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## REVIEW ARTICLE

# The Impact Of Bundled Payment On Health Care Spending, Utilization, And Quality: A Systematic Review

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**ABSTRACT** The Centers for Medicare and Medicaid Services (CMS) has promoted bundled payment programs nationwide as one of its flagship value-based payment reforms. Under bundled payment, providers assume accountability for the quality and costs of care delivered during an episode of care. We performed a systematic review of the impact of three CMS bundled payment programs on spending, utilization, and quality outcomes. The three programs were the Acute Care Episode Demonstration, the voluntary Bundled Payments for Care Improvement initiative, and the mandatory Comprehensive Care for Joint Replacement model. Twenty studies that we identified through search and screening processes showed that bundled payment maintains or improves quality while lowering costs for lower extremity joint replacement, but not for other conditions or procedures. Our review also suggests that policy makers should account for patient-level heterogeneity and include risk stratification for specific conditions in emerging bundled payment programs.

Provider reimbursement has shifted in recent years from fee-for-service to alternative payment models that incentivize value by shifting financial risk for both health care costs and quality onto providers. Such models include accountable care organizations, advanced primary care medical homes, and bundled (or episode-based) payment.<sup>1</sup> Under bundled payment, providers assume accountability for the quality and cost of care delivered during a predetermined episode. Providers that keep costs below a risk-adjusted target price share a portion of the resulting savings, but those that exceed the target price incur financial penalties.<sup>2</sup> This creates financial incentives for providers to coordinate care over the entire episode.<sup>3</sup>

Beginning in 2009 the Centers for Medicare

and Medicaid Services (CMS) tested the use of bundled payment for episodes of care with the three-year Acute Care Episode (ACE) Demonstration that covered all Parts A and B services for twenty-eight cardiac and nine orthopedic inpatient surgical services and procedures.<sup>4</sup> In 2013 CMS launched a large national bundled payment program, the Bundled Payments for Care Improvement (BPCI) initiative. The program accepted applications for four different models of payment covering forty-eight clinical episodes. Models 1, 2, and 3 retrospectively reconciled differences between the expenditure and a target price. Model 1 covered the acute period, model 3 the postacute period, and model 2 both periods. Medicare paid BPCI participants on a fee-for-service basis, and costs were reconciled after the episode was completed. In contrast,

model 4 was a prospective payment model that required CMS to make a one-time advance payment to participants for all services rendered.<sup>2,5,6</sup>

In 2016 CMS launched the Comprehensive Care for Joint Replacement (CJR) model, an ongoing model that makes bundled payments for hip or knee replacement. Similar to BPCI's model 2, CJR holds hospitals responsible for Medicare spending for the acute period and a postacute period of ninety days, and differences between target prices and incurred costs are reconciled at the end of the year. However, while other bundled payment programs have been voluntary, CJR mandated hospital participation by randomly assigning urban markets to the program. The number of urban markets mandated to participate was subsequently halved, and low-volume and rural hospitals were allowed to opt out.<sup>2,3,7</sup>

Given growing stakeholder interest in bundled payment, policy makers, clinicians, and researchers would benefit from information on how bundled payment models have affected the cost and quality of care for covered conditions and procedural episodes. Impact evaluations of BPCI and CJR have been conducted, including formal evaluations by a federal contractor.<sup>8</sup> To increase understanding of the findings of the available studies as a whole, we performed a systematic review on the impact of bundled payment models on spending, utilization, and quality outcomes.

## Study Data And Methods

Our systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.<sup>9</sup>

**STUDY INCLUSION CRITERIA** We included all prospective or retrospective studies that compared a bundled payment approach with a fee-for-service reimbursement control group. We focused on the ACE, BPCI, and CJR models because of similarities in their design. We excluded other programs because of a lack of data (for example, BPCI Advanced) or differences in program design (for example, the Oncology Care Model) compared to the models included in our review. We included only peer-reviewed, English-language articles. We used the population, intervention, comparator, and outcomes (PICO) framework to guide our systematic review.

