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Policy Makers Will Need A Way To Update Bundled Payments That Reflects Highly Skewed Spending Growth Of Various Care Episodes

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Abstract

Bundled payment entails paying a single price for all services delivered as part of an episode of care for a specific condition. It is seen as a promising way to slow the growth of health care spending while maintaining or improving the quality of care. To implement bundled payment, policy makers must set base payment rates for episodes of care and update the rates over time to reflect changes in the costs of delivering care and the components of care. Adopting the fee-for-service paradigm of adjusting payments with uniform update rates would be fair and accurate if costs increased at a uniform rate across episodes. But our analysis of 2003 and 2007 US commercial claims data showed spending growth to be highly skewed across episodes: 10 percent of episodes accounted for 82.5 percent of spending growth, and within-episode spending growth ranged from a decline of 75 percent to an increase of 323 percent. Given that spending growth was much faster for some episodes than for others, a situation known as skewness, policy makers should not update episode payments using uniform update rates. Rather, they should explore ways to address variations in spending growth, such as updating episode payments one by one, at least at the outset.

Bundled payment for episodes of care has received significant attention as a means of slowing the rapid growth of health care spending that has occurred under the fee-for-service

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system. Such payment systems pay a single price for all services delivered as part of an episode of care for a specific condition.

Both public and private payers are experimenting with episode-based payment models as a way to curb spending growth and improve the quality of care.[1] At the federal level, this type of reimbursement has been used for Medicare Parts A and B services in selected demonstrations. For example, it is being used by the Center for Medicare and Medicaid Innovation's Bundled Payments for Care Improvement initiative to test four innovative bundling approaches across a mix of hospital, hospital physician, and postacute care services.[2]

At the state level, Arkansas Medicaid and private insurers partnered in 2011 to form the Arkansas Health Care Payment Improvement Initiative, which aims to move the state's medical spending to bundled payment.[3] In the private sector, Geisinger Health System offers a bundled payment rate for coronary artery bypass surgery that includes both pre- and postoperative care.[1] As bundled payment programs evolve, it is likely that they will increasingly be used in conjunction with other payment models. For example, payers and providers could agree to a global budget for overall spending and then to bundled payments within that amount for discretely defined episodes, such as hip replacements.

Despite burgeoning interest in bundled payment models, implementation has been challenging because of many persistent barriers.[4] One such barrier is how payment rates should be set and later updated over time to reflect changes in the costs of delivering care. The initial payment rate may be set to provide a one-time reduction in spending. However, the success of such systems in slowing the trajectory of spending growth—bending the cost curve—will greatly depend on how the bundled payment rates are updated over time. It will also depend on the extent to which spending growth reflects changes in spending per episode (which may be controlled by limiting growth in episode payments) versus changes in the number of episodes (which may not).

Initially, bundled payments may be updated using the paradigm employed by Medicare, which bases updates on recent cost growth within each broad service category—for instance, physician services or hospital care. At present, Medicare reimbursement rates are based on a set of relative weights applied to all services within a given service category and a conversion factor, or base payment rate, to which these weights are applied. It is the conversion factor that gets updated over time.

Payments for acute care inpatient hospital stays under Medicare Part A are a perfect example. Each inpatient hospital stay is categorized into a diagnosis-related group (DRG), and each DRG in turn has a relative payment weight assigned to it that is based on the average resources used to treat Medicare patients in that group. Medicare applies these relative weights to the single conversion factor to obtain the payment amounts for each DRG.

For instance, the DRG weight for an admission for a kidney transplant is 3.0825. Payment in any given year, ignoring some adjustments that are not specific to any DRG, is thus 3.0825 times the conversion factor, which was about $5,300 in 2013. For an admission associated

with angina pectoris, the DRG weight is 0.5207. So payment is 0.5207 times the same conversion factor. Over time, the conversion factor gets updated, but the DRG weights are generally kept the same unless special adjustments are made. For example, the relative weight of a specific DRG might be increased to encourage the use of a less invasive but more costly treatment if it improves patient outcomes.

