# Evaluating bundled payment contracting

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**Alternatives to traditional fee-for-service (FFS) reimbursement have gained attention as financial pressures mount and as FFS is recognized as contributing to medical inflation. The recent Centers for Medicare and Medicaid Innovations (CMMI) Bundled Payments for Care Improvement Initiative is a prominent example, as are private payor contracts.**

Bundled payments can be viewed as a stop along the road to full provider risk, along with pay for performance (P4P) and accountable care organization (ACO) shared savings arrangements. For payors, bundled payment arrangements create opportunity to reduce claim costs for services within the bundle. For providers, bundled payments present opportunities for reducing expenses, improving delivery system integration, gain-sharing between the hospital and physicians, increasing profit margin, and increasing patient volume.

Because bundled payment contracts provide a fixed fee for what is typically variable, providers bear risk for costs greater than the fixed fee. An actuarial analysis of historical claim data will provide the foundation for evaluating the risks and rewards of bundled payment contracting.

In this paper, we illustrate a bundled payment model for hip- and knee-replacement surgeries using commercial claim data. We detail reimbursement and resource allocation among three phases: the pre-operative period, the admission, and the post-discharge period. This paper does not address some important operational issues, such as administrative systems, governance of the provider contracting entity, and market analysis.

## OVERVIEW OF BUNDLED PAYMENTS

According to one theory, under a bundled payment the payor "make[s] a single payment for all services related to a treatment or condition, possibly spanning multiple providers in multiple settings."[1] In practice, the services included or excluded from the bundle are defined by a payor-provider contract. In theory, under FFS arrangements, each specific service is billed by the provider, but in practice FFS arrangements often include elements of bundling, such as diagnosis-related group (DRG) payments that cover all services rendered during a hospital stay.

The theoretical treatment of bundled payments as covering care related to an "episode" has led to much confusion. In some cases, it may be easy to clinically associate a medical condition as belonging to the bundle (e.g., a surgery-related infection after a hip-joint-replacement surgery belongs to the surgery episode). Other conditions may be less clear, such as pneumonia that appears three weeks after inpatient discharge. It is no easy task to make such determinations for all possible conditions—and to do so for all possible bundles. This complexity has led to much activity by several software vendors, who have competing products that "bundle" the claims and services associated with a patient into related episodes. In practice, the Centers for Medicare and Medicaid Services (CMS) and many payors are defining bundles more simply—as all care within a defined time period after surgery or after discharge, with explicit exceptions (e.g., treatments for accidental injury in the post-discharge period).

Bundled payments appear in contracts when doing so brings advantages to both providers and payors relative to other options. We have observed organizations using bundled payments for the following purposes:

- By providers to attract more business, including business from self-pay patients, medical tourism, and payor contracts
- By providers to engage physicians (especially surgeons), including those who could split their admissions among several hospitals
- By providers to gain the cooperation of physicians (especially surgeons) to reduce hospital cost
- By payors to reduce payments
- By payors to encourage patients to use lower-cost or higher-quality providers

Bundled payments can help align financial and quality of care incentives among the various providers. The CMMI bundled payment initiative includes legal waivers that will allow hospitals to share

[1] Rand Corporation. Overview of bundled payment. Retrieved April 21, 2011, from http://www.randcompare.org/policy-options/bundled-payment.

cost reductions or other financial gain with physicians, which might otherwise be illegal, and it could include waivers from other Medicare rules, such as the "three-day inpatient stay" before coverage in a skilled nursing facility (SNF).

Because payor databases and accounting systems are generally more transparent and standard than providers' systems, most of the data available for analyzing bundles represent the payor's cost (provider reimbursement) rather than the provider's cost. Reimbursement data is very useful for bundles. Certainly, a provider needs to know how much payors typically pay for the full scope of services. Furthermore, to the extent a provider can reduce services that "leak" outside its system(e.g., skilled nursing services or rehabilitation unaffiliated with the core provider), it can retain a greater portion of the revenue. However, when it comes to reducing cost, such as the cost of implants or the savings from reducing an inpatient stay by a half day, payor reimbursement data has less value. Hospitals with accurate cost accounting systems can best model the potential savings within their own walls.