We classified the outcomes into four categories: health care spending, utilization, quality, and unintended consequences. Health care spending included total episode spending, episode spending for inpatient and postacute care stays, and home health agency spending in the episode. Utilization included discharge disposi-

tion (discharges to a postacute care facility, home health agency, or home) and length-of-stay in the hospital and postacute care facilities. Quality included readmission rate, complication rate, mortality, and emergency department visits. Unintended consequences included differences in risk selection or case complexity and episode volume.

### IDENTIFICATION AND SELECTION OF STUDIES

We searched MEDLINE and the Cochrane Central Register of Controlled Trials from inception to February 2019. Our detailed search strategy is in online appendix exhibit A1.<sup>10</sup> Title and abstract screening was done by one author (Rajender Agarwal), which was followed by full-text screening of relevant citations by two authors working independently (Agarwal and Ashutosh Gupta). Disagreements were resolved through consensus. Reference lists of included studies were screened to identify any additional studies that met our inclusion criteria.

**DATA EXTRACTION** We created evidence tables using the PICO framework and extracted relevant information on study design and analysis, population, sample size, details of the bundled payment initiative, and study outcomes. One author (Agarwal) initially extracted this information from each included article and inserted it into the evidence tables. All data extraction was subsequently verified for accuracy by a second author (Gupta) working independently.

**LIMITATIONS** Our systematic review had limitations that are worth mentioning. First, our conclusions were limited by the quality of the constituent studies. Fifty percent of the included studies were observational single-center studies with no adjustment for confounders.

Second, there was significant heterogeneity among the included studies in terms of interventions designed to facilitate care coordination between the inpatient and postacute care settings.

Third, despite the publication of several recent studies, there were limited data on patient-centered outcomes.

Finally, the tools available to assess the risk of bias in nonrandomized studies<sup>11,12</sup> are not sufficiently developed to account for selection on unobservable confounders. Rigorous nonrandomized studies use design-based approaches (for example, difference-in-differences analysis and instrumental variables estimation) to control for unobservable sources of confounding.<sup>13,14</sup> We report these study designs in the "Study Results" section and exhibits.

## Study Results

Our literature searches identified 983 unique citations. Fifty-two of them were considered po-

tentially relevant based on title and abstract screening, and the full texts were obtained (see appendix exhibit A2 for the PRISMA flow diagram).<sup>10</sup> Our detailed review of full texts ultimately yielded twenty studies that met our inclu-

sion criteria.<sup>15-34</sup>

**STUDY CHARACTERISTICS** All included studies were published in the period 2016–19. Our evidence base included seven quasi-experimental studies that used a difference-in-differences or instrumental variables analysis (exhibit 1).<sup>15,19,22,23,26,27,30</sup> Thirteen studies were observational in nature, with three adjusting for confounders.<sup>29,31,32</sup> Three studies did not perform significance testing for any outcome.<sup>17,24,25</sup> Seven studies were national multicenter studies,<sup>15,19,22,23,26,29,30</sup> while the remaining studies examined single-center experiences. The most common clinical episode was lower extremity joint replacement (LEJR).<sup>15,17,19,22–25,27,28,30,31,33,34</sup> Other clinical episodes were noncervical spinal fusion,<sup>18,27,29</sup> shoulder arthroplasty,<sup>32</sup> revision knee or hip arthroplasty,<sup>20</sup> cardiac surgery,<sup>19,27</sup> and medical conditions.<sup>16,26</sup>

BPCI's model 2 was evaluated in sixteen studies,<sup>16–18,20–22,25–34</sup> mandatory CJR was evaluated in three studies,<sup>15,23,24</sup> and ACE was evaluated in two studies.<sup>19,31</sup> The episode duration consisted of the hospitalization period plus ninety days in all except three studies, in which the duration was the hospitalization period plus thirty days.<sup>19,31,34</sup> Clinical episodes were initiated by a physician group practice in five studies<sup>21,28,32–34</sup> and by hospitals in the remaining studies. See appendix exhibit A3 for detailed study characteristics.<sup>10</sup>

**OUTCOMES** Exhibit 2 summarizes the outcomes of the included studies. See appendix exhibits A4–A22 for more detailed evidence tables that show the study outcomes.<sup>10</sup> (In this section of the article, “BPCI” refers to BPCI's model 2 unless otherwise noted.)