If spending growth among services is heavily skewed—that is, much more rapid for some than for others—applying uniform updates will create inequities in pricing. For example, if the cost of admission for kidney transplants rises faster than the cost of admission for angina pectoris, the updates will be inaccurate unless the Centers for Medicare and Medicaid Services (CMS) makes special adjustments. Although the relative weights can be changed, it is a cumbersome and often criticized process.[5] The uniformity makes updating easier.

The problem of pricing inequity may be even more serious with episodes than with DRGs, which include only inpatient payments, because the breadth of the bundle is greater, reflecting a larger number of services. As a result, spending growth can reflect more factors, probably increasing the variation.

The extent to which bundled payments could be uniformly and fairly updated using methods similar to those used by Medicare depends on the skewness of spending growth. If spending growth is skewed across episodes, a uniform update factor would not be ideal.

To provide insight into these issues, we decomposed spending growth into the portion attributable to changes in episode volume versus changes in episode spending, and we explored in greater detail the clinical conditions that contribute the most and the least to per capita spending growth. We also examined the skewness of spending growth across episodes of care in a large, commercially insured population.

Study Data And Methods

Data

We used data from the 2003 and 2007 MarketScan Commercial Claims and Encounters Database from Truven Health Analytics (formerly Thomson Reuters and, before that, MedStat). The MarketScan data captured the claims of about 17.5 million commercially insured people in 2003 and, because of an increasing number of employers submitting claims, more than 31 million in 2007. About half of the insurance claims for this period were submitted by very large employers; the other half were submitted by insurance plans. Insurance plan data included claims from both large and small firms.

For each of these years we selected people under age sixty-five who had drug coverage, were in a commercial plan with valid plan type, and were continuously enrolled for the full year (this requirement was to ensure that entire episodes were captured). We excluded people enrolled in capitated plans because their utilization data are frequently incomplete, which complicates episode formation and spending estimation. This process left 5.8 million and 11.1 million people in our samples for 2003 and 2007, respectively.

We used three types of files for each year. First, the enrollment files contained information on patient demographics, enrollment periods, and type of health insurance coverage. Second, the event files contained inpatient, outpatient, and prescription drug claims, and they included dates and types of services, diagnosis (*International Classification of Diseases*, Ninth Revision, Clinical Modification, or ICD-9-CM) and procedure (*Current Procedural Terminology*, Fourth Edition, or CPT-4) codes, types of providers, and costs of services.

Third, the episode files linked each event with a clearly defined episode of care and provided information on the type of episode, discussed below. These data included information on both reimbursements and charges. However, all analyses used the actual amount received by the provider, which included payments from both the insurer and the patient.

Methods

We classified spending into episodes using Truven Health Analytics' Medical Episode Grouper, which is widely available.[6] This commercial grouper employs a proprietary algorithm, based on clinical knowledge, which reviews claims and either assigns them to one of 569 possible episodes of care for different conditions or classifies them as "ungroupable." Ungroupable claims were typically claims for prescription drugs or ancillary services such as laboratory or radiologic tests for patients who did not have a relevant episode for the service. We omitted these claims from our analysis.

We further classified the episodes into five different types using the labels that the grouper assigned to each episode: acute, three types of chronic episodes (chronic maintenance, exacerbation of chronic condition, and chronic non-stratified), and well care. We combined the three chronic episode types into a single chronic category for reporting summary statistics and spending growth by disease, but we describe them separately when reporting spending growth by episode acuity. The lone well care episode, "encounter for preventive health services," was considered separately.

For each episode, we computed average spending per episode in 2003 and 2007 and the total count of episodes per capita, adjusted for age and sex.[7] We decomposed overall spending growth into growth in the number of episodes, changes in the mix of episodes, and growth in spending per episode, both at the disease level and for overall spending. We then examined the distribution of spending growth by episode acuity, calculating the contribution to overall spending growth for each type of episode.

Finally, we examined the distribution of spending growth across disease categories, and we calculated the contribution of each disease to overall spending growth and, importantly, the heterogeneity in spending growth per episode. The formulas used for our decomposition are provided in the online Appendix.[8]

To address the possibility that findings were unduly affected by outliers, we conducted a sensitivity analysis in which cost was top coded at the ninety-ninth percentile within each episode type. Analyses were conducted using two statistical software packages: SAS version 9.2 and Stata version 11.