## RECENT DEVELOPMENTS WITH BUNDLED PAYMENTS

**Bundled Payments for Care Improvement Initiative**. CMMI recently released applications for the Bundled Payments for Care Improvement Initiative, which invites organizations to apply for bundled payments for Medicare beneficiaries. Four bundled payment options are available; they vary in the services included (inpatient, post-discharge, or both), time frames covered in the bundle, and whether payments are made on a prospective or retrospective basis. Four additional models are planned. Awardees may have to refund money to CMS if episode costs are greater than promised by the awardee, while awardees may be paid the difference if FFS payments come in under the promised budget.

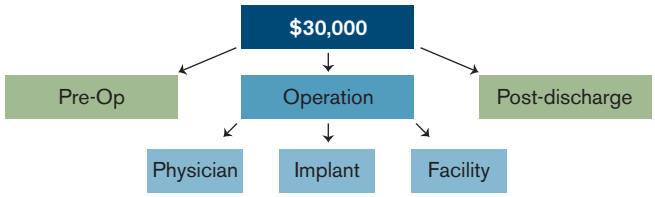
CMS also plans a five-year pilot program starting 2013 that will test single-payment acute-care episode contracts with selected providers. This pilot is anticipated to include hip- and knee-replacement surgeries and is expected to include both preoperative and postoperative services (up to 30 days post-discharge).

**Medicare ACE demonstration**. In 2009, Medicare began a three-year demonstration program involving bundled payments for acute care episodes (ACE). The program involved competitive bids for select orthopedic and cardiovascular inpatient procedures. The participants were chosen partly for their high volume to test economies of scale. Bundled payments include all Medicare Part A and B services during an inpatient stay plus preadmission testing: but no postoperative care.[2] Under this demonstration, Medicare shares its savings with the participating sites as well as with patients.

## A SIMPLE BUNDLED PAYMENT MODEL: HIP OR KNEE REPLACEMENT

Figure 1 illustrates a simple bundled payment arrangement. In this example, we assume $30,000 is the bundled payment amount to be split among providers delivering services in the preoperative, operative, and post-discharge periods for a hip or knee replacement. We illustrate the funds flow for the discrete time periods and for discrete services during the inpatient admission.

**FIGURE 1: BUNDLED PAYMENT MODEL**




Allocation: Based on Historical Costs or Resources

In FFS environments, reimbursement for inpatient services may include separate payments for facility, physician, and implant costs. The facility fee is typically a contracted DRG rate or per-diem rate. The professional or physician fees include services such as primary surgeon, assistant surgeon, anesthesiologist, consults, and hospital visits. In some cases, a carve-out contract for devices/implants will allow the provider to bill device/implant fees in addition to the facility fee. In other cases the device/implant is part of the DRG or per-diem payment. In the post-discharge period, separate FFS fees can be paid for long-term acute care hospital, skilled nursing facility, acute rehabilitation, home care, physician, inpatient facility for readmissions, outpatient facility, independent outpatient therapy, durable medical equipment (DME), clinical laboratory, and prescription drugs.

A bundled payment arrangement may include some or all of the preadmission, admission, and post-admission services. Some contracts may reference bundling systems such as the open-source Prometheus system[3] or one of the proprietary systems. Whatever the bundle definition in the contract, the provider and payor will want to evaluate the historical utilization and unit price reimbursement for these services to establish an actuarially sound bundled rate. Providers will need to consider their current profit margin for the bundled services, the ability to manage services and expenses for delivering the bundled services, and financial incentives for those physicians who will be asked to do more—or those who will be asked to do less.

The claim data analysis will need to consider how costs and utilization vary by patient for services in the bundle and the risk of outlier cases. The financial risk associated with the inpatient component is mainly the facility expenses for cases with complications or extended stays. In current FFS or case-rate structures (such as MS-DRGs), facilities may have protection through an outlier payment arrangement, while a bundled payment arrangement may not include such features. In particular, while the population average reimbursement associated with outliers may be built into the bundled payment as a small increment,

2 U.S. Department of Health and Human Services, Centers for Medicare and Medicaid Services (2009). Medicare Demonstrations: Details for Medicare Acute Care Episode (ACE) Demonstration. Details available at http://www.cms.gov/demoprojectsevalrpts/md/itemdetail.asp?itemid=cms1204388.

