READY?...SET?...NO!

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"This article alerts us that some important work remains in order to fine-tune the specifications of the demonstration so that the incentives for care redesign can safely unleash the intended innovation."

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For decades, analysts have decried the US healthcare system for providing the wrong mix of services, adding up to cost that is too high, and overall value that is too low. Most players in the system have been complacent and content to benefit from the indiscriminate adoption of new technologies resulting in rising costs per unit of service, multiplied by the overutilization of expensive services due to inadequate management of patients through the continuum of care. Meanwhile, there has been a longstanding quest among a brave cadre to redirect the system toward higher value and lower total cost per capita. New incentives surrounding acute hospital stays could provide marvelous opportunities for improvement in patient safety, preparation for discharge, and appropriate post-acute placement and follow-up. This article proclaims many of the promises, and points out many of the potential pitfalls, in transforming Medicare payment from the current combination of hospital DRGs with FFS reimbursement for other providers, to fixed aggregate payment allowances for a defined bundle of services including the hospital stay and most services occurring in the post-acute period.

Are we poised to turn the corner? Medicare has offered hospitals nationwide to participate in reforming care through a bundled payment demonstration; in turn, hundreds of hospitals have submitted applications. Empirical analysis in this article gives the reader insights into formidable challenges remaining before we can be confident that this demonstration will lead to reliable net gains for Medicare.

Are lower costs due to efficiency or favorable case mix? Attempts to reform healthcare incentives almost always run into a daunting problem: how to distinguish between efficiency and other factors that affect measureable outcomes of interest, most notably the mix of patients seen by a provider during a given time period. Analysis of Medicare claims data show that hospitals could see heterogeneous patient cohorts, even for the same nominal DRG. Furthermore, a frequent pattern in healthcare is that a small fraction of patients within a cohort account for a majority of the total resources used for that cohort. Thus, hospitals can face financial risk for disproportionate fractions of catastrophic cases within patients admitted for the same DRG.

For the bundled payment demonstration, Medicare "prices" will be based on the Medicare payment experience for each hospital's own patient population in a recent year. Although that helps to account for idiosyncratic factors affecting a hospital's place in the local market, it also means that the resulting bundle "prices" can reflect unusual circumstances affecting case-mix. Unusually high costs during the baseline observation period could translate into inflated prices for the demonstration; whereas unusually low baseline costs could deprive a hospital of resources intended to manage successfully. Simply, differences over time (in addition to the results of care design) could stack the deck for or against a hospital.

Could related policies significantly weaken bundled payment? Inevitably problematic and contentious are payment policies involving patients who die (or may be likely to die) and how to reimburse for their care. It is broadly perceived that aggressive and expensive treatments are utilized too often in predictably futile cases; hence, incentives to redirect those resources to other purposes are often sought. The proposed demonstration requires that all beneficiaries who are admitted for any of designated DRGs be counted as participants in the demonstration, including beneficiaries who die during the stay or the post-acute period defined in the demonstration (e.g., 30 days after discharge). As it is, decedents are not priced differentially, even though differential costs are largely subsumed within the DRG and truncated upon death. The analysis quantifies the potential financial reward for increased mortality rates, and corresponding penalties for increased survival rates in the demonstration.

For many years, Medicare DRG payments have included add-ons for indirect medical education and disproportionate number of low-income patients. Hospitals use these revenues (including from readmissions) to fund those missions. Efforts to reduce readmissions are most costly to the hospital because of these forgone revenues, weakening the incentives for care redesign, or perhaps reducing hospital participation in the demonstration. The article discusses the magnitude of the problem for academic medical centers and offers some policy options to maximize the value of bundled payment for enhancing efficiency of care delivery.

Ready?...Set?...No! With the bundled payment opportunity before them, and so many hospitals actively considering participation, we may be close to leading the industry away from the complacency and self-serving ways of the past. But, this article alerts us that some important work remains in order to fine-tune the specifications of the demonstration so that the incentives for care redesign can safely unleash the intended innovation.

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DESIGNING THE BPCI FOR SUCCESS

CMMI Bundled Payments for Care Improvement Requires Design Changes to Ensure Pilot Success

ABSTRACT

Objective: Examine the variation in costs within certain episodes of care to better quantify the risks and benefits to providers participating in the CMMI Bundled Payments for Care Improvement (BPCI).

Methods: We performed a retrospective analysis of claims data using the SAS-based freeware application developed by Brandeis University and the Health Care Incentives Improvement Institute (HCI3) for the BPCI initiative. We used seven Hospital Referral Cluster (HRC) datasets comprised of Medicare Fee For Service claims across the United States. The study population consisted of 67,746 major joint replacement surgeries, 34,912 percutaneous coronary intervention (PCI) procedures, 20,435 Heart Failure hospitalizations, and 55,362 Pneumonia hospitalizations between January 1, 2008 and December 31, 2009. We examined the variation in average episode costs by (1) comparing episode costs for major joint replacement and percutaneous coronary intervention (PCI) MS-DRGs, split by Principal ICD-9 Procedure and Diagnosis codes respectively; (2) analyzing the magnitude of variation in heart failure episode costs as the episode time windows are increased from 30 days to 90 days to 180 days; and (3) studying the effects of outlier episodes on pneumonia costs. In addition, we also evaluated the impact of excluding Indirect Medical Education (IME), Disproportionate Share (DSH) and Capital add-on amounts from the episode (chronic, acute, and procedural) bid price by analyzing a range of episodes triggered at 10 Academic Medical Centers (AMCs)[i].

Results: For episodes triggered by Joint Replacement DRGs 469 and 470, we observed significantly different average episode costs for Total Hip Replacements, Partial Hip Replacements, and Total Knee Replacements within the same DRG. Similarly, we found differences in average episode costs for PCIs based on the underlying etiology. Patients undergoing PCI had much lower average episode costs if their underlying condition was stable coronary artery disease (CAD) compared to patients with more acute diagnoses, such as acute myocardial infarction (AMI) or Cardiac Dysrhythmias. We observed that in patients hospitalized for heart failure (CHF), the variability in episode costs increases as the episode time window is extended, primarily due to variability in post acute care costs, and that a relatively small number of patients could account for a substantial increase in average costs due to readmissions and long-term care. We also observed that Pneumonia patients that die during the episode time window have much lower average episode costs. Finally, the impact of reducing readmissions within the context of the BPCI would lead to reductions in mission-related add-on payments to academic medical centers, and the reductions would increase from $200,000 if the readmit reduction is 10% to $500,000 if the reduction is 25%.

