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Implications of the 90-day episode definition used for the Comprehensive Care for Joint Replacement model

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Abstract

Importance—Under the Comprehensive Care for Joint Replacement (CJR) model, hospitals are held accountable for nearly all Medicare payments that occur during the initial hospitalization through 90-days post-discharge (i.e., episode of care). It is unknown whether unrelated expenditures resulting from this “broad” episode definition will impact participating hospital’s average 90-day episode payments.

Objective—To compare the CJR program’s broad episode definition to a clinically-narrow episode definition

Design—We identified Medicare claims for patients in Michigan who underwent joint replacement from 2011 through 2013. Using specifications from the CJR model and the clinically-narrow *Hospital Compare* payment measure, we constructed episodes of care and calculated 90-day episode payments. We then compared hospitals’ average 90-day episode payments using the two episode definitions and fit linear regression models to understand whether payment differences were associated with specific hospital characteristics (average CMS-HCC risk score, rural hospital status, joint replacement volume, percentage of Medicaid discharges, teaching

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hospital status, number of beds, percentage of joint replacements performed on African American patients and median income of the hospital's county).

Setting—All Michigan hospitals located in metropolitan statistical areas

Participants—Medicare beneficiaries

Main Outcome and Measure(s)—The correlation and difference between average 90-day episode payments using the broad CJR model episode definition and the clinically-narrow Hospital Compare episode definition.

Results—We identified 23,251 joint replacement episodes. 90-day episode payments using the broad CJR episode definition ranged from \$17,349 to \$29,465 (mean: \$22,122, standard deviation: \$2,600). Episode payments were slightly lower (mean: \$21,670) when the *Hospital Compare* episode definition was used. Both methods were strongly correlated ($r=0.99$, $p<0.001$). The average payment difference between these two episode definitions was small (mean \$452, SD \$177, range \$73-\$1,006). In our multivariable analysis, we found that the hospital characteristics examined made minimal to no impact on the payment differential.

Conclusions and Relevance—Average 90-day episode payments determined by both episode definitions were strongly correlated and there was a small payment differential for most hospitals. In the context of joint replacement bundled payments, these data suggest that hospital performance will be consistent whether a broad or clinically-narrow episode definition is used.

INTRODUCTION

The Centers for Medicare & Medicaid Services (CMS) recently announced an episode-based bundled payment program for patients undergoing lower extremity joint replacement.^{1,2} This initiative—the Comprehensive Care for Joint Replacement (CJR) program—was designed to improve care transitions and coordination across multiple providers and, therefore, reduce episode payments associated with this commonly performed procedure. Accordingly, the model will not only hold hospitals financially accountable for joint replacement related payments, but also for nearly all medical and surgical expenditures that occur during the initial hospitalization through 90-days post-discharge (i.e., an episode of care).

Supporters of this broad episode definition argue that hospitals should be held responsible for expenses that derive from both surgical complications *and* suboptimal management of medical comorbidities during and after the index admission. For example, in the CJR program, payments associated with a readmission for acute exacerbation of congestive heart failure that occurs 83 days after discharge will be attributed to the joint replacement episode. Policymakers at CMS and elsewhere are optimistic that, by defining episodes to include a *very broad* range of post-discharge services, this payment reform will accelerate coordination and optimization of medical and surgical care for Medicare beneficiaries undergoing joint replacement surgery.

Although many stakeholders contend that this broad episode definition is necessary to drive higher value care, others have expressed concern that this approach will unfairly penalize hospitals for post-discharge expenditures that are more directly related to the patient's underlying health condition than to the joint replacement procedure.¹ Notably, during the

same time period when the CJR model was announced, CMS also publically released the Total Hip Arthroplasty and/or Total Knee Arthroplasty (THA/TKA) payment measure.³ Similar payment measures for acute myocardial infarction, pneumonia and congestive heart failure have been publically reported on the Hospital Compare website⁴ (CMS will likely begin public reporting of the THA/TKA payment measure in 2017). In contrast to the CJR model's broad episode definition, the *Hospital Compare* payment measure attributes a much more narrow set of post-discharge claims to the joint replacement episode. Although nearly all claims are attributed to the joint replacement episode within 30 days of the surgery, only claims related to specific post-operative complications are attributed for days 31–90 (e.g., mechanical complications, peri-prosthetic joint infections). Accordingly, for this measure, if a patient is readmitted with an acute exacerbation of congestive heart failure more than 30 days post-discharge, the claim is not included in the *Hospital Compare* payment measure. Proponents of the clinically-narrow episode definition used for the *Hospital Compare* argue that this attribution method is better suited for joint replacement because it holds providers accountable for the complications and care delivery most directly relevant to the surgery, without unfairly penalizing hospitals that take care of patients with more frequent or more severe medical comorbidities.