3 Health Care Incentives Improvement Institute. More information available at http://www.hci3.org/.



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that amount is unlikely to balance the outlier risk unless the provider has a large number of cases.

Outlier risk does not apply only to the initial inpatient stay. For the post-discharge period, readmissions pose a major financial risk unlike in a FFS environment, where readmissions and post-acute stays may generate additional revenue to the facilities and physicians. Similarly, extended acute rehab or nursing home stays can generate significant reimbursement under FFS arrangements but could quickly deplete available funds under a bundle.

## ILLUSTRATION

We provide a simplified claim data analysis for hip- and knee-replacement surgery using the 2008 Thomson Reuters MarketScan database (with approximately 28 million commercially insured lives). Our analysis summarizes claims incurred by commercially insured individuals having a hip- or knee-replacement surgery by three time periods: 30 days preoperative, operative inpatient stay, and 60 days post-discharge. We then group claims in each time period into facility (inpatient and outpatient), professional, and other services. Our analysis captured approximately 5,000 hip replacements and 10,500 knee replacements.

We provide payor costs by region in Figures 2 through 5. The payor cost of hip and knee replacement varies regionally but the allocation by component is consistent when presented as percentages of allowed dollars and relative value units (RVUs) by

**FIGURE 2: HIP-REPLACEMENT SURGERIES**

**SUMMARY OF ALLOWED DOLLARS BY TREATMENT PHASE**
**ALLOWED CHARGES REFLECT CY 2008 DATA**

| REGION | AVERAGE LENGTH OF STAY | ALLOCATION OF ALLOWED DOLLARS PRE-OP | OPERATIVE | POST-DISCHARGE | TOTAL |
|---|---|---|---|---|---|
| EAST NORTH CENTRAL | 3.2 | $688 | $25,153 | $1,913 | $27,753 |
| EAST SOUTH CENTRAL | 3.3 | $434 | $23,194 | $1,400 | $25,028 |
| MIDDLE ATLANTIC | 3.5 | $619 | $25,761 | $1,847 | $28,227 |
| MOUNTAIN | 3.2 | $494 | $27,150 | $1,144 | $28,789 |
| NEW ENGLAND | 3.5 | $642 | $30,655 | $1,396 | $32,694 |
| PACIFIC | 3.1 | $520 | $38,947 | $1,405 | $40,873 |
| SOUTH ATLANTIC | 3.2 | $521 | $26,251 | $1,489 | $28,261 |
| WEST NORTH CENTRAL | 3.1 | $523 | $26,607 | $915 | $28,045 |
| WEST SOUTH CENTRAL | 3.4 | $455 | $28,988 | $1,577 | $31,020 |
| NATIONWIDE AVERAGE | 3.2 | $545 | $27,918 | $1,546 | $30,009 |

**FIGURE 3: KNEE-REPLACEMENT SURGERIES**

**SUMMARY OF ALLOWED DOLLARS BY TREATMENT PHASE**
**ALLOWED CHARGES REFLECT CY 2008 DATA**

| REGION | AVERAGE LENGTH OF STAY | ALLOCATION OF ALLOWED DOLLARS PRE-OP | OPERATIVE | POST-DISCHARGE | TOTAL |
|---|---|---|---|---|---|
| EAST NORTH CENTRAL | 3.2 | $719 | $25,399 | $2,608 | $28,725 |
| EAST SOUTH CENTRAL | 3.6 | $352 | $24,078 | $2,201 | $26,630 |
| MIDDLE ATLANTIC | 3.5 | $585 | $25,920 | $2,564 | $29,069 |
| MOUNTAIN | 3.2 | $458 | $26,887 | $1,997 | $29,342 |
| NEW ENGLAND | 4.0 | $740 | $29,370 | $2,559 | $32,669 |
| PACIFIC | 3.1 | $445 | $35,932 | $2,313 | $38,691 |
| SOUTH ATLANTIC | 3.4 | $368 | $26,359 | $2,181 | $28,909 |
| WEST NORTH CENTRAL | 3.4 | $578 | $26,446 | $2,129 | $29,153 |
| WEST SOUTH CENTRAL | 3.5 | $421 | $27,980 | $2,241 | $30,643 |
| NATIONWIDE AVERAGE | 3.4 | $481 | $27,308 | $2,292 | $30,081 |

Notes:
Pre: Related pre-operative services performed up to 30 days prior to the admit.
Operative: Services performed during the hospitalization.
Post-discharge: Related post-discharge care performed within 60 days of discharge.



