

## Reference Pricing: A Small Piece of the Health Care Price and Quality Puzzle

BY CHAPIN WHITE AND MEGAN EGUCHI

*As purchasers seek strategies to reduce high health care provider prices, interest in reference pricing—or capping payment for a particular medical service—has grown significantly. However, potential savings to health plans and purchasers from reference pricing for medical services are modest, according to a new analysis by researchers at the former Center for Studying Health System Change (HSC) using 2011 private insurance claims data for about 528,000 active and retired nonelderly autoworkers and their dependents. In 2011, the California Public Employees’ Retirement System (CalPERS) adopted reference pricing for inpatient knee and hip replacements. Using quality and price information, CalPERS set an upper limit of \$30,000—the reference price—for hospital facility services for a knee or hip replacement. CalPERS designated certain in-network hospitals as meeting the reference price, and patients using designated hospitals are responsible only for the health plan’s usual cost-sharing amounts. However, if patients use a non-designated hospital, they are responsible for both usual cost sharing and any amount beyond the \$30,000 reference price. While reference pricing for inpatient services has some potential to steer patients to hospitals with better quality metrics, only limited savings—a few tenths of a percent of total spending—are possible from applying a similarly narrow reference pricing to other privately insured populations. If reference pricing were applied to a much broader set of so-called “shoppable” inpatient and ambulatory services, potential savings would be somewhat larger—roughly 5 percent of total spending. The potential savings from reference pricing are modest for two reasons: Shoppable services only account for about a third of total spending, and reference pricing only directly affects prices at the high end of the price distribution. When considering reference pricing, employers and health plans need to weigh potential savings against increased plan complexity and financial risk to enrollees, along with the analytical and financial resources needed to create and manage the program.*

### Reference Pricing: A Response to Price and Quality Variation

The negotiated prices that private health plans pay for hospital and other health care services vary widely from market to market and from provider to provider, even after accounting for differences in service complexity and the local cost of doing business.<sup>1</sup> At the same time, a growing body of research shows that paying higher prices does not necessarily mean patients receive higher-quality care.<sup>2</sup>

Wide, and seemingly unwarranted, price variation suggests that private health plans can reduce spending by steering patients to lower-price providers. Historically, health plans have used a combination of selective contracting and benefit design to steer patients to preferred providers—patients typically pay less out of pocket if they use in-network providers that have contracted with their health plan. Other providers are excluded from the plan network, and patients who receive care from out-of-network providers pay more, or even full charges, for services. Limited networks can be unpopular with enrollees and plan sponsors, but they have played, and will continue to play, a key role in health plan design.

Long used for pharmacy benefits, reference pricing for medical services is a relatively new approach to steering patients to particular providers and has



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**About the Institute.** The National Institute for Health Care Reform (NIHCR) contracted with the Center for Studying Health System Change (HSC) between 2009 and 2013 to conduct health policy research and analyses to improve the organization, financing and delivery of health care in the United States. As a result of the subsequent merger of Mathematica Policy Research (MPR) and HSC, MPR assumed the contract to complete NIHCR projects.

received a great deal of attention recently.<sup>3</sup> Although touted as a major innovation, reference pricing is a variation on conventional network-based plan design. The principle behind reference pricing is to maintain contracts with a broad network of providers but set an upper limit—the reference price—on the amount that health plans will pay in-network providers for a specific service. The enrollee is then liable for the usual cost sharing plus any excess of the negotiated in-network price over the reference price. Reference pricing has been referred to as a “reverse deductible” or a “defined-contribution” arrangement, because the plan covers amounts up to the reference price less usual cost sharing, and then the patient is liable for any amounts above the reference price.<sup>4</sup>

## CalPERS Blazes Path

The most widely discussed example of reference pricing is operated by CalPERS, which has applied reference pricing to inpatient knee and hip replacements and ambulatory surgical and imaging procedures, including knee arthroscopies and colonoscopies.<sup>5</sup> Under the CalPERS reference pricing system, patients who go to designated facilities are liable only for the

usual cost sharing, but patients who go to non-designated providers are liable for the usual cost sharing plus any excess of the negotiated price over the reference price.

For inpatient hospital services, facilities are designated on the basis of quality metrics and average historical negotiated prices paid by CalPERS. For ambulatory services, all in-network freestanding centers are designated facilities, and hospital-based facilities, which tend to have higher prices, are not. As a result of the CalPERS reference pricing system, there was a substantial increase in the share of inpatient knee and hip replacements provided by designated facilities, and there was a dramatic decline in the amounts paid by the plan to non-designated facilities for those services.<sup>6</sup> In general, it appears that non-designated facilities for joint replacements chose not to pursue collection of excess amounts above the reference price from CalPERS enrollees.