► **HEALTH CARE SPENDING:** Sixteen studies evaluated Medicare episode payments.<sup>15,16,18–24,26,27,29,31–34</sup> Six studies showed a significant decrease in episode payments associated with bundled payment.<sup>15,21,22,31,32,34</sup> In a multicenter study, Laura Dummit and colleagues showed a significant decrease in episode payment of \$1,166 (3.9 percent) for patients undergoing LEJR in BPCI.<sup>22</sup> Three single-center studies showed a significant decrease in episode payments (range: \$2,717–\$3,263) among patients undergoing orthopedic surgery in BPCI.<sup>21,32,34</sup> In another single-center study, Amol Navathe and colleagues showed that for LEJR without complications, decreases in episode payments were not significant during the ACE period ( $p = 0.62$ ) but were significant during the BPCI period ( $p < 0.001$ ). There were no significant decreases or increases in episode payments during either the ACE or BPCI periods for LEJR with complications.<sup>31</sup> In another single-center study, Lindsay Jubelt and colleagues found that there was a significant in-

## EXHIBIT 1

### Selected characteristics of 20 studies that compared a bundled payment model and fee-for-service reimbursement, and study outcomes

CHARACTERISTICS	Number of studies
Study design	
Quasi-experimental	7
Observational study with adjusted analyses	3
Observational study with no adjustment for confounders	10
Observational study with no significance testing	3
Number of centers	
Multiple	7
One	13
Patient population	
Lower extremity joint replacement	13
Spine fusion	3
Shoulder arthroplasty	1
Revision total knee or hip arthroplasty	1
Cardiac surgery	2
Medical conditions	2
Bundled payment model	
Acute Care Episode Demonstration	2
Bundled Payments for Care Improvement initiative	16
Comprehensive Care for Joint Replacement model	3
Practice setting	
Hospital	15
Physician group practice	5
OUTCOMES	
Health care spending	
Episode payments	16
Spending by type	
Inpatient hospitalization	10
Postacute care period	3
Institutional postacute care	2
Skilled nursing facility	6
Inpatient rehabilitation facility	7
Long-term acute care hospital	4
Home health agency	8
Utilization	
Discharge to:	
Postacute care facility	12
Home health agency	7
Home or self-care	6
Length-of-stay	
Hospital	13
Postacute care facility	6
Quality	
All-cause readmission rate	18
Complication rate	4
Mortality	4
Emergency department visits	5
Unintended consequences	
Risk selection or case complexity	5
Volume	5

**SOURCE** Authors' analysis of the studies.

crease in episode payments of \$8,291 among patients undergoing spinal fusion in BPCI, but no significant decrease or increase in episode payments for LEJR (−\$3,017; 95% confidence interval: −\$6,066, \$31) or cardiac valve replacement (−\$2,999; 95% CI: −\$8,103, \$2,105).<sup>27</sup> A multicenter observational study by Brook Martin and colleagues found that there was a significantly lower reduction in episode payments among beneficiaries undergoing lumbar fusion in BPCI.<sup>29</sup> Another single-center study was unable to demonstrate cost savings for lumbar spine fusions in BPCI.<sup>18</sup> Two single-center studies found no significant difference in episode payments associated with BPCI for LEJR<sup>33</sup> or revision total knee or hip arthroplasty.<sup>20</sup> A multicenter study by Lena Chen and colleagues found a nonsignificant \$514 increase in episode payments with ACE for cardiac surgery and a nonsignificant \$358 decrease for orthopedic surgery.<sup>19</sup> BPCI was not associated with a significant change in episode spending among patients with medical conditions (sepsis, pneumonia, heart failure, acute myocardial infarction, or chronic obstructive pulmonary disease) in two studies.<sup>16,26</sup> In a multicenter study, Michael Barnett and colleagues demonstrated a significant 3.6 percent reduction (\$1,084) associated with CJR.<sup>15</sup> In another multicenter study, Amy Finkelstein and colleagues showed that the overall Medicare spending per episode was \$453 lower (95% CI: −\$909, \$3) in CJR, a nonsignificant difference.<sup>23</sup>