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period (preoperative, operative, and post-discharge). Figures 2 and 3 summarize the average allowed amounts by period, for hip and knee replacements, respectively, and show average lengths of stay.

In Figures 4 and 5, the allocation of total dollars and that of RVUs are fairly consistent; for hip and knee replacements, 93% and 91% of dollars, respectively, were incurred in the operative stage, and 95% and 94% of RVUs, respectively, were incurred in the operative stage. The relatively small costs outside the facility suggest that, for the 60-day post-discharge bundle, financial success will be largely decided by how inpatient costs are managed.

We note that for some specific cases, the portion of reimbursement that occurs after discharge is much higher than in this example. In general, extending the definition of the bundle beyond 60 days will increase the post-discharge portion.

Figures 6 and 7 report the index inpatient stay only and show the allocation of costs and resources by professional and facility. This information and additional provider detail for services and costs during the inpatient stay will inform the allocation of the bundled payment dollars for specific providers and opportunities for improved efficiency.

**FIGURE 4: HIP-REPLACEMENT SURGERIES**

**SUMMARY OF ALLOWED DOLLARS AND RESOURCES (RELATIVE VALUE UNITS) BY TREATMENT PHASE**
**ALLOWED CHARGES REFLECT CY 2008 DATA**

| | ALLOCATION OF ALLOWED DOLLARS | | | | ALLOCATION OF RESOURCES (RVUS) | | | |
|---|---|---|---|---|---|---|---|---|
| REGION | PRE-OP | OPERATIVE | POST-DISCHARGE | TOTAL | PRE-OP | OPERATIVE | POST-DISCHARGE | TOTAL |
| EAST NORTH CENTRAL | 2% | 91% | 7% | 100% | 2% | 95% | 3% | 100% |
| EAST SOUTH CENTRAL | 2% | 93% | 6% | 100% | 1% | 97% | 1% | 100% |
| MIDDLE ATLANTIC | 2% | 91% | 7% | 100% | 1% | 95% | 4% | 100% |
| MOUNTAIN | 2% | 94% | 4% | 100% | 1% | 96% | 3% | 100% |
| NEW ENGLAND | 2% | 94% | 4% | 100% | 1% | 97% | 2% | 100% |
| PACIFIC | 1% | 95% | 3% | 100% | 2% | 95% | 3% | 100% |
| SOUTH ATLANTIC | 2% | 93% | 5% | 100% | 2% | 95% | 4% | 100% |
| WEST NORTH CENTRAL | 2% | 95% | 3% | 100% | 1% | 97% | 2% | 100% |
| WEST SOUTH CENTRAL | 1% | 93% | 5% | 100% | 2% | 95% | 3% | 100% |
| NATIONWIDE AVERAGE | 2% | 93% | 5% | 100% | 2% | 95% | 3% | 100% |

**FIGURE 5: KNEE-REPLACEMENT SURGERIES**

**SUMMARY OF ALLOWED DOLLARS AND RESOURCES (RELATIVE VALUE UNITS) BY TREATMENT PHASE**
**ALLOWED CHARGES REFLECT CY 2008 DATA**

| | ALLOCATION OF ALLOWED DOLLARS | | | | ALLOCATION OF RESOURCES (RVUS) | | | |
|---|---|---|---|---|---|---|---|---|
| REGION | PRE-OP | OPERATIVE | POST-DISCHARGE | TOTAL | PRE-OP | OPERATIVE | POST-DISCHARGE | TOTAL |
| EAST NORTH CENTRAL | 3% | 88% | 9% | 100% | 1% | 94% | 4% | 100% |
| EAST SOUTH CENTRAL | 1% | 90% | 8% | 100% | 1% | 96% | 3% | 100% |
| MIDDLE ATLANTIC | 2% | 89% | 9% | 100% | 1% | 93% | 6% | 100% |
| MOUNTAIN | 2% | 92% | 7% | 100% | 1% | 95% | 4% | 100% |
| NEW ENGLAND | 2% | 90% | 8% | 100% | 1% | 94% | 5% | 100% |
| PACIFIC | 1% | 93% | 6% | 100% | 2% | 94% | 5% | 100% |
| SOUTH ATLANTIC | 1% | 91% | 8% | 100% | 1% | 94% | 5% | 100% |
| WEST NORTH CENTRAL | 2% | 91% | 7% | 100% | 1% | 96% | 3% | 100% |
| WEST SOUTH CENTRAL | 1% | 91% | 7% | 100% | 1% | 95% | 4% | 100% |
| NATIONWIDE AVERAGE | 2% | 91% | 8% | 100% | 1% | 94% | 4% | 100% |