## Simulating the Effects of Reference Pricing

The goals of this analysis were, first, to quantify the share of spending that is attributable to shoppable services and then to simulate the effects of reference pricing

on those services. Two types of reference pricing were analyzed—one for inpatient hospital services and another for ambulatory services, including hospital outpatient services, professional services, and laboratory and imaging procedures. To simulate reference pricing for inpatient hospital care, certain hospitals were designated as high-value providers based on prices, quality and volume of services. For ambulatory services, service-specific reference prices were simulated, without designation of facilities or providers.

Two versions of inpatient reference pricing were simulated—a narrow one that only applied to knee and hip replacements, and a broader one that applied to all shoppable inpatient hospital stays. One of the key outcomes of interest was the simulated change in spending by the plan. In addition, the analysis of inpatient reference pricing also compared characteristics of designated vs. non-designated hospitals and average hospital quality metrics.

The data used for this analysis are from 2011 enrollment and claims data on 528,000 active and retired nonelderly U.S. autoworkers and their dependents (see Data Source and Technical Appendix). The simulation analysis was limited to 19 metropolitan markets, each with at least 4,000 enrollees, and all located in the Midwest (see Supplementary Table 1 for a list).

## Shoppable Services

In general, a shoppable health care service must typically be scheduled in advance, there must be more than one provider in a market that can perform the service, and there has to be price data available for the different providers. Ideally, the patient also would have some information on each provider’s quality of care, or at least some reasonable assurance that quality does not vary much. Elective—nonemergency—knee and hip replacements are good examples of shoppable procedures:

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### Data Source

This Research Brief uses detailed facility and professional 2011 claims data for current and retired autoworkers and their dependents under age 65. General Motors, Chrysler, Ford and the UAW Retiree Medical Benefits Trust provided claims for 528,000 enrollees living in 19 selected metropolitan markets as well as nonmetropolitan areas of Michigan. The claims data include detailed information on the service provided, the allowed amount—the total amount paid to the provider, including amounts paid by the insurer and the enrollee—and provider identifying information (name, zip code, tax identification number and national provider identifier). See the Technical Appendix for additional methodology information.

They are scheduled in advance, they are common and provided by many different hospitals and surgeons, health plans have accurate information on the prices they pay, and quality metrics are available.

To identify and classify shoppable services, this analysis used a combination of quantitative analysis of the claims dataset and clinician review to identify the maximum savings potential of reference pricing. Services were considered shoppable if they were among the top-ranked services in terms of total spending in the autoworker plan—either because of high prices, high quantities or both—and they could generally be scheduled in advance. Individual services that occurred within three days of an emergency department visit were excluded, even if the type of service was determined to be shoppable.

The list of shoppable services was not limited based on the availability of quality metrics, and services were included regardless of their potential use by plans to discriminate against seriously ill individuals. For example, injections of Avastin (generic name Bevacizumab) are included in the list of shoppable ambulatory services, although the drug is a chemotherapy treatment that, more or less without fail, would only be provided to individuals with colorectal cancer or other serious illnesses.

Finally, the analysis considered as shoppable some small-ticket services that patients would likely not shop for—such as electrocardiograms—but where the out-of-pocket liability might factor into a patient's choice of physician. As a result, the list of shoppable services should be considered an outer bound. Adding a requirement that widely accepted quality metrics be available for shoppable services would narrow the range of shoppable services and lower the potential savings impact substantially.

The 100 highest-spending inpatient diagnosis-related groups (DRGs) in the study population were included for

consideration as shoppable services. Together, these 100 DRGs accounted for approximately 70 percent of inpatient spending. Of these 100 DRGs, 73 were determined to be shoppable, including eight of the 10 DRGs accounting for the most spending.<sup>7</sup> The top 300 ambulatory Healthcare Common Procedure Coding

The price for each visit was measured as the total payment to the facility during the stay, excluding non-facility payments, such as inpatient physician care, surgeon fees and post-acute care. For each hospital, two average prices were calculated, one for shoppable knee or hip replacements and another for all shoppable stays. Hospitals

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System (HCPCS) and Current Procedural Terminology (CPT) codes were considered in the identification of shoppable ambulatory services. Among these 300 services, approximately 90 percent were determined to be shoppable.<sup>8</sup>

