.8)	0.85
Psychiatric comorbidity	1,332 (4.5)	1,381 (4.4)	1,273 (4.3)	1,473 (4.6)	-0.5 (-1.0, -0.0) <sup>b</sup>	0.04
Seizure disorders and convulsions	359 (1.2)	361 (1.1)	335 (1.1)	356 (1.1)	-0.1 (-0.3, 0.2)	0.59
Congestive heart failure	1,912 (6.5)	1,762 (5.6)	1,828 (6.2)	1,823 (5.8)	-0.5 (-1.0, 0.1)	0.08
Coronary atherosclerosis or angina, cerebrovascular disease	3,317 (11.3)	3,473 (11.0)	3,172 (10.8)	2,936 (9.3)	1.2 (0.5, 1.9) <sup>b</sup>	<0.001
Specified arrhythmias	3,618 (12.3)	3,817 (12.0)	3,422 (11.6)	3,616 (11.4)	-0.0 (-0.8, 0.7)	0.93
Chronic obstructive pulmonary disease	2,046 (6.9)	1,970 (6.2)	1,847 (6.3)	1,883 (5.9)	-0.4 (-0.9, 0.1)	0.15
Ulcers	598 (2.0)	583 (1.8)	528 (1.8)	562 (1.8)	-0.2 (-0.5, 0.1)	0.27
Cardio-respiratory failure or cardio-respiratory shock	528 (1.8)	581 (1.8)	555 (1.9)	588 (1.9)	0.1 (-0.2, 0.4)	0.65
Stroke	458 (1.6)	405 (1.3)	368 (1.3)	394 (1.2)	-0.3 (-0.5, -0.0) <sup>b</sup>	0.04
Acute renal failure	1,714 (5.8)	1,926 (6.1)	1,676 (5.7)	1,859 (5.9)	0.1 (-0.4, 0.6)	0.76
Rheumatoid arthritis and inflammatory connective tissue disease	1,536 (5.2)	1,708 (5.4)	1,515 (5.1)	1,656 (5.2)	0.1 (-0.4, 0.6)	0.72
Hip fracture/dislocation	4,723 (16.0)	4,362 (13.8)	4,670 (15.9)	4,372 (13.8)	-0.2, (-1.0, 0.6)	0.60

eTable 5 (continued). Patient and Location Characteristics, BPCI and Comparison Populations, Baseline and Intervention Periods: Alternative Risk-Adjustment Factors<sup>a</sup>

	BPCI Population		Comparison Population		Difference-in-Difference Estimate (95% CI)	p-Value
	Baseline Period (Oct. 2011 - Sep. 2012) n=29,441	Intervention Period (Oct. 2013-Jun. 2015) n=31,700	Baseline Period (Oct. 2011-Sep. 2012) n=29,440	Intervention Period (Oct. 2013-Jun. 2015) n=31,696		
Hierarchical Care Category Variables						
	N (%)		N (%)			
Lymphatic, head and neck, brain, and other major cancers	408 (1.4)	439 (1.4)	406 (1.4)	448 (1.4)	-0.0 (-0.3, 0.2)	0.79
Breast, prostate, colorectal and other cancers and tumors	1,795 (6.1)	1,904 (6.0)	1,839 (6.2)	1,904 (6.0)	0.1 (-0.4, 0.7)	0.59
Diabetes with renal or peripheral circulatory manifestation	467 (1.6)	571 (1.8)	444 (1.5)	475 (1.5)	0.2 (-0.1, 0.5)	0.12
Diabetes with neurologic or other specified manifestation	623 (2.1)	767 (2.4)	593 (2.0)	698 (2.2)	0.1 (-0.2, 0.4)	0.49
Diabetes without complication	3,693 (12.5)	3,682 (11.6)	3,813 (13.0)	3,934 (12.4)	-0.4 (-1.1, 0.4)	0.30
Bone/joint/muscle infections/necrosis	884 (3.0)	947 (3.0)	918 (3.1)	924 (2.9)	0.2 (-0.2, 0.6)	0.34
Rheumatoid arthritis and inflammatory connective tissue disease	1,536 (5.2)	1,708 (5.4)	1,515 (5.1)	1,656 (5.2)	0.1 (-0.4, 0.6)	0.72
Major depressive, bipolar, and paranoid disorders	1,169 (4.0)	1,233 (3.9)	1,148 (3.9)	1,319 (4.2)	-0.3 (-0.8, 0.1)	0.13
Polyneuropathy	691 (2.3)	785 (2.5)	728 (2.5)	803 (2.5)	0.1 (-0.3, 0.4)	0.70
Parkinson's and Huntington's Diseases	335 (1.1)	352 (1.1)	351 (1.2)	326 (1.0)	0.1 (-0.1, 0.4)	0.26

eTable 5 (continued). Patient and Location Characteristics, BPCI and Comparison Populations, Baseline and Intervention Periods: Alternative Risk-Adjustment Factors<sup>a</sup>