Notes:
Pre: Related pre-operative services performed up to 30 days prior to the admit.
Operative: Services performed during the hospitalization.
Post-discharge: Related post-discharge care performed within 60 days of discharge.
Relative Value units based on RBRVS Physician Fee Schedule and Milliman RBRVS for Hospitals ™



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## CONSIDERATIONS IN CONTRACTING FOR BUNDLED PAYMENTS

Financial, operational, and quality issues need to be considered by providers and payors contracting for bundled payment rates. We summarize key considerations below.

**Defining the episode**. The "bundled" episode must be clearly defined, because it defines contractual obligations. What is the "trigger" or "index date" and when does the case end? Which services are included? For example, are physical therapy services part of the bundle, and for what time period? Are laboratory services prior to the surgery included? Are prescription drugs carved out? Determining which services are in or out of the bundle includes analyzing historical reimbursement and the ability of the provider organization to reduce expenses.

**Evaluating catastrophic risk**. The bundled payment generally reflects the average per-patient cost for a set of services, but few cases are average. An outlier risk analysis that includes a classical stop loss analysis can evaluate the financial risk to the sponsoring organization. Variation in length of stay and the probability of serious complications are key dynamics to consider in the risk analysis. Such analysis can include the probability of outliers for various annual patient volumes and the expected losses beyond margin if outliers occur. Some organizations may want to consider funding outliers through a captive insurance program as an unrelated line of business. Stop-loss protection may be available, either from the payor or from a stop-loss carrier.

### FIGURE 6: HIP-REPLACEMENT SURGERIES

**ALLOCATION OF FACILITY/PROFESSIONAL CHARGES AND RESOURCES DURING INPATIENT STAY FOR HIP REPLACEMENT**
**ALLOWED CHARGES REFLECT CY 2008 DATA**

| | ALLOCATION OF ALLOWED CHARGES | | | ALLOCATION OF RESOURCES (RVUS) | | |
|---|---|---|---|---|---|---|
| REGION | PHYSICIAN | FACILITY | TOTAL | PHYSICIAN | FACILITY | TOTAL |
| EAST NORTH CENTRAL | 19% | 81% | 100% | 16% | 84% | 100% |
| EAST SOUTH CENTRAL | 18% | 82% | 100% | 12% | 88% | 100% |
| MIDDLE ATLANTIC | 19% | 81% | 100% | 14% | 86% | 100% |
| MOUNTAIN | 16% | 84% | 100% | 14% | 86% | 100% |
| NEW ENGLAND | 16% | 84% | 100% | 8% | 92% | 100% |
| PACIFIC | 12% | 88% | 100% | 12% | 88% | 100% |
| SOUTH ATLANTIC | 14% | 86% | 100% | 15% | 85% | 100% |
| WEST NORTH CENTRAL | 17% | 83% | 100% | 12% | 88% | 100% |
| WEST SOUTH CENTRAL | 13% | 87% | 100% | 15% | 85% | 100% |
| NATIONWIDE AVERAGE | 15% | 85% | 100% | 14% | 86% | 100% |