Policy Implications: Depending on the DRG-based episode selected, the current proposed design for the BPCI can create an opportunity for providers to beat or come over their bid price based on factors outside their control that have very little, if anything, to do with clinical management. Building a price by principal procedure or principal diagnosis code (depending on the episode of interest) reduces the variability due to patient mix and creates more clinical homogeneity around the pricing. BPCI applicants should understand the source of the added variability related to longer episode time windows and consider asking for stop-loss when episodes exceed the bid price by a specified amount. Similarly, variability in episode costs, due to deaths or high outlier episodes, could be mitigated by excluding deceased patients and capping high cost outliers when calculating the target price. Creating a more stable bid price and flagging the number of patients who die or are recognized as outliers, will reduce perverse incentives and the likelihood of gaming in the implementation period. In addition, some allowance for the expected loss in mission-related add-ons for AMCs would reduce the current perverse incentive in the BPCI that would penalize these hospitals for reducing readmissions.

[i] This portion of the analysis was performed by Brandeis University for the Association of Academic Medical Centers

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FINANCIAL SUPPORT AND DISCLOSURE:
No financial support.

*FB, CS, EB, AR, JS and SE are employees of the Health Care Incentives Improvement Institute, Inc., in Newtown, Conn. HCI3 created and owns the PROMETHEUS analytics software. A nonprofit organization, HCI3 makes part of the analytics software available as freeware for all users on its website (www.hci3.org).

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INTRODUCTION

Bundled Payments for Care Improvement (BPCI), operated by the Center for Medicare and Medicaid Innovation (CMMI), is an opportunity for providers and other organizations to contract for a "user-defined" episode of care. The Request for Application for this initiative was released in August 2011[1]. Provider organizations and other convening organizations submitted Letters of Intent and received Medicare Fee For Service data for their Hospital Referral Clusters (HRCs), enabling them to build their own episode definitions within the framework set forth by CMMI. Currently, BPCI consists of four different Models[2]: a mix of acute care only, post acute care, retrospective and prospective payment. All Models require an MS-DRG to trigger the episode. The analyses reported in this issue brief focus on Model 2, which includes both the acute and post acute portions of the episode of care. applicants were charged with calculating an average episode price for all patients included in a specific MS-DRG and all MS-DRGs in a family. The average price is to become the basis for the proposed target price in the application. These two features are important because, at face value, taking all patients in an MS-DRG and all MS-DRGs in a family might avoid the potentially perverse incentive of shifting patients from one MS-DRG to another, or from selecting certain patients and not others. However, there are other important principles and features to consider when contracting for bundled payments, and now that all applications have been submitted—the due date was June 28, 2012—these features should be evaluated by CMMI and potential awardees during the review and negotiation process.

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METHODS

We used seven HRC datasets consisting of Medicare Fee For Service claims from 2008-2009. The datasets were transferred to provider organizations that had submitted a Letter of Intent for the BPCI pilot and were analyzed remotely by HCI3 using a SAS-based software package built specifically to develop episodes of care and calculate episode costs for the BPCI application process. This software application is freeware and available on HCI3's website[3]. The outputs from each individual HRC analysis were aggregated across all HRCs. We focused on high volume episodes of care namely Major Joint Replacement (MS-DRGs 469 and 470), PCI procedures (MS-DRGs 246-251), Heart Failure hospitalizations (MS-DRGs 291-293), and Pneumonia hospitalizations (MS-DRGs 193-195). Additionally, the AAMC contributed analyses that examined a range of episodes across 10 AMCs, from chronic conditions (CHF, COPD) to acute events (Stroke, Pneumonia), to procedural episodes (CABG, Valves, PCI).

Major Joint Replacement

We analyzed episodes triggered by MS-DRG 469 (Major joint replacement or reattachment of lower extremity with MCC) and MS-DRG 470 (Major joint replacement or reattachment of lower extremity without MCC). Each episode time window consisted of a 3-day look back period, the index hospitalization, and 30 days post discharge. For both types of Major Joint Replacement episodes, we examined average costs, standard deviations, and 95% confidence intervals for all patient episodes triggered by the individual MS-DRG. We also studied the above metrics separately for acute care (inpatient hospitalization) and post-acute care periods. We then stratified the patients by their Principal Procedure code (Total Hip Replacement, Partial Hip Replacement, Total Knee Replacement, and Other Joint Replacement procedures) and examined the average episode costs and the above metrics for each stratum. Finally, we observed the impact of changes in case mix on the financial results of an applicant and CMS.

PCI

We performed a similar analysis for PCI procedures, focusing on the effect of differences in Principal Diagnosis codes or principal reasons for admission. We first calculated the average cost of each MS-DRG triggered episode for PCI procedures (MS-DRGs 246-251). Within each MS-DRG, we then examined the breakdown by Principal ICD-9 Diagnosis codes, distinguishing Acute Myocardial Infarction (AMI) and Cardiac Dysrhythmias from Stable Coronary Artery Disease (CAD) and other Principal Diagnoses. Each episode consisted of a 3-day look back period, the index hospitalization, and 30 days post discharge.

Heart Failure

We evaluated the average costs and the standard deviation for each of three time windows a) 30 days post-discharge; b) 90 days post-discharge; and c) 180 days post-discharge for a consistent group of more than 20,000 patients with Heart

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Failure (MS-DRGs 291-293). In addition, we analyzed the distribution of episodes within various cost bands to determine if outliers drove the cost differentials, and identified the service categories where costs grew most significantly as the length of the episode expanded.

Pneumonia

We studied the effect of maintaining and removing high outlier episodes and deceased patients from the Pneumonia study population. We focused on MS-DRGs 193-195, which are simple pneumonia & pleurisy w MCC, simple pneumonia & pleurisy w CC, and simple pneumonia & pleurisy w/o CC/MCC. For each, we calculated the average full episode cost for the following: all patients; all patients excluding those who died during the episode; all patients excluding those who died during the episode or who were high cost outliers; all patients excluding those who died during the episode and capping high cost outliers; high outlier patients only; and deceased patients only. Outlier patients were identified as being 2 standard deviations above the mean full episode price.