In reality, however, little is known about the degree to which these different episode definitions actually impact hospital payments for joint replacements. A better understanding of this issue would provide clinicians, hospital administrators and policymakers with insight on the direct financial implications of CMS' selection of a broad episode definition for the CJR program. Moreover, information on the implications of claim attribution can be used to guide the development of future bundled payment programs. In this context, we used Medicare claims data from 2011 through 2013 to calculate and compare average 90-day episode payments using the broad CJR model episode definition and the clinically-narrow *Hospital Compare* episode definition. We also examined whether the observed payment differences between these two definitions were associated with specific hospital characteristics.

METHODS

Data and study population

We analyzed Medicare claims for beneficiaries in the state of Michigan who underwent lower extremity joint replacement (MS-DRG 469 and 470) from 2011 through 2013. We included in our analysis only those patients who had surgery in a hospital meeting the following criteria: 1) the hospital was geographically located in a metropolitan statistical area (an inclusion criteria for the CJR program); 2) the hospital performed more than 20 cases during the study period.

To ensure the availability of complete claims from the index hospitalization through 90 days post-discharge, we excluded patients who received a joint replacement after October 1, 2013. We also excluded beneficiaries that were not continuously enrolled in Medicare Part A and B, those who died during the episode of care, and those who had HMO coverage or were eligible for Medicare because of end-stage renal disease or disability. In addition, we excluded patients who had a primary diagnosis of hip fracture (12.3% of episodes).

We used data from the 2012 American Hospital Association annual survey and the Census Bureau to assess hospital characteristics for facilities included in this analysis. This study was deemed exempt from review by the Institutional Research Board at our health system.

Defining episodes of care and calculating 90-day episode payments

We defined 90-day episodes of care according to specifications from both the CJR program and the *Hospital Compare* Total Hip Arthroplasty and/or Total Knee Arthroplasty (THA/TKA) payment measure.^{1,5} Fundamentally, these episode definitions differ in the scope of post-discharge services that are considered related to the joint replacement surgery. The CJR episode definition includes a very wide range of medical and surgical post-discharge expenditures. Throughout this manuscript, we also refer to the CJR definition as a “broad” episode definition. The *Hospital Compare* episode definition, in contrast, includes a more narrow range of post-discharge claims that are more directly related to complications resulting from joint replacement surgery. Herein, we also refer to the episode definition used for the *Hospital Compare* as a “clinically-narrow” episode definition. Details for both episode definitions are summarized in eTable 1.

For the broad episode definition, we aggregated all hospitalization, professional, and post-acute care claims from the index admission through 90 days after discharge and then removed claims that matched the exclusion list published by CMS in the CJR Final Rule.¹ For the clinically-narrow episode definition, all index hospitalization and post-acute care claims within 30 days were attributed to the bundle; however, this definition only includes claims “related” to the joint replacement surgery after 30 days.⁵

Next, we calculated the 90-day payments for each surgical episode according to both the broad and clinically-narrow definitions. To do this, we first aggregated the payments received for each claim included in the respective episode definitions. We then removed intentional payments by CMS for disproportionate share hospitals, indirect medical education, and new technologies. Next, following the methods used by CMS in the CJR Final Rule, we excluded episodes with 90-day payments lower than \$4,000 and capped payments that were higher than two standard deviations above the mean at the 95th percentile. Finally, we accounted for national price trends by adjusting payments by the consumer price index.

Assessing the impact of alternative episode definitions on average 90-day episode payments

We assessed the impact of the two episode definitions by calculating the correlation between each hospital’s average 90-day episode payments using the CJR and Hospital Compare algorithms. In addition to the statewide analysis, we performed several subgroup analyses to confirm the stability of our findings. To perform these analyses, we stratified hospitals by average CMS-HCC risk score, rural hospital status, joint replacement volume, percentage of Medicaid discharges, teaching hospital status, number of beds, percentage of joint replacements performed on African American patients and median income of the hospital’s county. The CMS-HCC risk score includes data on age, gender, 70 potential comorbidities, dual eligible status and original reason for Medicare entitlement derived by reviewing 12-

months of inpatient, outpatient and select professional claims. We selected subgroups based hospital characteristics that may influence determinants of total episode cost (e.g., readmissions).⁶⁻⁸ For each subgroup, we calculated average 90-day episode payments using both the CJR definition and the Hospital Compare definition and then calculated the correlation between the two definitions for all hospitals in these subgroups.

Assessing the difference in average 90-day payments between both definitions

For each hospital, we first calculated the magnitude of the difference between average 90-day payments determined by the CJR and Hospital Compare definitions. Next, we fit a linear regression models with heteroscedastic robust standard errors to examine associations between hospital characteristics and the payment differential. For these models, the payment differential was used as our dependent variable. Similar to the subgroup analyses, the average CMS-HCC risk score, rural hospital status, joint replacement volume, percentage of Medicaid discharges, teaching hospital status, number of beds, percentage of joint replacements performed on African American patients and median income of the hospital's county were used as independent variables.