### FIGURE 7: KNEE-REPLACEMENT SURGERIES

**ALLOCATION OF FACILITY/PROFESSIONAL CHARGES AND RESOURCES DURING INPATIENT STAY FOR KNEE REPLACEMENT**
**ALLOWED CHARGES REFLECT CY 2008 DATA**

| | ALLOCATION OF ALLOWED CHARGES | | | ALLOCATION OF RESOURCES (RVUS) | | |
|---|---|---|---|---|---|---|
| REGION | PHYSICIAN | FACILITY | TOTAL | PHYSICIAN | FACILITY | TOTAL |
| EAST NORTH CENTRAL | 19% | 81% | 100% | 15% | 85% | 100% |
| EAST SOUTH CENTRAL | 17% | 83% | 100% | 11% | 89% | 100% |
| MIDDLE ATLANTIC | 17% | 83% | 100% | 13% | 87% | 100% |
| MOUNTAIN | 17% | 83% | 100% | 14% | 86% | 100% |
| NEW ENGLAND | 16% | 84% | 100% | 9% | 91% | 100% |
| PACIFIC | 12% | 88% | 100% | 11% | 89% | 100% |
| SOUTH ATLANTIC | 14% | 86% | 100% | 14% | 86% | 100% |
| WEST NORTH CENTRAL | 17% | 83% | 100% | 12% | 88% | 100% |
| WEST SOUTH CENTRAL | 14% | 86% | 100% | 15% | 85% | 100% |
| NATIONWIDE AVERAGE | 15% | 85% | 100% | 14% | 86% | 100% |

Notes:
Relative Value units based on RBRVS Physician Fee Schedule and Milliman RBRVS for Hospitals ™



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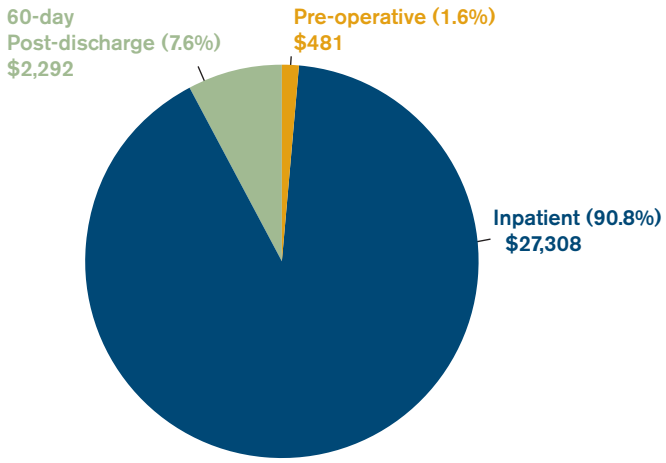
**Financial stability for low case loads**. Financial risk that is due to random fluctuations may be greater for provider groups with low case loads. The feasibility analysis will need to consider the risk impact and contractual protections necessary for contracting with providers performing a limited number of cases.

**Determining provider allocation of funds**. The bundled rate negotiated between providers and payors is typically lower than the total the payor would have spent piecemeal, which means some combination of more efficient care, lower-expense care, and retaining more care within the system is necessary for a provider to maintain current profit margins. Physicians' financial incentives can help promote more cost-effective care, which for the hip/knee example may include choosing lower-cost implants/devices or aggressively managing length of stay and use of cost-efficient post-discharge care. Funds flow models, which show how gains or losses are shared, are used to align financial incentives. One foundation for the funds flow model is the claim data analysis of historical provider reimbursement for delivery of the bundled services. These models can be very complex depending on the mix of salary and independent and IPA physicians.

**FIGURE 8: AVERAGE ALLOWED COSTS PER CASE KNEE-REPLACEMENT SURGERIES**




**Total average cost per case = $30,081**
**Total number of cases = 10,497**

**Distinguishing case severity**. In general, the more severe the case, the higher the costs and reimbursement, but also the higher the outlier risk. One strategy to limit the risk is to contractually remove higher-severity patients. For example, the American Society of Anesthesiologists (ASA) system classifies patients into severity levels based on comorbidities, where ASA levels range from 1-6. Restricting the bundled payment contract to ASA Levels 1 and 2, which are considered mild and moderate, can minimize risk by accepting only lower-severity cases for the bundled payment. (We note the ASA level may be difficult for a third party to validate, so other metrics may need to be considered.)

**Quality outcome requirements**. Patients and payors may be concerned that quality could be compromised if providers reduce needed services to reduce expenses. Minimum quality outcomes and patient satisfaction thresholds may be incorporated into the bundled payment contract with specified rewards/penalties for meeting/not meeting quality outcome standards.