ME and DSH Payments

The AAMC contributed analyses that evaluated the impact of excluding IME, DSH, and Capital add-on amounts from the episode bid price. They examined a range of episodes that 10 different AMCs were interested in pursuing. The episodes included in the analysis consisted of the following: 36% major joint replacement procedures, 21% Pneumonia, 16% Cardiac procedures (CABG, Valves, PCI), 13% Stroke, 9% CHF, 3% COPD, and 2% Spine. Each episode included a 3-day look back period, the index hospitalization, and 90 days post discharge. After calculating the total historical cost per episode, along with the cost of applying a 2% discount, the add on amount per readmission was calculated, weighted by the hospital average. Readmissions included only those within the institution hospital or "same store" readmissions. Lastly, the AAMC calculated the add on amounts for both a 10% and a 25% reduction in readmissions. Total historical episode costs, the 2% discount, and all add on amounts were aggregated across all episodes and all AMCs.

RESULTS AND DISCUSSION

Major Joint Replacement

As shown in Table 1, the average cost of an episode triggered by MS-DRG 469 was $32,345 and $19,638 for episodes triggered by MS-DRG 470. Within MS-DRG 469, Partial Hip Replacements accounted for 49% of all procedures; 30% were Total Knee Replacement procedures; and 20% were Total Hip Replacements—other procedures accounted for less than 1%. Within MS-DRG 470, 61% of procedures were Total Knee Replacements, 26% Total Hip Replacements, 13% Partial Hip Replacements, and less than 1% other procedures. Within both Major Joint Replacement MS-DRGs, we found that average episode costs for Total Hip, Partial Hip, and Total Knee Replacements are significantly different from one another using 95% confidence intervals. The average episode costs for the three procedures were also significantly different from the average cost for MS-DRG 469 and 470, individually and combined. Consistently across both MS-DRGs, Partial Hip Replacements were the most expensive procedure and the difference in costs was primarily driven by services rendered during the post-discharge period (Figure 1).

The differences between the average costs of the procedures within a MS-DRG can lead the provider or payer to win or lose under the BPCI simply due to a change in case mix from the original case mix used to calculate the bid price. For example, the average cost of episodes triggered by MS-DRG 469 is $32,345, given the observed mix of procedures (20% Total Hip; 49% Partial Hip; and 30% Total Knee). If we assume a shift in case mix to 49% for Total Hip Replacements, and 20% for Partial Hip Replacements, the average episode cost drops to $30,577 leading the applicant to "win" by roughly $1,800 per triggered episode and CMS to "lose" by a corresponding amount. Similarly, for MS-DRG 470, we observed an average episode cost of $19,638, based on the mix of procedures in 2009 (26% Total Hip; 13% Partial Hip; and 61% Total Knee). If, during the pilot year, the number of Partial Hip Replacements increases to 26% and Total Hip Replacements decrease to 13%, the average episode cost increases to $21,030 leading to a "loss" of $1,500 for the applicant and a commensurate "win" for CMS.

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Table 1. Major Joint Replacement: Average Episode Costs by MS-DRG and Principal Procedure Code

Major Joint Replacement	469	470	Combined
N Observed	4,713	63,033	67,746
Average Epsiode Price	$32,345	$19,638	$20,522
St Dev	$16,003	$8,460	$9,740
95% Confidence Interval	($31,889; $32,802)	($19,572: $19,704)	($20,449: $20,595)
TKR N	1,402	38,291	39,693
Average Epsiode Price	$26,812	$17,813	$18,131
St Dev	$11,949	$6,410	$6,887
95% Confidence Interval	($26,186; $27,437)	($17,749; $17,877)	($18,063; $18,199)
THR N	961	16,561	17,522
Average Epsiode Price	$30,313	$19,160	$19,772
St Dev	$14,615	$8, 356	$9,173
95% Confidence Interval	($29,389; $31,237)	($19,033; $19,288)	($19,636; $19,908)
PHR N	2,317	7,978	10,295
Average Epsiode Price	$36,458	$29,382	$30,975
St Dev	$17,477	$10,424	$12,714
95% Confidence Interval	($35,746; $37,169)	($29,153; $29,611)	($30,729; $31,220)
Other PPx N	33	203	236
Average Epsiode Price	$37,904	$19,940	$22,452
St Dev	$14,878	$11,468	$13,497
95% Confidence Interval	($32,828; $42,980)	($18,363; $21,518)	($20,730; $24,174)

TKR= Total Knee Replacement **THR** = Total Hip Replacement **PHR** = Partial Hip Replacement **PPx** = Principal Procedure code