### Reference Pricing for Inpatient Care

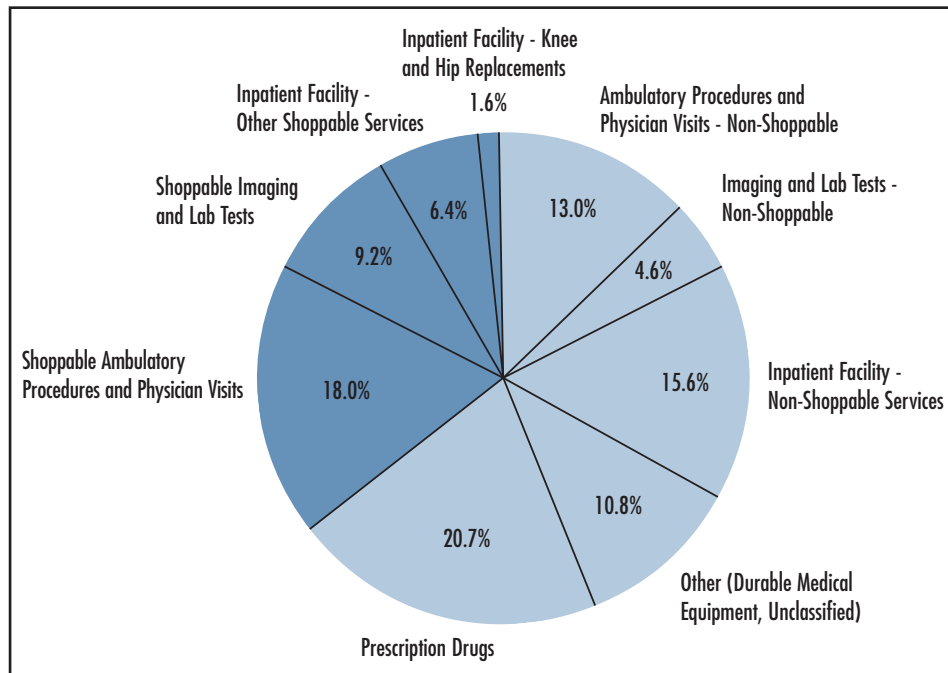
In the simulation of reference pricing for inpatient care, hospitals were categorized as either designated or non-designated under two reference pricing structures—one applied solely to knee and hip replacements and one applied to all shoppable stays. The criteria for designation included volume (three or more stays), quality (either just for knee and hip replacements or using broader measures of quality) and price.

Publicly available quality measures were obtained from the Centers for Medicare and Medicaid Services (CMS) and used in the simulated designations. To be designated, facilities could not be worse than the U.S. national rate for selected quality measures.

met the price criteria if their average facility price was below the 65th percentile among hospitals in the 19 markets. The 65th percentile was chosen because it is roughly analogous to the price criterion applied in the CalPERS system.<sup>9</sup>

Under this reference pricing strategy, designated hospitals would have prices at or below the reference price, and patients using non-designated hospitals would be responsible for paying the difference between the allowed amount and the reference price. The analysis simulated a steering effect in which some patients using a non-designated hospital would instead switch to a designated hospital. Results from the implementation of reference pricing by CalPERS indicated that roughly 15 percent to 30 percent of patients who would have gone to non-designated hospitals switched to a designated hospital in the first year.<sup>10</sup> Based on the CalPERS experience, the simulation was carried out assuming a switching rate of 30 percent. The outcomes of interest in the simulation

**Figure 1**  
**Shoppable Services Account for One-Third of Total Spending**



Note: Shoppable services were identified in claims data based on the diagnosis-related group for inpatient facility stays or the Healthcare Common Procedure Coding System and Current Procedural Terminology codes for outpatient facility and professional services.

Source: Authors' calculations using 2011 claims data from nonelderly privately insured autoworkers and dependents

included changes in quality, prices and the distance from a patient's residence to the hospital after taking this switching into account.

## Reference Pricing for Ambulatory Services

Reference prices for ambulatory services were applied service by service based only on prices. This system did not distinguish between designated and non-designated facilities for two reasons: Quality metrics are not publicly available for such services, and data limitations made it difficult to identify specific facilities and professionals within the claims data used for the analysis. Simulating reference pricing without a so-called safe harbor for designated providers tends to lead to larger estimates of reference pricing's spending impact.

Under this strategy, a reference price is calculated for each type of service. The price of a service could include both an

outpatient facility component and a professional component. One such example would be the combination of the facility fee for an MRI procedure with a radiologist's professional fee for reading the scan. For each service, the reference price was set at the 65th percentile of prices among all visits, again excluding those that occurred within three days of an emergency department visit. The simulation analysis assumed that all prices above the 65th percentile would be reduced to the reference price limit, and the excess would be transferred to the patient as a balance bill. The main outcome of interest was the change in spending by the plan under the simulated reference pricing structure.