Sensitivity analyses

We performed our primary analysis without including fractures because patients undergoing hip fracture surgery are typically different from patients undergoing elective joint replacement. Accordingly, they have been excluded from CMS' Hospital Compare measure. However, because hip fractures are included in the CJR program, we performed a sensitivity analysis with hip fractures included to confirm the stability of our primary findings.

All analyses were performed using statistical software (STATA 13/SE, College Station, TX), and at the 5% significance level.

RESULTS

We identified 23,251 lower extremity joint replacement episodes (740 for MS-DRG 469, 22,511 for MS-DRG 470) performed from January 1, 2011 through October 1, 2013 at 64 hospitals in Michigan. Using the broad episode definition, 90-day payments varied widely across hospitals, ranging from \$17,349 to \$29,465 (mean: \$22,122, standard deviation: \$2,600). Although the magnitude of variation was similar, mean 90-day episode payments were lower (\$21,670) when calculated using the Hospital Compare episode definition. (Table 1) The most expensive and least expensive quartile of hospitals differed in 90-day episode payments by \$6,383 and \$6,209 using the CJR and Hospital Compare definitions, respectively. As illustrated in Figure 1, this difference was largely due to variation in post-acute care expenditures (e.g., skilled nursing facility payments, inpatient rehabilitation, home health care).

We identified a very strong correlation between average 90-day episode payments using the broad and clinically-narrow episode definitions ($r=0.99$, $p<0.001$), indicating extreme consistency in a hospital's episode costs with both definitions (eFigure 1). Moreover, the mean difference in 90-day episode payment between the broad and clinically-narrow

definition was only \$452 (SD \$177, range \$73-\$1,006), representing only 2% of the average total episode payment based on the wide definition. (Figure 2)

In univariate regression analyses, hospital CMS-HCC risk score ($p=0.03$) and proportion of African Americans treated ($p<0.001$) was associated with a greater difference in payments between the two episode definitions. In our multivariable analysis, only proportion of African Americans remained significantly associated with the payment differential ($p=0.04$). While this variable was statistically significant, the effect size was small. For each percentage point increase in patients who are African American, there was a \$4 (95% CI \$0.60 to \$7.75) increase in the payment difference between the CJR and Hospital Compare episode definition.

Our sensitivity analysis with hip fractures included yielded no substantive changes to our primary findings.

DISCUSSION

In this analysis, we directly compared two episode definitions used by CMS to measure 90-day episode payments for patients undergoing lower extremity joint replacement surgery. Specifically, the CJR model's broad episode definition was compared to the clinically-narrow Hospital Compare episode definition. Using both episode definitions, we found wide variation in 90-day episode payments (largely driven by differences in post-acute care utilization). We identified a strong correlation between 90-day episode payments calculated using both episode definitions; moreover, the magnitude of the payment difference was small relative to the overall episode costs. Collectively, these findings suggest that because average 90-day episode payments were similar between the broad and clinically-narrow episode definition, it is likely that hospital performance will be consistent whether a broad or clinically-narrow episode definition is used.

Explanations for the tight correlation, and small absolute difference, between payments based on the broad and clinically-narrow episode definitions stem mainly from the epidemiology of post-discharge care after joint replacement. Total 90-day episode payments for joint replacement are comprised mostly of expenditures for the index hospitalization and from post-acute care. These payments are also included in more clinically-narrow episode definitions.^{9,10} The main difference with the CJR's model's broad episode definition is that almost all medical readmissions are attributed to the joint replacement episodes. However, these events are rare after joint replacement: at 90-days, in our study and prior work the overall unplanned readmission rate after joint replacement was approximately 6–8% (see eTable 4), and only 18–25% of these readmissions result from medical causes.^{11–13} Accordingly, regardless of the episode definition used, hospitals should focus their resources on reducing post-acute care expenditures to perform well on the CJR model and the Hospital Compare payment measure.

Our study has several limitations. First, it is possible that our analysis of Michigan hospitals may not be generalizable to hospitals nationally. However, we believe that the results would be no different in a national sample for two primary reasons. First, all hospitals in

metropolitan statistical areas (MSAs) selected for the CJR model are required to participate in the program. Accordingly, the CJR participating hospitals vary greatly in regards to teaching status, number of beds and other structural characteristics. Similarly, Michigan hospitals are also diverse according to these same characteristics (see eTable 2). Second, we performed subgroup analyses around many of structural characteristics that could potentially impact the generalizability of our results and found no difference in our primary findings. Our second limitation is that while we considered two episode definitions for joint replacement, many other definitions are considered by commercial payers. However, the two episode definitions evaluated in this study are most policy-relevant, as they are currently being used in CMS performance programs. Finally, our finding of the deep congruence between broad and clinically-narrow episode definitions may not hold true for conditions where patients have more comorbidities and where medical readmissions may constitute a greater proportion of the variation in 90-day episode payments (e.g., vascular surgery procedures, coronary artery bypass graft).