Figure 1. Average Acute and Post Acute Episode Costs by Principal Procedure

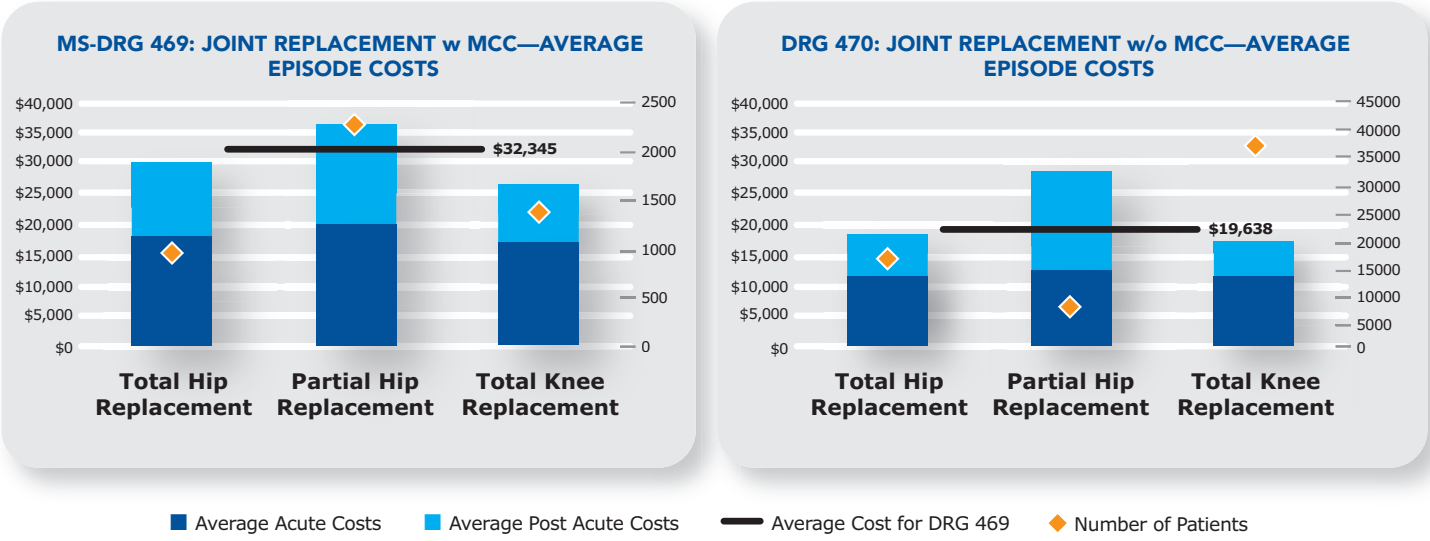

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Table 2. PCI: Average Episode Costs by MS-DRG and Principal Diagnosis Code

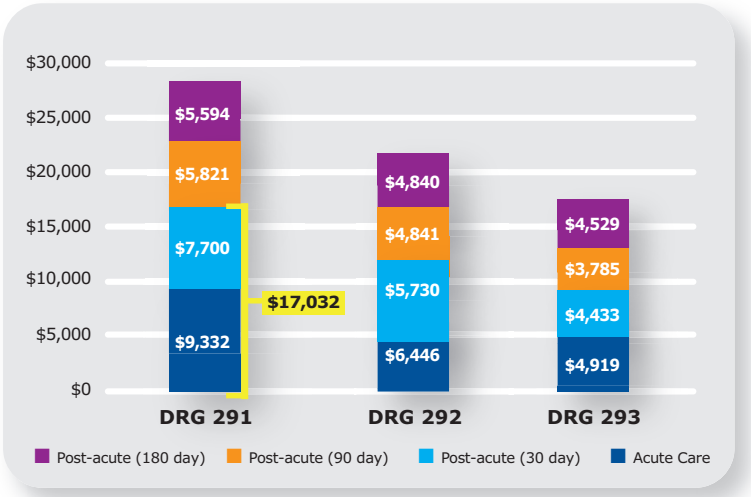
PCI	246	247	248	249	250	251	Combined
N Observed	3,704	17,585	1,771	6,426	893	4,533	34,912
Average Epsiode Price	$24,376	$14,202	$23,550	$13,259	$24,712	$12,986	$15,693
St Dev	$13,002	$6,101	$13,740	$6,322	$14,265	$6,813	$9,011
95% Confidence Interval	($23,958; $24,795)	($14,112; $14,292)	($22,911; $24,190)	($13,105; $13,414)	($23,777; $25,648)	($12,788; $13,184)	($15,598; $15,788)
AMI/Cardiac Dysrhythmias N	1,745	5,046	1,070	2,648	539	2,866	13,914
Average Epsiode Price	$26,521	$15,531	$24,866	$14,613	$24,449	$13,077	$17,293
St Dev	$14,587	$7,125	$14,764	$7,048	$13,044	$6,203	$10,441
95% Confidence Interval	($25,837; $27,206)	($15,335; $15,728)	($23,982; $25,751)	($14,344; $14,881)	($23,348; $25,550)	($12,850; $13,304)	($17,120; $17,466)
Stable CAD	1,582	11,791	520	3,557	115	972	18,537
Average Epsiode Price	$21,697	$13,576	$20,271	$12,149	$21,235	$11,986	$14,147
St Dev	$9,817	$5,400	$9,806	$5,194	$8,073	$6,221	$6,672
95% Confidence Interval	($21,214; $22,181)	($13,479; $13,674)	($19,428; $21,113)	($11,978; $12,319)	($19,759; $22,710)	($11,595; $12,377)	($14,051; $14,243)
Other PDx	377	748	181	221	239	695	2,461
Average Epsiode Price	$25,689	$15,091	$25,195	$14,915	$26,979	$14,012	$18,292
St Dev	$14,815	$7,364	$15,511	$9,422	$18,321	$9,360	$12,700
95% Confidence Interval	($24,194; $27,185)	($14,563; $15,619)	($22,936; $27,455)	($13,672; $16,157)	($24,656; $29,301)	($13,316; $14,708)	($17,790; $18,794)

PCI

On average and across all six PCI procedures, episodes with stable CAD as the principal diagnosis code had statistically significantly lower costs than the overall average for the MS-DRG. PCI episode costs for stable CAD were also significantly less expensive than PCI episode costs for AMI or Cardiac Dysrhythmias. PCI procedures for patients with stable CAD are more likely to be elective procedures planned in advance, whereas PCIs for AMI or Cardiac Dysrhythmias may be more urgent or emergent in nature leading to higher episode costs.

Changes in case mix for these episodes could also drive the BPCI applicant's ability to win or lose solely based on the "luck of the draw" and not effective clinical management. If the number of patients seeking elective PCI for stable CAD decreases or if the number of patients with an acute and immediate need for PCI increases, the provider applicant organization may be at risk for a loss. This exposure to case mix risk could lead certain providers to shift more emergent patients to other facilities, as evidenced in a recent study of uninsured patients[4].

Figure 2. Incremental Increase in Average Post-Acute Care Costs by Heart Failure Episode Time Window



Heart Failure

Table 3 shows the number of episodes, the average episode cost and the standard deviation for three heart failure (CHF) DRGs. The values are shown separately for the acute care portion and the post-acute care portion of the episode. Also shown is the percentage change in the average episode cost and in the standard deviation as the episodes move from 30 to 90 to 180 days post discharge. Since the acute care costs don't change based on the time window, the variability in the episode costs is entirely due to post-acute care costs as seen in Figure 2.