**Administrative complexity**. All parties will compare the benefits of the contract to the administrative costs of supporting the contract. Under retrospective arrangements, claims adjudication processes will generate additional costs that may be incorporated in the reconciliation to the contracted, bundled payment amount. Prospective arrangements typically require the provider to administer claims, perhaps with payor help for out-of-system providers.

**Risk-sharing alternatives**. Risk-sharing contracts may be more viable than "pure" bundled payments. For example, the provider and payor could set a price target (e.g., $30,000 per patient) and agree to a risk-sharing arrangement where the provider is at risk for only a specified portion of the loss or gain of each patient.

**Potential for increased utilization**. This risk comes in two forms. First, individual providers' contracts and the details of a funds flow model may create incentives for certain providers to increase utilization within a bundle. Second, on a bigger scale, bundled payments may create an incentive for providers to produce more bundles. Administrative systems can monitor these risks, but remedial actions may be difficult.

## CONCLUSION

Bundled payment arrangements have the potential to reduce claim costs for payors and can create market and financial advantages for providers, but they change the nature of risk. An actuarial analysis of historical claim data is a powerful way to understand and plan for the risk and rewards associated with bundled payments.

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## APPENDIX A: RESEARCH METHODOLOGY

Our analysis identified hip- and knee-replacement cases using ICD-9 procedure codes 81.54 and 81.51. We chose cases incurred from March 2008 through October 2008 in MarketScan. This allowed for analysis of a preoperative and post-discharge time frame. In this analysis, "preoperative" included 30 days prior to hospital admission; "post-discharge" was 60 days after discharge. Data was summarized by standard Milliman service categories.

Exclusions:

- Patients less than 18 years of age
- Cases in which the patient died or stopped receiving treatment against medical advice
- Cases in which the implant was removed (revision)
- Cases in which a patient had both hip and knee replacement
- Cases in which a patient had more than one hip- or knee-replacement surgery
- Outlier cases (costs less than $1,000 or greater than $100,000)

We appended RVUs in order to quantify resources independent of contracting:

- Physician RVUs from Medicare Resource-based Relative Value Scale (RBRVS) Fee Schedule

Hospital RVUs from Milliman's RBRVS for Hospitals; see http://www.milliman.com/expertise/healthcare/products-tools/rbrvs/pdfs/milliman-rbrvs-for-hospitals.pdf

## APPENDIX B: CATEGORIZATION OF STATES INTO U.S. CENSUS REGIONS

**East North Central**
Illinois
Indiana
Michigan
Ohio
Wisconsin

**East South Central**
Alabama
Kentucky
Mississippi
Tennessee

**Middle Atlantic**
New Jersey
New York
Pennsylvania

**Mountain**
Arizona
Colorado
Idaho
Montana
Nevada
New Mexico
Utah
Wyoming

**New England**
Connecticut
Maine
Massachusetts
New Hampshire
Rhode Island
Vermont

**Pacific**
Alaska
California
Hawaii
Oregon
Washington

**South Atlantic**
Delaware
District of Columbia
Florida
Georgia
Maryland
North Carolina
South Carolina
Virginia
West Virginia

**West North Central**
Iowa
Kansas
Minnesota
Missouri
Nebraska
North Dakota
South Dakota

**West South Central**
Arkansas
Louisiana
Oklahoma
Texas

## APPENDIX C: DESCRIPTION OF THOMSON REUTERS MARKETSCAN DATABASES

The Thomson Reuters MarketScan® databases reflect the healthcare experience of employees and dependents covered by the health benefit programs of large employers. Nationwide, these claim data are collected from approximately 100 different insurance companies, Blue Cross Blue Shield plans, and third-party administrators. In addition to allowed amounts, the data includes CPT, HCPCS, DRG, major diagnostic category (MDC), length of stay, provider type, place of service, and type of service. Each record also includes a claimant identifier to facilitate the accumulation of records by patient.

The databases are widely used to understand health economics and treatment outcomes. Information about the databases is available from http://thomsonreuters.com/products_services/healthcare/healthcare_products/pharmaceuticals/mktscan_res_db/



**FOR MORE ON MILLIMAN'S HEALTHCARE REFORM PERSPECTIVE**

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