	BPCI Population		Comparison Population		Difference-in-Difference Estimate (95% CI)	p-Value
	Baseline Period (Oct. 2011 - Sep. 2012) n=29,441	Intervention Period (Oct. 2013-Jun. 2015) n=31,700	Baseline Period (Oct. 2011-Sep. 2012) n=29,440	Intervention Period (Oct. 2013-Jun. 2015) n=31,696		
Hierarchical Care Category Variables (continued)						
	N (%)		N (%)			
Seizure disorders and convulsions	359 (1.2)	361 (1.1)	335 (1.1)	356 (1.1)	-0.1 (-0.3, 0.2)	0.59
Cardio-respiratory failure and shock	524 (1.8)	579 (1.8)	551 (1.9)	584 (1.8)	0.1 (-0.2, 0.4)	0.62
Congestive heart failure	1,912 (6.5)	1,762 (5.6)	1,828 (6.2)	1,823 (5.8)	-0.5 (1.0, 0.1)	0.08
Angina pectoris/ Old myocardial infarction	683 (2.3)	607 (1.9)	660 (2.2)	644 (2.0)	-0.2 (-0.5, 0.1)	0.24
Specified heart arrhythmias	3,618 (12.3)	3,817 (12.0)	3,422 (11.6)	3,616 (11.4)	-0.0 (-0.8, 0.7)	0.93
Ischemic or unspecified stroke	402 (1.4)	335 (1.1)	309 (1.0)	336 (1.1)	-0.3 (-0.6, -0.1) <sup>b</sup>	0.01
Vascular disease with complications	297 (1.0)	342 (1.1)	307 (1.0)	308 (1.0)	0.1 (-0.1, 0.4)	0.22
Vascular disease	2,152 (7.3)	2,367 (7.5)	2,020 (6.9)	1,840 (5.8)	1.2 (0.6, 1.8) <sup>b</sup>	<0.001
Chronic obstructive pulmonary disease	2,046 (6.9)	1,970 (6.2)	1,847 (6.3)	1,883 (5.9)	-0.4 (-0.9, 0.1)	0.15
Renal failure	1,714 (5.8)	1,926 (6.1)	1,676 (5.7)	1,859 (5.9)	0.1 (-0.4, 0.6)	0.76
Chronic ulcer of skin, except decubitus	416 (1.4)	416 (1.3)	381 (1.3)	392 (1.2)	-0.0 (-0.3, 0.2)	0.74
Hip fracture/dislocation	4,723 (16.0)	4,362 (13.8)	4,670 (15.9)	4,372 (13.8)	-0.2 (-1.0, 0.6)	0.60

eTable 5 (continued). Patient and Location Characteristics, BPCI and Comparison Populations, Baseline and Intervention Periods: Alternative Risk-Adjustment Factors<sup>a</sup>