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Table 3. Average Episode Costs by DRG at 30, 90 and 180 Days Post-Discharge

	Days Post-Discharge			Percentage Change		
DRG 291	**30**	**90**	**180**	**30 to 90 days**	**90 to 180 days**	**30 to 180 days**
N	7,276	7,276	7,276			
Average Full Episode $	$17,032	$22,392	$27,487	31%	23%	61%
STDEV	$17,111	$23,556	$39,442	38%	67%	130%
Average Acute Care $	$9,332	$9,332	$9,332	0%	0%	0%
STDEV	$4,177	$4,177	$4,177			
Average Post Acute Care $	$7,700	$13,060	$18,155	70%	39%	136%
STDEV	$16,176	$22,738	$38,890	41%	71%	140%
DRG 292						
N	7,842	7,842	7,842			
Average Full Episode $	$12,176	$16,977	$21,743	39%	28%	79%
STDEV	$9,294	$15,677	$20,917	69%	33%	125%
Average Full Episode $	$6,446	$6,446	$6,446	0%	0%	0%
STDEV	$1,938	$1,938	$1,938			
Average Full Episode $	$5,730	$10,531	$15,298	84%	45%	167%
STDEV	$8,866	$15,380	$20,676	73%	34%	133%
DRG 293						
N	5,317	5,317	5,317			
Average Full Episode $	$9,353	$13,170	$17,681	41%	34%	89%
STDEV	$10,413	$15,211	$20,185	46%	33%	94%
Average Full Episode $	$4,919	$4,919	$4,919	0%	0%	0%
STDEV	$1,411	$1,411	$1,411			
Average Full Episode $	$4,433	$8,251	$12,762	86%	55%	188%
STDEV	$10,181	$15,004	$20,001	47%	33%	96%

Notes: DRG 291: Heart failure and shock with major complications; DRG 292: heart failure and shock with complications; heart failure and shock without complications.

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The increase in post acute care costs stem largely from readmissions, as shown in Figures 3 and 4. Figure 3 shows that at the 30-day time window, readmissions made up 22% of total post-acute care costs, compared to 32% at the 180-day time window for DRG 291. Skilled nursing facilities made up the largest proportion of post-acute care costs at each time window, but decreased from 45% of total post-acute care costs to 34% from the 30-day time window to the 180-day time window as the cost of readmissions increased. Other cost categories remain stable throughout the three different time windows.

As observed for many episodes, a small number of cases drives the majority of the variation in the average. Using DRG 291 as an example, approximately 850 cases had no post-acute care costs, even at 180 days post discharge, which presumes that these beneficiaries died during the stay or soon after discharge. As a result, their episode costs were low and their inclusion in any bid would have the same effect as discussed further below in Pneumonia, namely to decrease the average. Conversely, while there are very few episodes that incurred more than $50,000 in post-acute care costs at 30 days, nearly 600 episodes had post-acute care costs of more than $50,000 at 180 days (still a relatively small proportion of the total number of episodes—less than 8%). Of those, 113 had post-acute care costs that were more than 2 standard deviations above the average (>$96,000)—2 had post-acute care costs of more than $1 million dollars. Twenty episodes had post-acute care costs in excess of $200,000 at 180 days. For the most part, the highest outlier episodes (those with more than $200,000 in post-acute care costs), had a significant proportion of costs spent on readmissions and long-term care.

Figure 3. Distribution of Post-Acute Costs by Service Type, 30, 90 and 180-Day Time Windows—DRG 291

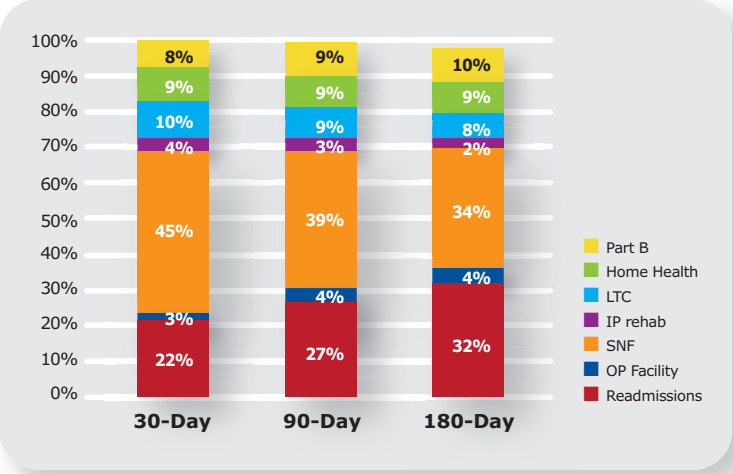

Figure 4. Total Post-Acute Care Costs (typical vs. complications) at 30, 90, 180-Days Post-Discharge—DRG 291

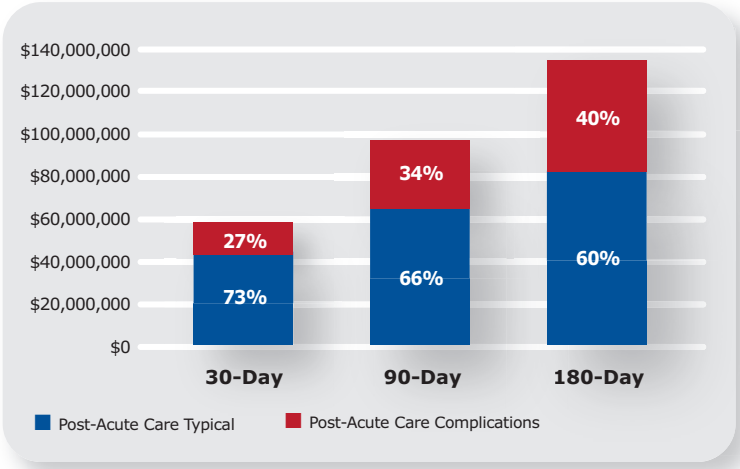

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Figure 5 compares the distribution of costs by service type for all 180-day episodes to the 113 episodes for which the post-acute care costs exceeded $96,000. Readmissions and long-term care were significant drivers of costs for these episodes, and Figure 6 shows how complications are the major driver for the added costs of these outlier episodes.