Ten studies evaluated spending for inpatient hospitalization.<sup>15,16,19,20,22,26,27,31,32,34</sup> Three single-center studies found a significant reduction in spending (range: \$562–\$811) for patients undergoing orthopedic surgery in BPCI,<sup>20,27,32</sup> while another single-center study showed an increase in spending of \$267.<sup>34</sup> A single-center study found a significant increase in spending of \$4,178 for spinal fusion in BPCI.<sup>27</sup> Five studies showed no difference in spending for inpatient hospitalization<sup>15,16,19,22,26</sup> with bundled payment, and one study did not test for significance.<sup>31</sup>

All three of the studies that evaluated spending in the postacute care period (including spending on institutional postacute care, home health agencies, and outpatient visits) demonstrated a significant reduction in spending (range: \$591–\$1,960) with bundled payment.<sup>19,21,32</sup> Two single-center studies that evaluated institutional postacute care spending (including spending on care at skilled nursing facilities, inpatient rehabilitation facilities, and long-term acute care hospitals) found a significant reduction in spending (range: \$307–\$7,982).<sup>23,27</sup> (One of the two studies showed no significant difference among patients undergoing spinal fusion.)<sup>27</sup>

## EXHIBIT 2

**Summary of results from 20 studies that compared a bundled payment model and fee-for-service reimbursement, by study outcome**

Outcome	Direction of outcome	ACE	BPCI	CJR	Overall
<b>HEALTH CARE SPENDING</b>					
Episode payments	–	0/2	5/12	1/3	6/16
Spending by type					
Inpatient hospitalization	–	0/2	3/8	0/1	3/10
Postacute care period	–	1/1	2/2	— <sup>a</sup>	3/3
Institutional postacute care	–	— <sup>a</sup>	1/1	1/1	2/2
Skilled nursing facility	–	0/2	3/4	1/1	4/6
Inpatient rehabilitation facility	–	0/2	3/5	1/1	4/7
Long-term acute care hospital	–	0/1	0/3	0/1	0/4
Home health agency	+	0/2	3/6	0/1	3/8
<b>UTILIZATION</b>					
Discharge to:					
Postacute care facility	–	— <sup>a</sup>	5/9	2/3	7/12
Home health agency	–	— <sup>a</sup>	2/5	0/2	2/7
Home or self-care	+	— <sup>a</sup>	1/5	0/1	1/6
Length-of-stay					
Inpatient	–	1/1	7/11	1/2	8/13
Postacute care facility	–	— <sup>a</sup>	1/4	1/2	2/6
<b>QUALITY</b>					
All-cause readmission rate	–	1/2	4/14	1/3	6/18
Complication rate	0	1/1	— <sup>a</sup>	3/3	4/4
Mortality	0	1/1	2/2	1/1	4/4
Emergency department visits	0	1/1	3/3	2/2	5/5
<b>UNINTENDED CONSEQUENCES</b>					
Risk selection or case complexity	+	— <sup>a</sup>	1/3	0/2	1/5
Volume	–	— <sup>a</sup>	3/3	2/2	5/5

**SOURCE** Authors' analysis of the studies. **NOTES** The exhibit shows the number of studies that demonstrated the outcome effect among the total studies that evaluated the effect. The denominators across columns do not always sum to the denominator in the "overall" column because one study evaluated both the Acute Care Episode (ACE) Demonstration and the Bundled Payments for Care Improvement (BPCI) initiative. A minus sign (–) means that there was a decrease, a plus sign (+) means an increase, and a zero (0) means no change in the outcome evaluated. CJR is Comprehensive Care for Joint Replacement model. <sup>a</sup>Not applicable.