	BPCI Population		Comparison Population		Difference-in-Difference Estimate (95% CI)	P-Value
	Baseline Period (Oct. 2011 - Sep. 2012) n=29,441	Intervention Period (Oct. 2013-Jun. 2015) n=31,700	Baseline Period (Oct. 2011-Sep. 2012) n=29,440	Intervention Period (Oct. 2013-Jun. 2015) n=31,696		
State	N (%)		N (%)			
Arizona	763 (2.6)	1,621 (5.1)	871 (3.0)	452 (1.4)	4.1 (3.7, 4.4) <sup>b</sup>	<0.001
Arkansas	1,045 (3.5)	919 (2.9)	323 (1.1)	403 (1.3)	-0.8 (-1.2, -0.5) <sup>b</sup>	<0.001
California	1,155 (3.9)	898 (2.8)	2,219 (7.5)	2,397 (7.6)	-1.1 (-1.6, -0.6) <sup>b</sup>	<0.001
Connecticut	630 (2.1)	1,526 (4.8)	811 (2.8)	1,017 (3.2)	2.2 (1.8, 2.6) <sup>b</sup>	<0.001
Delaware	1,029 (3.5)	625 (2.0)	32 (0.1)	40 (0.1)	-1.5 (-1.8, -1.3) <sup>b</sup>	<0.001
Florida	1,177 (4.0)	1,230 (3.9)	1,510 (5.1)	1,779 (5.6)	-0.6 (-1.1, -0.1) <sup>b</sup>	0.01
Georgia	226 (0.8)	372 (1.2)	537 (1.8)	484 (1.5)	0.7 (0.4, 1.0) <sup>b</sup>	<0.001
Illinois	2,132 (7.2)	1,425 (4.5)	1,806 (6.1)	1,883 (5.9)	-2.6 (-3.1, -2.0) <sup>b</sup>	<0.001
Indiana	50 (0.2)	8 (0.0)	979 (3.3)	1,160 (3.7)	-0.5 (-0.8, -0.2) <sup>b</sup>	0.001
Kentucky	138 (0.5)	48 (0.2)	1,090 (3.7)	1,552 (4.9)	-1.5 (-1.8, -1.2) <sup>b</sup>	<0.001
Louisiana	403 (1.4)	590 (1.9)	343 (1.2)	617 (1.9)	-0.3 (-0.6, -0.0) <sup>b</sup>	0.04
Maine	253 (0.9)	84 (0.3)	436 (1.5)	640 (2.0)	-1.1 (-1.4, -0.9) <sup>b</sup>	<0.001
Massachusetts	1,931 (6.6)	1,668 (5.3)	2,388 (8.1)	2,585 (8.2)	-1.3 (-1.9, -0.8) <sup>b</sup>	<0.001
Michigan	1,360 (4.6)	1,085 (3.4)	1,632 (5.5)	2,034 (6.4)	-2.1 (-2.6, -1.6) <sup>b</sup>	<0.001
Minnesota	0 (0.0)	0 (0.0)	874 (3.0)	429 (1.4)	1.6 (1.4, 1.8) <sup>b</sup>	<0.001
Missouri	498 (1.7)	369 (1.2)	299 (1.0)	248 (0.8)	-0.3 (-0.5, -0.1) <sup>b</sup>	0.02
Nebraska	811 (2.8)	1,154 (3.6)	199 (0.7)	219 (0.7)	0.9 (0.6, 1.2) <sup>b</sup>	<0.001

eTable 5 (continued). Patient and Location Characteristics, BPCI and Comparison Populations, Baseline and Intervention Periods: Alternative Risk-Adjustment Factors<sup>a</sup>

	BPCI Population		Comparison Population		Difference-in-Difference Estimate (95% CI)	P-Value
	Baseline Period (Oct. 2011 - Sep. 2012) n=29,441	Intervention Period (Oct. 2013-Jun. 2015) n=31,700	Baseline Period (Oct. 2011-Sep. 2012) n=29,440	Intervention Period (Oct. 2013-Jun. 2015) n=31,696		
State (continued)						
	N (%)		N (%)			
New Jersey	1,972 (6.7)	2,568 (8.1)	285 (1.0)	485 (1.5)	0.8 (0.4, 1.3) <sup>b</sup>	<0.001
New York	1,920 (6.5)	2,711 (8.6)	1,590 (5.4)	1,395 (4.4)	3.0 (2.5, 3.6) <sup>b</sup>	<0.001
North Carolina	905 (3.1)	1,208 (3.8)	528 (1.8)	462 (1.5)	1.1 (0.7, 1.4) <sup>b</sup>	<0.001
Ohio	1,276 (4.3)	747 (2.4)	439 (1.5)	456 (1.4)	-1.9 (-2.3, -1.6) <sup>b</sup>	<0.001
Oklahoma	361 (1.2)	662 (2.1)	715 (2.4)	1,028 (3.2)	0.0 (-0.3, 0.4)	0.78
Pennsylvania	2,389 (8.1)	2,927 (9.2)	1,917 (6.5)	2,300 (7.3)	0.4 (-0.2, 1.0)	0.22
Tennessee	1,671 (5.7)	1,699 (5.4)	390 (1.3)	249 (0.8)	0.2 (-0.2, 0.6)	0.27
Texas	1,831 (6.2)	1,698 (5.4)	2,566 (8.7)	2,514 (7.9)	-0.1 (-0.7, 0.5)	0.79
Virginia	798 (2.7)	928 (2.9)	341 (1.2)	458 (1.4)	-0.1 (-0.4, 0.2)	0.67
Wisconsin	348 (1.2)	428 (1.4)	838 (2.8)	780 (2.5)	0.6 (0.2, 0.9) <sup>b</sup>	<0.001

<sup>a</sup> Analysis of Medicare enrollment and claims data. Unadjusted proportions and means averaged across beneficiaries in the BPCI and comparison populations, for the baseline (October 2011-September 2012) and the intervention (October 2013-June 2015) periods. Intervention period varies by hospital based on when they were participating.

<sup>b</sup> Statistically significant difference at the 5% significance level.

<sup>c</sup> The hierarchical condition categories (CMS-Hierarchical Condition Category) 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 70 Hierarchical Condition Category indicators.

<sup>d</sup> National Quality Forum. NQF #1789 Hospital-Wide All-Cause Unplanned Readmission Measure (HWR) Measure Information. Last updated April 1, 2014.