Figure 5. Distribution of Post-Acute Care Costs by Service Type, DRG 291, 180 days (all episodes v. outlier episodes)

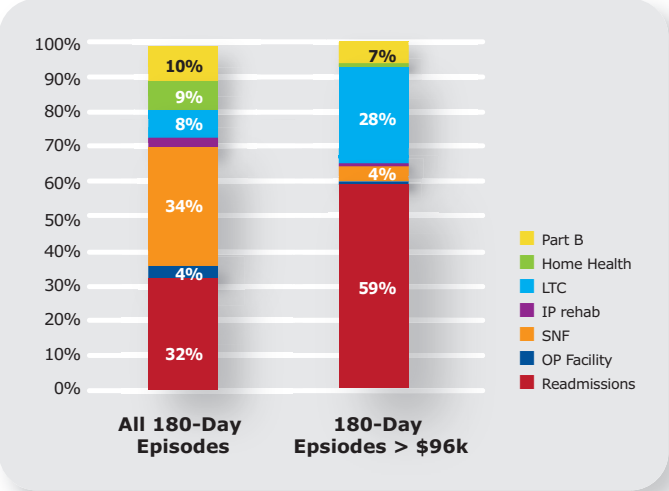
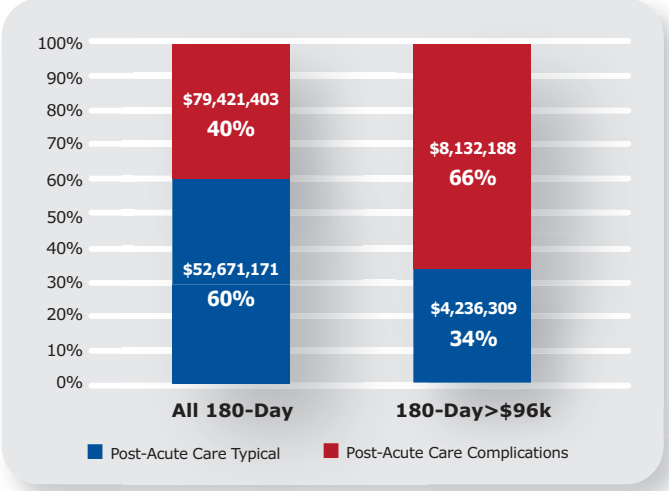


Figure 6. Post-Acute Care Costs (typical vs. complications), DRG 291, 180-days post-discharge, (all episodes vs. outlier episodes)



Pneumonia

For all patients, the average episode cost for MS-DRG 193 was highest among the three MS-DRGs at $15,887, followed by $12,110 for MS-DRG 194, and $9,772 for MS-DRG 195 (Table 4). When deceased patients were excluded from the average episode cost calculation, the average episode costs increased for each MS-DRG, although the coefficient of variation did not vary greatly. For all patients, the coefficient of variation was 0.92 for MS-DRG 193, 0.94 for MS-DRG 194, and 0.96 for MS-DRG195. These coefficients were 0.91, 0.93, and 0.96, respectively, when deceased patients episodes were excluded.

However, the average episode cost for patients who died during the episode was $9,410 (STD= $6,506), which is statistically significantly lower than patients who were alive (95% confidence). We observed similar statistically significant patterns for MS-DRGs 194 and 195. These lower costs were driven by far lower post-acute care costs for patients who died, averaging about $5,000 less for each of the MS-DRGs

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Conversely, the average cost for high outlier episodes is $70,833 for MS-DRG 193 (STD= $44,512); $51,076 for MS-DRG 194 (STD= $32,574); and $41,174 for MS-DRG 195 (STD= $22,569). When both deceased patients and high outlier episodes are excluded, average episode costs decrease for all MS-DRGs, dropping below the average episode cost for all patients. In addition, the variation in those costs decrease greatly as evidenced by the substantial decrease in the standard deviation and coefficients of variation. For MS-DRG 193, average cost decreased to $14,795 (STD = $8,496, CV = 0.57); for 194, it decreased to $10,908 (STD = $6,810, CV = 0.62); and for 195, it decreased to $8,627 (STD = $5,769, CV = 0.67). High outlier cases only account for 3% of total episode volume, but 21% of

Table 4. Pneumonia: Episode Costs and Variation by MS-DRG

		MS-DRG 193	MS-DRG 194	MS-DRG 195
All	N	12,251	26,531	16,580
	Average Episode Price	$15,887	$12,110	$9,772
	STDEV	$14,558	$11,348	$9,394
	Relevant Acute Care Price	$8,742	$6,553	$5,403
	Relevant Post-Acute Care Price	$8,784	$6,308	$5,005
	Coefficient of Variation	0.92	0.94	0.96
Alive	N	11,202	26,021	16,317
	Average Episode Price	$16,494	$12,218	$9,844
	STDEV	$14,951	$11,420	$9,443
	Relevant Acute Care Price	$8,697	$6,555	$5,405
	Relevant Post-Acute Care Price	$8,819	$6,318	$5,012
	Coefficient of Variation	0.91	0.93	0.96
Deceased and High Outliers Excluded	N	10,864	25,172	15,707
	Average Episode Price	$14,795	$10,908	$8,627
	STDEV	$8,496	$6,180	$5,769
	Relevant Acute Care Price	$8,537	$6,445	$5,296
	Relevant Post-Acute Care Price	$7,107	$4,998	$3,781
	Coefficient of Variation	0.57	0.62	0.67
Deceased Excluded, High Outliers Capped	N	11,202	26,021	16,317
	Average Episode Price	$15,705	$11,688	$9,372
	STDEV	$9,835	$7,930	$6,807
	Relevant Acute Care Price	$8,696	$6,555	$5,405
	Relevant Post-Acute Care Price	$7,009	$5,132	$3,967
	Coefficient of Variation	0.63	0.68	0.73
High Outliers	N	346	850	610
	Average Episode Price	$70,833	$51,076	$41,174
	STDEV	$44,512	$32,574	$22,569
	Relevant Acute Care Price	$14,792	$9,874	$8,233
	Relevant Post-Acute Care Price	$57,198	$41,348	$32,942
Deceased	N	1,049	510	263
	Average Episode Price	$9,410	$6,563	$5,307
	STDEV	$6,506	$3,717	$3,243
	Relevant Acute Care Price	$9,222	$6,435	$5,257
	Relevant Post-Acute Care Price	$3,179	$1,451	$569