Among the six studies that evaluated spending for skilled nursing facilities,<sup>15,19,22,26,31,34</sup> four found a significant reduction in spending (range: \$527–\$2,697).<sup>15,22,31,34</sup> Similarly, of the seven studies that evaluated spending for inpatient rehabilitation facilities,<sup>15,19,20,22,26,31,34</sup> four found a significant reduction in spending (range: \$227–\$1,416).<sup>15,22,31,34</sup>

None of the four studies that evaluated spending for long-term acute care hospitals showed a significant difference with bundled payment participation.<sup>15,26,31,34</sup> Eight studies evaluated spending for home health agencies,<sup>15,19,20,22,26,27,31,34</sup> of which three (all single-center studies) showed an increase in spending (range: \$188–\$957) with bundled payment.<sup>27,31,34</sup>

► **UTILIZATION:** Twelve studies evaluated the impact of bundled payment on discharge to postacute care facilities (including skilled nursing facilities, inpatient rehabilitation facilities, and



long-term acute care hospitals).<sup>15,17,18,20–25,27,32,33</sup> Two multicenter studies showed a significant decrease in the percentage of discharges to post-acute care facilities (range: 2.5–2.9 percent) with CJR,<sup>15,23</sup> and one single-center study did not test for significance.<sup>24</sup> Of the nine studies that evaluated the association of BPCI with discharges to postacute care facilities, five studies showed a significant impact of BPCI on this outcome.<sup>21,22,27,32,33</sup> One multicenter study<sup>22</sup> and two single-center studies<sup>32,33</sup> showed a significant decrease in discharge to postacute care facilities (range: 3.4–30.2 percent) in BPCI. Another single-center study found a significant decrease in discharges to skilled nursing facilities in BPCI. However, there was a significant increase in discharges to inpatient rehabilitation facilities.<sup>21</sup> Another single-center study showed that discharges to skilled nursing facilities for LEJR and spinal fusion increased significantly in BPCI. Discharges to inpatient rehabilitation facilities decreased significantly in all patient groups except those who had spinal fusion with major complication or comorbidity.<sup>27</sup> Of the remaining studies that evaluated the association of BPCI with discharges to postacute care facilities, three single-center studies<sup>17,18,25</sup> did not test for significance, and one single-center study<sup>20</sup> did not show a significant difference.

Seven studies evaluated the impact of bundled payment on discharge to a home health agency.<sup>15,17,18,20,21,23,32</sup> Two single-center studies done in orthopedic physician group practice settings showed a significant decrease in discharges to home health agencies (range: 6–8 percent) in BPCI,<sup>21,32</sup> and one multicenter study showed a significant increase in CJR.<sup>15</sup> Of the remaining studies, two did not test for significance,<sup>17,18</sup> and two others did not show a significant difference in discharges to home health agencies with bundled payment.<sup>20,23</sup>

Six studies evaluated the association between bundled payment participation and discharge to home or self-care,<sup>17,18,20,23,28,33</sup> with one single-center study showing a significant increase in BPCI.<sup>33</sup> Another single-center study showed a significant decrease in discharges to home after primary total hip arthroplasty but no difference after primary knee arthroplasty.<sup>28</sup> Two studies did not test for significance,<sup>17,18</sup> and two others did not show a significant difference in discharges to home with bundled payment participation.<sup>20,23</sup>