These limitations notwithstanding, our results have several important implications. Our finding that average 90-day episode payments based on the broad episode definition used in CJR are similar to those calculated using the more clinically-narrow Hospital Compare definition should reassure both policymakers and hospital administrators that the episode definition alone will not unfairly penalize facilities that treat sicker patients with multiple medical conditions. Furthermore, because it does not rely on nuanced, condition-specific clinical details, the broader episode definition for CJR represents a much more rapidly scalable model for CMS as it inevitably moves toward bundled payment programs and episode payment measures for other conditions.¹⁴ However, our findings in no way imply that risk-standardization is unnecessary when measuring 90-day episode payments for joint replacement. While readmissions for medical conditions after joint replacement are infrequent, age and comorbidities will still impact 90-day episode payments through several mechanisms including longer length of stay, greater use of post-acute care and greater frequency of inpatient complications.

For hospitals leaders and orthopedic surgeons practicing at one of the approximately 800 hospitals involved in the CJR program, our findings should reduce understandable concerns about being unfairly penalized for readmissions and other expenditures that are not directly related to joint procedures. Instead, our findings clarify the key point that a hospital's success with episode payments for joint replacement will depend to a large extent on its ability to reduce post-acute care spending without compromising patient outcomes.

Our collective findings suggest that the broad episode definition used by CMS for the CJR model will not unintentionally penalize hospitals that treat patients with multiple medical conditions because 90-day readmissions resulting from conditions unrelated to joint replacement are infrequent. Moving forward, however, future research in this area should focus on whether a broad vs clinically-narrow episode definition would impact similar bundled payment programs for other clinical conditions associated with a higher prevalence of significant comorbidities. Patients undergoing these procedures may have a higher rate of unrelated readmissions and other expenditures. Such analyses are particularly important if CMS applies the CJR model's broad definition ubiquitously to future bundled payment

programs. Moreover, it will be important for policymakers and researchers to monitor unintended consequences of bundling including care stinting and patient selection. These concerns would exist regardless of the episode definition used, but may be more apparent if hospitals believe that medically complex patients will impact their bottom line under the broad episode definition. In the end, the goal of any bundled payment program should be to motivate hospitals and clinicians to reduce episode payments and improve care delivery. To achieve this laudable goal in an equitable manner, policymakers should aim to define episodes of a care in a way that does not lead unintended consequences such as reducing beneficiary access or financially penalizing hospitals for treating inherently expensive patients.

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Figure 1. Difference in 90-day payments between the most expensive and least expensive quartile of hospitals according to CJR versus Hospital Compare episode definitions

This figure demonstrates that regardless of the episode definition, most of the spending variation between high cost and low cost hospitals is due to post-acute care. CJR refers to the Comprehensive Care for Joint Replacement model. *Hospital Compare* refers to the 90-day Total Hip Arthroplasty and/or Total Knee Arthroplasty Payment Measure.

Figure 2. Average 90-day episode payments for all hospitals in Michigan using the broad CJR and the clinically-narrow *Hospital Compare* episode definitions

CJR refers to the Comprehensive Care for Joint Replacement model. *Hospital Compare* refers to the 90-day Total Hip Arthroplasty and/or Total Knee Arthroplasty Payment Measure.

Average 90-day episode payments and component payments using the broad CJR and the clinically-narrow *Hospital Compare* episode definitions

Table 1

Category	CJR model episode definition			Hospital Compare episode definition		
	Mean	SD	Range	Mean	SD	Range
Total episode	\$22,122	\$2,600	\$17,350–\$29,465	\$21,670	\$2,534	\$16,830–\$29,031
Index hospitalization	\$11,151	\$808	\$10,187–\$14,137	\$11,151	\$808	\$10,187–\$14,137
Readmissions	\$970	\$441	\$0–\$2355	\$725	\$369	\$0–\$2,176
Professional	\$2,491	\$391	\$1849–\$3604	\$2,486	\$387	\$1,838–\$3,572
Post-acute care	\$7,303	\$2,073	\$3356–\$12,733	\$7,303	\$2,073	\$3356–\$12,733

CJR refers to the Comprehensive Care for Joint Replacement model. The CJR model’s episode definition attributes a broad range of medical and surgical post-discharge expenditures to the 90-day joint replacement episode. *Hospital Compare* refers to the 90-day Total Hip Arthroplasty and/or Total Knee Arthroplasty Payment Measure. In contrast to the CJR model’s episode definition, the *Hospital Compare*’s episode definition is clinically-narrow and only includes post-discharge expenditures directly related to the joint replacement surgery.