* For MS-DRGs 193, 194, and 195, the average episode price for deceased patients was statistically significantly lower than that of non-deceased patients (95% confidence)

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Figure 7. Pneumonia: Post Acute Care Costs by MS-DRG

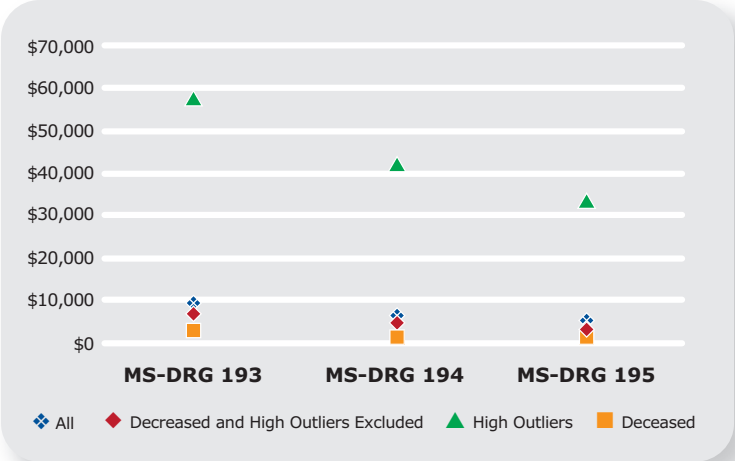
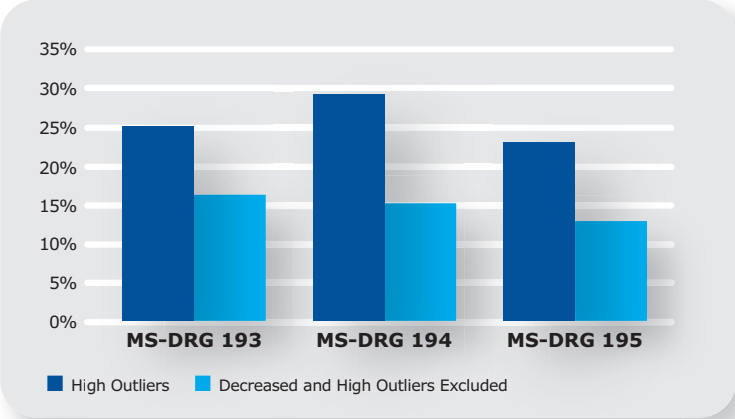


Figure 8. Pneumonia: Percentage of Post Acute Care Costs Classified as Readmissions



total post acute care costs. Figure 7 shows the difference in post-acute care costs between the different cohorts.

A substantial amount of the post acute care costs were due to readmissions. Figure 8 shows the difference in readmissions as a percentage of total post acute care costs for the high outlier cohort alone, and also for the cohort in which deceased patients and high outliers were excluded. For MS-DRG 193, 25% of total post-acute costs were due to potentially avoidable readmissions, as compared to 16% for deceased and high outliers excluded. Similar patterns were present for MS-DRG 194 and 195, in which readmissions were also a significant cost driver of post acute care.

IME and DSH Payments

For all potential AMC applicants to the BPCI pilot, the total savings provided to CMMI, based on a 2% discount, would exceed $2 million. In addition, since IME and DSH add-ons are excluded from the calculation of the bid price, CMMI would also potentially gain from the non-payment of these add-ons due to lower readmissions achieved as a natural course of the improvement in the management of patients covered by a bundle. Table 5 summarizes the potential gains to CMS from the base discount and from reductions in readmissions.

The loss of these add-ons for the BPCI applicant increases the hurdle rate for breakeven compared to non academic centers, and that rate goes up as readmissions go down.

Table 5.

	ALL AAMC BUNDLES
# Cases	3,766
Total episode historical payment	$107,155,125
Avg. Target Price (2% discount)	$105,012,031
Discount (2%)	$2,143,092
# Readmissions	656
Add on per readmission (weighted hosp avg)	$3,053
25% reduction in readmits	168
10% reduction readmits	67
Add-on amounts for 25% reduction in readmits	$509,779
Add-on amounts for 10% reduction in readmits	$204,733

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POLICY IMPLICATIONS

Our analyses point to a number of issues that should be addressed by CMMI and applicants as they review and finalize participation in the pilot. And applicants, in particular, should understand the increased financial risk they could be subjected to if they fail to negotiate certain protections in their agreement to participate in the pilot.

"Applicants, in particular, should understand the increased financial risk they could be subjected to if they fail to negotiate certain protections in their agreement to participate in the pilot."

Case Mix Adjustments

Our review of joint replacement and PCI MS-DRGs illustrates the impact of case mix on the average episode costs. While the "luck of the draw" can play in the applicant's favor, it can also potentially play in CMS's favor. Either way, changes in case mix have little, if anything, to do with the good clinical management of a patient during and after the acute hospitalization. The stated purpose of the BPCI is to improve care, and yet incentives to reduce costs in a program that is subject to the vagaries of case mix can potentially lead the risk bearer—the applicant—to find ways to mitigate that risk through any means. For example, the diversion of a small number of patients could have a marginal impact that leads the applicant to win in the BPCI even though the care management hasn't significantly improved. And a small shift of patients would be statistically insignificant and therefore difficult to question. Similarly, as more traditionally inpatient procedures move to the outpatient setting, CMMI must consider the impact of shifts in case mix on the pilot program. For example, if the lower severity total knee replacement procedures are shifted from the inpatient setting to the outpatient setting, the remaining mix of procedures in the pilot could become more complex, potentially driving up average episode costs. Note also that our observations in this Issue Brief are over many HRCs. However, the sample size of certain MS-DRGs in a family of MS-DRGs can become quite small (i.e. less than 30), which would result in creating average bid prices for those MS-DRGs that are statistically unreliable.

As a result, we strongly recommend that CMMI applies (and that applicants insist that CMMI apply) a case mix adjustment to all bids. We further recommend that MS-DRGs with historical samples of less than 30 be removed from the family of MS-DRGs included in an applicant's pilot to avoid swings in actual episode prices that are due to sample case changes. Finally, much of this case mix adjustment could simply be mitigated by triggering episodes based on the principal procedure and diagnosis codes, as is being done in all private sector bundled payment pilots.