Thirteen studies evaluated the outcome of hospital length-of-stay.<sup>15,17,18,20,22,24–28,31,33,34</sup> Eight studies (two multicenter studies and six single-center studies) showed a significant decrease in the mean length-of-stay (range: 0.3–1.4 days) with bundled payment.<sup>15,18,20,22,27,31,33,34</sup> Of these

studies, one single-center study found a significant decrease in the length-of-stay in BPCI for LEJR, but not for cardiac valve replacement or spinal fusion.<sup>27</sup> Three of the remaining studies did not test for significance,<sup>17,23,25</sup> and two others did not show a significant difference in length-of-stay.<sup>26,28</sup>

Six studies evaluated the outcome of length-of-stay in postacute care facilities.<sup>15,21–23,27,33</sup> One multicenter study<sup>15</sup> and one single-center study<sup>33</sup> showed a significant decrease in length-of-stay (range: 2.0–7.2 days). A single-center study found a significant increase in skilled nursing facility and inpatient rehabilitation facility length-of-stay in certain patient groups and no difference in other patient groups.<sup>27</sup> Of the remaining studies, one single-center study did not test for significance,<sup>21</sup> and two multicenter studies did not show a significant difference in length-of-stay in postacute care facilities.<sup>22,23</sup>

► **QUALITY:** Eighteen studies evaluated all-cause readmission rates across the episode duration.<sup>15–24,26–29,31–34</sup> Six studies found a significant decrease in readmission rates (range: 0.6–7.0 percent) with bundled payment.<sup>15,19,21,27,32,33</sup> Of the two studies that evaluated the association between ACE and readmission rates,<sup>19,31</sup> one multicenter study found a significant reduction in readmission rates with ACE for orthopedic surgery but not for cardiac surgery.<sup>19</sup> Of the fourteen studies that evaluated the association between BPCI and readmission rates,<sup>16–18,20–22,26–29,31–34</sup> three single-center studies showed a significant reduction in BPCI,<sup>21,32,33</sup> while one single-center study found a reduction in readmission rates for LEJR but not for cardiac valve replacement or spinal fusion.<sup>27</sup> Lastly, of the three studies that evaluated the association between CJR and readmission rates,<sup>15,23,24</sup> one multicenter study showed a significant reduction.<sup>15</sup> Bundled payment was not associated with differences in complication rates,<sup>15,19,23,24</sup> mortality,<sup>15,19,22,26</sup> or emergency department visits.<sup>15,22,23,26,31</sup>

► **UNINTENDED CONSEQUENCES:** Five studies evaluated case complexity to address whether hospitals that participated in bundled payment avoided higher-risk patients, a potential unintended consequence of the payment model.<sup>15,18,23,26,30</sup> A single-center study demonstrated a significantly higher case complexity in the BPCI cohort, with 45 percent of the patients considered to be complex versus 23 percent of the comparison cohort. This was believed to be the reason for the lack of cost savings.<sup>18</sup> Navathe and colleagues compared patient characteristics at matched BPCI and non-BPCI hospitals and found no significant differences across any case-mix measures. However, patients at BPCI hospitals were less likely to have been admitted to a skilled

nursing facility in the prior year, leading to a concern that hospitals may be avoiding patients with a history of institutional care.<sup>30</sup> The remaining studies, all of which were multicenter and quasi-experimental, did not show any significant differences in case complexity with bundled payment.<sup>15,23,26</sup>

There were no significant differences in episode volume in hospitals or markets that participated in bundled payment.<sup>15,23,26,29,30</sup>