Limitations

Our study had some limitations. First, our data set, although large, is a convenience sample from select employers and insurers—and thus is not representative of the private market. Our sample was restricted to people under age sixty-five who were continuously enrolled in noncapitated plans with drug coverage. These exclusions were necessary to ensure complete claims data on all members of the sample. We excluded 20 percent of spending from our analyses because we could not group those amounts to a particular episode. Although the distribution of spending growth across episodes was determined using one commercial grouper, there are several other episode groupers in use or development. However, we would expect spending growth across episodes to be skewed regardless of which grouper is used.

Another limitation related to our inability to assess the appropriateness of episode spending growth or whether the appropriateness of spending growth per episode varied across episodes. Also, our use of fee-for-service spending growth as a basis for projecting episode trends assumes no behavioral changes on the part of providers in response to bundled payment incentives. Our results nonetheless illustrate the skewness in spending growth observed in the past; it remains to be seen how new payment models would (or should) affect that.

Despite these limitations, this study is broadly relevant to payers and policy makers interested in operationalizing bundled payment.

Study Results

Descriptive statistics for our sample are shown in Exhibit 1. The age and sex distribution of our samples remained relatively constant over time. Overall, the grouper allocated 78 percent of spending into 558 types of episodes: 361 acute, 196 chronic,[9] and one well care. The grouper was unable to allocate 23.7 percent and 21.1 percent of spending to episodes in 2003 and 2007, respectively. The final sample included total annual spending of $18.9 billion and $42.1 billion in 2003 and 2007, respectively, on inpatient services, outpatient services, and prescription drugs.

Between 2003 and 2007, spending per capita increased by 15 percent, from approximately $3,253 to $3,739, holding age and sex constant. This increase was lower than the national private spending growth rate of 21 percent, which includes growth due to the aging of the population.[10] Exhibit 2 displays the decomposition of per capita spending growth into changes in spending per episode, episode mix, a shift from lower-cost to higher-cost episodes or the reverse, and the number of episodes per beneficiary.

The increase in spending per episode was the key driver of spending growth, accounting for 73 percent of the total. The number of episodes per person increased as well, from 10.39 to 10.94, accounting for a 36 percent increase in spending growth. The episode mix was slightly tilted to less expensive episodes over time, although not greatly.

Spending growth was highly skewed, with 10 percent of episodes accounting for 82.5 percent of total spending growth. Spending on the 10 percent of episodes with the smallest contribution to cost growth actually decreased12.9 percent between 2003 and 2007, contributing −16 percent to overall spending growth. Among episodes with at least 1,000 observations per year, spending per episode rose 323 percent in the fastest-growth episode and fell 75.5 percent in the slowest.

Exhibit 3 displays the contribution to spending growth of the major episode types. Chronic episodes accounted for 43.5 percent of baseline spending and 40.6 percent of spending growth. Acute episodes accounted for 53.1 percent of baseline spending and 46.2 percent of spending growth. The remaining 13.2 percent of spending growth was attributable to well care.

We found much heterogeneity in spending growth per episode across episodes and within each episode type as well. Among acute episodes with at least 1,000 observations per year, spending per episode rose 323 percent in the fastest-growth episode, disorders of bilirubin excretion, and fell 75.5 percent in the slowest-growth episode, bacterial meningitis. Among chronic episodes with at least 1,000 observations per year, spending per episode rose 190 percent in the fastest-growth episode, other maternal conditions affecting newborns, and fell 44.1 percent in the slowest-growth episode, hepatitis G.

Exhibit 4 displays our decomposition of cost increases for the ten episodes with the largest and the ten with the smallest contributions to per capita spending growth. The lone well care episode was the single largest contributor to per capita spending growth, accounting for more than twice as much spending growth—13.2 percent—as the next-fastest-growth episode. Other top contributors included breast cancer, contributing 5.3 percent; osteoarthritis of the lower back, 4.5 percent; and type 2 diabetes, 4.4 percent. In contrast, reductions in spending on angina pectoris and acute myocardial infarction actually slowed per capita spending growth by 5.9 percent and 2.3 percent, respectively.