A related unintended consequence of triggering episodes exclusively with a MS-DRG is the exclusion of procedures that could/would otherwise be done at lower cost sites of care. For example, joint replacement and PCI procedures are increasingly being performed in non-hospital settings. Excluding these cases from the pilot creates an incentive to focus the care of patients in hospitals and sets an artificial floor on episode prices. CMMI should therefore consider expanding the universe of episode triggers beyond MS-DRGs.

Outlier Adjustments

We established that there are four potential cohorts by which a bid price can be calculated for the Pneumonia MS-DRGs, and, by extension, for other episodes. The first is based on all patients, the second excludes deceased patients, the third excludes deceased patients and high outliers, and the fourth excludes deceased patients and places a cap on high outliers. Though CMS has instructed applicants to calculate a bid price for an MS-DRG based on all patients, we observed in our comparative analysis that deceased patients have significantly lower average episode costs than non-deceased patients. That's because the BPCI triggers all episodes with a hospitalization and patients that die at or shortly after discharge incur far fewer post-acute care costs. While that issue doesn't impact applicants for Models 1 and 4, it has a potential detrimental effect on Model 2. To the extent that care improves in and after the acute phase, it is reasonable to expect that the number of deaths might decrease. However, since average episode costs for those who die are lower, decreasing the number of deaths has the perverse effect of increasing the average episode cost.

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"A common goal of payment reform is to create the incentives for providers to reduce those readmissions, which we must balance against an unintended consequence of patient diversion to mitigate outlier risk. One common strategy used in private sector bundled payment programs is to establish a stop loss at the individual episode level and in aggregate."

At the other end of the cost spectrum, maintaining high outlier episodes in the bid price may cause significant variation in year-to-year costs, subjecting providers to a risk of loss or gain. While decreasing these outlier costs will result in lower averages and therefore benefit the provider, the net effect is only positive to CMS if the decrease is a result of care improvement and not potential diversion of patients. Using the three Pneumonia MS-DRGs as an example, if a provider organization were able to shift its outlier cases to another facility it could save on average $1,162 per case, resulting in a windfall of over $60 million. After subtracting the loss in MS-DRG payments for 1,806 outlier cases (roughly $8.7 million), the group still maintains a savings of over $51 million for gaming the system by shifting outlier cases and not doing any clinical reengineering.

We observed that high post acute care costs are the primary driver of outlier Pneumonia and Heart Failure episodes, and that inpatient readmissions, which we consider to be potentially avoidable complications, account for the majority of that excess. A common goal of payment reform is to create the incentives for providers to reduce those readmissions, which we must balance against an unintended consequence of patient diversion to mitigate outlier risk. One common strategy used in private sector bundled payment programs is to establish a stop loss at the individual episode level and in aggregate. Though the price per Pneumonia MS-DRG with deceased patients excluded and outliers capped was found to be similar to the price per MS-DRG for all patients, this method of capping the outliers actually eliminated much of the variation in costs, as evidenced by significant reductions in standard deviations and coefficients of variation.

As such, we recommend that CMMI remove patients who died from the episode bid price and also establish a mutually acceptable stop-loss amount for each episode bid. The effect of these two outlier policies would reduce the negative incentives in the current design while continuing to create a positive incentive for providers to reduce the excessive readmissions that are driving the higher cost cases, improving the care of beneficiaries and reducing overall costs to the Medicare program.

IME and DSH Add-ons

Holding AMCs harmless for IME and DSH add-ons lost by reductions in readmissions would encourages participation in the BPCI without jeopardizing the educational and uninsured missions while care is redesigned. Thoughtful policy changes could emphasize and reward training and education in ambulatory based care and ultimately improve care. Recommendations include:

A) Recognize lost Add-on Payments: Under this option, CMS recognizes that teaching hospitals and high DSH hospitals provide an effective discount rate higher than 2% for the 90 day bundle, since policy payments related to avoided readmissions have not been included in the discount. We recommend a two-stage reconciliation: first, the 2% discount would be paid, followed by a final reconciliation which recognizes policy payment losses (for readmissions, as well as care provided in IRFs in lieu of a readmission) during the 90-day period after the index admission. In addition, recognize high DSH hospitals (who are not teaching settings) by using the same methodology.

a) Pro: For CMMS, the 2% discount is constant, for a return to CMMS of about $2.2M. Regarding add-on impact, it amounts to $200,000 if the readmit reduction is 10% and $500,000 if the reduction is 25% (total add-ons for the AMC participants is about $2M, thus the CMMS add on payment reconciliation is minimal). In this scenario, AMCs have incentive to drive down readmissions and overall cost, as desired (see Table 8).

b) Con: CMMS could retain all add-on payments for readmission reduction and would gain about $500,000 (in addition to the 2% discount), while AMCs' incentive to redesign care is diminished.

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B) Develop parallel demo for AMCs to convert current readmission-related add-on payments to ambulatory care redesign payment to support bundling efforts (an 'outpatient IME' to incentivize PCMH and alternative site team education such as hospice, community health centers, etc).

a) Pro: For CMMS and AMCs, this approach promotes experimentation with an alternative to traditional IME payments through a demonstration model. It also stimulates and supports the broader policy discussion regarding the role of IME in supporting care, training and essential service capacity in ambulatory settings.

b) Con: The design and implementation of such a demo may be time intensive for CMMI already occupied with multiple national care redesign projects.

Conclusion

The CMMI BPCI holds the promise to reduce costs of care for the Medicare program while improving the quality of care delivered to beneficiaries. However, several elements must be addressed in the final negotiations between CMMI and applicants to ensure that the results are not simply due to the "luck of the draw" and that negative incentives are either removed or highly mitigated. This will increase the likelihood that lower costs to Medicare are due to real improvements in clinical management by all pilot participants.

1 http://innovations.cms.gov/Files/x/Bundled-Payments-for-Care-Improvement-Request-for-Applications.pdf
2 http://innovations.cms.gov/initiatives/bundled-payments/index.html
3 http://www.hci3.org/cmmi-analytic-report-tools
4 See http://content.healthaffairs.org/content/31/8/1749.abstract