## Discussion

We performed the first systematic review of the published literature on the impact of bundled payment on episode spending, utilization, and quality. BPCI's model 2 was the most commonly represented program in the studies we included. We found that bundled payment resulted in a significant decline in Medicare episode payments in six of the sixteen studies that evaluated spending. Notably, all six studies examined orthopedic surgery, with four examining LEJR episodes. There were no significant differences in episode payments for spinal fusion procedures,<sup>18,27,29</sup> revision joint arthroplasty,<sup>20</sup> or medical conditions.<sup>26</sup> Discharges to postacute care facilities declined significantly in seven of the twelve studies that evaluated this outcome, and there was a significant reduction in hospital length-of-stay in eight of thirteen studies. However, a substantial number of studies found no effect on health care spending and utilization, although there was heterogeneity in the clinical episodes examined. Changes in quality of care, measured by complication rates, emergency department visits, and mortality, were not associated with bundled payment participation. There was a significant decrease in readmission rates in one-third of the studies that evaluated this outcome. Lastly, the available studies did not show evidence of potential unintended consequences from bundled payment, such as increased procedure volume or case-mix shifts resulting from patient selection.

Our results are consistent with those of an evaluation of BPCI's model 2 conducted by federal contractors. In their report, model 2 accounted for nearly 90 percent of the episodes initiated. Of the sixty-seven clinical episode combinations analyzed in the report, there was a significant decline in Medicare payments for twenty-seven episodes. The declines were primarily due to relative reductions in institutional postacute care. There was no association between bundled payment participation and changes in quality of care as measured by readmission rates, emergency department visits, or mortality.<sup>8</sup>

## Policy Implications

Our findings have four important implications for policy makers debating the further implementation and expansion of bundled payment programs. First, the current state of evidence suggests that for LEJR, bundled payment encourages hospitals and physician practice groups to provide cost-efficient care without compromising quality. By demonstrating that the quality of care remained the same or increased while costs decreased, the existing evidence from the BPCI and CJR models suggests that LEJR episodes may meet the criteria for expansion—though formal assessments require an actuarial analysis by CMS. There is no evidence of benefit for other clinical episodes at the present time.

Second, while bundled payment has yielded favorable results for LEJR, it has yet to demonstrate similar benefits for other clinical episodes, including those for medical conditions. Medical condition episodes differ from LEJR episodes in that LEJR is elective and patients undergoing it tend to be younger, with lower rates of poverty and disability than patients with medical conditions included in bundled payment.<sup>26</sup> In scaling up bundled payment programs, policy makers will need to restrict the programs to those clinical episodes that may be an appropriate fit for such payment models.

Third, we found that for certain clinical episodes, such as spinal fusion procedures, bundled payment was not associated with cost savings because of unusually high baseline patient complexity—which likely influenced the care provided by postacute care facilities and home health agencies in such populations. Given the penalty for cases that exceed the bundled payment target price, providers may be reluctant to accept these patients, which could in turn lead to decreased access to care. Studies have suggested that CMS needs to include more robust risk stratification of patients in bundled payment programs to allow higher payments for more complex patients and to more fairly judge the performance of providers who care for them.<sup>35,36</sup>

Fourth, it is of paramount importance to continue examining the design and impact of bundled payment programs and differences in outcomes by clinical episode. The BPCI Advanced program is a new iteration of voluntary bundled payment that started in October 2018. This program will generate new data about bundled payment by adding outpatient episodes and engaging new specialty types in advanced alternative payment models. The evidence to date suggests that the current bundled payment design is conclusively well suited to only one clinical episode—LEJR—and may require changes to

produce better value for patients with other conditions. Future research should evaluate how specific design features of bundled payment could be adapted to other clinical conditions and procedures. Furthermore, because voluntary bundled payment models are more popular than mandatory models, future work should consider the type and amount of financial reward needed to attract more participants. Lastly, most of the available evidence on bundled payment programs is from acute care hospitals, and more evidence is needed on physician group practice participants.

## Conclusion

While bundled payment programs maintain or improve quality while lowering costs for LEJR, our systematic review suggests that the effects of the payment model on health care spending and utilization varied considerably—particularly by clinical episode type. CMS should continue to scale up the BPCI and CJR programs for LEJR, but it should account for patient-level heterogeneity, include risk stratification, and consider changes to specific design features for specific episodes. ■

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## NOTES

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