There was also considerable heterogeneity in spending growth per episode across the ten episodes with the largest and the ten episodes with the smallest contributions to per capita spending growth. Among the top ten episodes, spending per episode rose 48.4 percent in the two fastest-growth episodes, colon cancer and multiple sclerosis, and fell 23.9 percent in the slowest-growth episode, renal failure. Among the ten episodes with the smallest contribution to overall spending growth, spending per episode rose 19.8 percent in the fastest-growth episode, benign breast neoplasm, and fell 39.1 percent in the slowest-growth episode, sleep disorders.

The robustness of our results was maintained when we dampened the effect of outliers by top coding spending at the ninety-ninth percentile within each episode type. Sensitivity analysis results are presented in more detail in the Appendix.[8]

Discussion

Episode-based bundled payment systems have gained traction in the public and private sectors. Yet many important questions must be addressed before episode-based payment can become a sustainable solution to rapid spending growth.[2,11–13]

Whether or not bundled payment can control spending growth depends in part on the extent to which spending growth is driven by increases in cost per episode as opposed to increases in episode volume. Spending growth that is attributable to increased number of episodes will not be materially curtailed by episode-based payment; spending growth due to costs per episode is more likely to be affected.

On this first point, our news is generally good. We found that spending per episode—including price increases, not episode volume—was the main driver of spending growth, accounting for 73.1 percent of overall spending growth.14

The success of episode-based payment models in curbing the rate of spending growth, as opposed to just providing a one-time reduction in level of spending, will rely greatly on the ability to update payment rates over time. Initial episode-based spending models may rely on the fee-for-service system as a reference when updating rates. However, an alternative updating approach will be needed as the fee-for-service system shrinks and becomes less representative of the prevailing costs of care.

Importantly, uniform updates based on historical spending growth will be appropriate only if spending growth per episode is relatively evenly distributed across episodes. Our findings on this second point are more problematic. Our analysis found spending growth to be highly skewed across episodes: 10 percent of episodes accounted for more than 80 percent of spending growth, and within-episode spending growth ranged from −75 percent to 323 percent across episodes.

This skewness has important implications for bundled payment mechanisms. Most notably, it implies that reimbursement rates cannot be updated uniformly across episodes. Some episodes, such as encounter for preventive health services and malignant breast neoplasm for females, experienced rapid growth. Others, such as angina pectoris and acute myocardial infarction, did not. In this context, uniformly updating payment rates would result in overpayment for angina and acute myocardial infarction care and underpayment for breast cancer care and preventive health services.

Our finding that the encounter for preventive health services topped the spending growth list warrants further investigation into specific clinical drivers of spending in primary care. The marked growth in well-care spending concurrent with an impressive decline in spending on acute exacerbations of chronic conditions raises the question of whether the two are related—in other words, whether there might be a causal relationship between preventive care delivered in a well care episode and a decline in spending on acute exacerbations of chronic illness.

In designing a system to differentially update reimbursement rates, it is critical to understand why spending per episode rises at different rates for different episodes. It might be the case, for example, that during our short time window, spending growth reflected only differential increases in the price per service (for example, inpatient or outpatient services or prescription drugs) within episodes and that these differential increases would reverse themselves over time.

However, most research on spending growth indicates that a large share of health care spending increases must be due to the diffusion of medical technology. If so, updates for different episodes should be based on some sense of where technology is driving changes in practice patterns.

Conclusion

Episode-based payment models constitute a promising advance in the evolution of payment reform; implementing and realizing cost containment from these systems, however, will be challenging. The marked skewness in spending growth demonstrated in this study indicates that reimbursement rates should not be updated uniformly across episodes of care. In the short term, as payers experiment with a limited number of episodes, individual updates for each episode may be appropriate. As the breadth of covered episodes expands, though, more systematic approaches to updating payment rates will likely be required.

Furthermore, whereas episode reimbursement rate updates can help control spending growth, they do nothing to control the number of episodes or those episodes' clinical appropriateness. Over time, moving from updates based on historical cost growth, which may reinforce overuse, to updates based on the appropriate use of evidence-based best practices would be ideal.

In the future, it will be important to decide whether increases in episode spending are justified by improved health or whether they reflect unnecessary use. Coupling payment with quality measures may be helpful. However, given time lags, it will also be important to have a system that assesses the need to increase reimbursements to allow the diffusion of valuable new medical technologies and other innovations.

Developing such a system will require the integration of greater clinical knowledge into payment update systems. Yet as episode-based payments become a larger part of our future payment system, we must begin the discussion of how such payments can be updated to allow the appropriate diffusion of medical technology.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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NOTES

1. A summary of nineteen high-profile public and private bundled payment experiments is provided in: Bailit MH, Burns ME, Painter MW. Bundled payment across the US today: status of implementations and operational findings [Internet]. 2012Newtown (CT)Health Care Incentives Improvement Institutecited 2013 Apr 1(Issue Brief). Available from: http://www.hci3.org/sites/default/files/files/HCI-IssueBrief-4-2012.pdf
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5. For example, see the critiques of the Resource Utilization Committees (RUCs) used for physician payment: Bodenheimer T, Berenson RA, Rudolf P. The primary care–specialty income gap: why it matters. Ann Intern Med. 2007; 146(4):301–306. [PubMed: 17310054]
6. For a more detailed description of two other widely used commercial episode groupers, see MaCurdy T, Kerwin J, Gibbs J, Lin E, Cotterman C, O'Brien-Strain M, et al. Evaluating the functionality of the Symmetry ETG and Medstat MEG software in forming episodes of care using Medicare data [Internet]. 2008Burlingame (CA)Acumen LLCcited 2013 Apr 1Available from: http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Reports/downloads/MaCurdy.pdf
7. Direct adjustment was used to standardize age and sex to 2003 levels to account for spending growth attributable solely to demographic changes in the population.
8. To access the Appendix, click on the Appendix link in the box to the right of the article online.
9. The 196 chronic episodes included 6 chronic maintenance episodes, 6 exacerbation of chronic condition episodes, and 184 chronic nonstratified episodes.
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14. Our result is not comparable to that reported in the literature because we did not deflate spending, as is typically done.

Biographies

Allison B. Rosen is an associate professor of quantitative health sciences at the University of Massachusetts Medical School.

In this month's *Health Affairs*, Allison Rosen and coauthors tackle the question of how bundled payment rates might be adjusted over time to reflect changes in the cost of delivering care. They reason that uniform update rates would be fair and accurate if costs increased at a uniform rate across episodes—but an analysis they performed of commercial claims shows that this isn't the case. Between 2003 and 2007, spending growth was highly skewed: 10 percent of episodes accounted for 82.5 percent of spending growth, and within-episode spending growth ranged from a decline of 75 percent to an increase of 323 percent. The authors conclude that policy makers should explore ways to address variations in spending growth, such as updating episode payments one by one, at least at the outset.

Rosen is an associate professor of quantitative health sciences at the University of Massachusetts Medical School and a faculty research fellow at the National Bureau of Economic Research (NBER). She is a general internist whose research focuses on how best to measure and improve the value of health care spending. She has a particular interest in the feasibility and effectiveness of tailoring payment policies to ensure that health is maximized —instead of compromised—by policy efforts to contain costs.

Rosen received a doctorate in health policy and management from Harvard University, a master's degree in public health from the University of North Carolina at Chapel Hill, and a medical degree from Duke University.

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Exhibit 1

Descriptive Statistics Of The Sample, Analysis Of Bundled Payment In A Nonelderly, Commercially Insured Population, 2003 And 2007

Characteristic	2003	2007
Number of unique individuals (millions)	5.8	11.3
Mean age (years)	35.6	34.9
Age distribution (%)		
Younger than 18	23.9	25.4
Age 18–29	11.9	12.1
Age 30–39	14.7	14.4
Age 40–49	20.1	19.6
Age 50–59	21.9	21.4
Age 60–64	7.4	7.1
Male (%)	45.5	46.1
Spending grouped to episodes ($ billions)	18.9	42.1
Portion of total spending grouped (%)	76.2	79.9
Spending per capita ($)	3,253	3,739

SOURCE Authors' analysis of data from the MarketScan Commercial Claims and Encounters Database, 2003 and 2007.

NOTE Includes people continuously enrolled in noncapitated plans with drug coverage for the full year.

Exhibit 2

Decomposition Of Per Capita Spending Growth In A Nonelderly, Commercially Insured Population, 2003–07

Contributing factors	Growth in spending per capita ($)	Contribution to total spending growth (%)
Total change in spending per capita	486.16	—[a]
Change in spending due to		
Cost per episode	355.57	73.1
Episode mix	−20.51	−4.2
Episodes per person	172.66	35.5
Interaction terms	−21.56	−4.4

SOURCE Authors' analysis of data from the MarketScan Commercial Claims and Encounters Database, 2003 and 2007.

NOTES Each line represents the contribution to the change in spending per capita holding the other components of the decomposition fixed at their 2003 levels. Direct adjustment was used to standardize age and sex to 2003 levels to account for spending growth attributable to demographic changes in the population.

[a]Not applicable.

Exhibit 3

Decomposition Of Spending Growth In A Nonelderly, Commercially Insured Population, By Episode Type, 2003–07

Episode type	Growth in spending per capita ($)	Contribution to overall spending growth (%)
Well care	64.31	13.22
Chronic episodes	197.24	40.56
Chronic maintenance	7.89	1.62
Chronic with acute flare	−12.16	−2.50
Chronic nonstratified	201.51	41.44
Acute episodes	224.72	46.21

SOURCE Authors' analysis of data from the MarketScan Commercial Claims and Encounters Database, 2003 and 2007.

NOTE Direct adjustment was used to standardize age and sex to 2003 levels to account for spending growth attributable to demographic changes in the population.

Exhibit 4

Spending Decomposition For Diseases With Largest And Smallest Contributions To Overall Spending Growth In A Nonelderly, Commercially Insured Population, 2003–07

	Episode type	Growth in spending per capita ($)	Contribution to overall spending growth (%)	Growth in spending per episode (%)
Top 10				
Encounter for preventive health services	Well care	64.31	13.22	31.6
Neoplasm, malignant: breast, female	Chronic	25.82	5.31	34.3
Osteoarthritis, lumbar spine	Chronic	21.81	4.49	23.5
Diabetes mellitus type 2	Chronic	21.24	4.37	4.9
Osteoarthritis, except spine	Chronic	18.18	3.74	27.2
Delivery, cesarean section	Acute	14.09	2.90	10.4
Renal failure	Chronic	13.37	2.75	−23.9
Neoplasm, malignant: colon and rectum	Chronic	13.25	2.73	48.4
Multiple sclerosis	Chronic	11.08	2.28	48.4
Other spinal and back disorders: low back	Acute	9.62	1.98	7.1
Bottom 10				
Neoplasm, benign: breast	Acute	−1.44	−0.30	19.8
Influenza	Acute	−1.52	−0.31	1.3
Sleep disorders	Acute	−1.82	−0.37	−39.1
Endometriosis	Acute	−2.05	−0.42	7.2
Congestive heart failure	Chronic	−2.16	−0.44	6.6
Sinusitis	Acute	−2.51	−0.52	−7.5
Hepatitis C	Chronic	−2.58	−0.53	−23.7
Depression	Acute	−3.84	−0.79	−5.2
Acute myocardial infarction	Chronic[a]	−11.29	−2.32	1.1
Angina pectoris, chronic maintenance	Chronic	−28.47	−5.86	−11.2

SOURCE Authors' analysis of data from the MarketScan Commercial Claims and Encounters Database, 2003 and 2007.

NOTE Direct adjustment was used to standardize age and sex to 2003 levels to account for spending growth attributable to demographic changes in the population.

[a]Episode type considered chronic with an acute exacerbation.