## How Much Care is Shoppable?

Elective knee and hip replacements, the archetypal shoppable procedure, are the most common type of inpatient stay in the

2011 autoworker claims data, but they only accounted for 1.6 percent of the autoworkers' total health care spending (see Figure 1). The potential savings from applying reference pricing would be only a fraction of that relatively small share, or 0.2 percent of total spending. All other shoppable inpatient stays accounted for 27.2 percent of inpatient spending and 6.4 percent of total spending.

Using an inclusive definition, all shoppable services accounted for about a third of total spending if both inpatient and ambulatory services are included. In the autoworker claims data, spending on shoppable services occurred primarily in hospital outpatient departments and physician offices (18.0% of total spending) and in imaging and laboratory facilities (9.2% of total spending). Although the prices of individual ambulatory services are generally far lower than the price of an inpatient hospital stay, ambulatory services collectively are much more common and more substantial from a spending perspective.<sup>11</sup>

## Designated Hospitals: Bigger, Better, Cheaper

Hospitals in the simulations were designated as high-value providers for inpatient care based on a combination of CMS quality metrics and the prices and volume of shoppable inpatient stays in the claims data. Based on these criteria, 30 percent of hospitals in the 19 selected markets were designated as high-value providers (74 of 244) and accounted for 43 percent of shoppable inpatient stays (see Table 1).

Prices show the starkest difference between designated and non-designated hospitals. The case mix-adjusted average price per stay for shoppable stays was 38 percent lower at designated hospitals than at non-designated hospitals (\$8,118 vs. \$13,096). That price gap is almost as large—34 percent—when both shoppable and non-shoppable stays are included, which is consistent with prior research showing that hospitals' prices for certain

types of inpatient services are highly correlated with prices for other types of services.<sup>12</sup>

Designated hospitals were 37 percent larger than non-designated hospitals, as measured by the number of staffed beds. That size difference reflects that smaller hospitals were more likely to lack three or more shoppable stays in the claims data. The rates of serious complications and in-hospital deaths were roughly 10 percent lower in the designated hospitals, reflecting that hospitals could only be designated if their quality scores were either average or better than average.

The differences between designated and non-designated hospitals reflect the particular criteria applied. But there are many other ways that hospitals could be designated as high-value providers, and scoring highly on the metrics used in this study does not necessarily imply scoring highly on other metrics. To get a sense of the level of divergence between the designations in this analysis and other quality metrics, the share of hospitals that were nationally ranked by *U.S. News & World Report* (USNWR) was examined. Being nationally ranked by USNWR was significantly more common among hospitals that were not designated—either because of high prices or poor performance on CMS quality measures—than among designated hospitals. That divergence suggests that the roster of designated hospitals will likely differ substantially depending on which quality criteria are applied.

CalPERS, when designating hospitals, tried to ensure geographic access for enrollees living in all parts of California. The simulations in this analysis do not include any geographic-access requirements. Even so, 17 of the 19 selected markets had at least one designated hospital. Before applying reference pricing, a health plan would have to assess, for example, whether it is reasonable to expect residents of Kokomo, Ind., to drive more

**Table 1**  
**Characteristics of Designated and Non-Designated Hospitals Under a Reference Pricing Simulation**

	Designated Hospitals	Non-Designated Hospitals	Ratio (Designated/Non-Designated)
<b>Number of Hospitals</b>	74	170	
<b>Hospital Characteristics</b>			
Beds	296**	216	1.37
Major Teaching Hospital	23.0%	21.0%	1.10
<b>Price Index</b>			
Shoppable Stays	\$8,118**	\$13,096	0.62
All Stays	\$8,060**	\$12,120	0.66
<b>Quality Metrics, All Surgical Stays</b>			
Composite Measure of Serious Complication Rate	0.59**	0.66	0.89
Rate of Serious Complications Worse than Average	0.0%**	23.0%	0.00
Rate of In-Hospital Death from Serious Treatable Complications (per 1,000 Surgical Stays)	101.83**	110.34	0.92
Rate of In-Hospital Death from Serious Treatable Complications Worse than Average	0.0%	3.0%	0.00
<b>Nationally Ranked by <i>U.S. News &amp; World Report</i></b>	1.0%*	6.0%	0.17

Note: Statistical significances were calculated comparing group means between designated and non-designated hospitals using PROC TTEST in SAS (Satterthwaite method). This table presents unweighted hospital-level means.

\* Difference between designated and non-designated hospitals is statistically significant at  $p < .05$ .

\*\* Difference between designated and non-designated hospitals is statistically significant at  $p < .01$ .

Source: Authors' calculations using 2011 claims data from nonelderly privately insured autoworkers and dependents

**Table 2**  
**Simulated Effects of Reference Pricing for Shoppable Inpatient Hospital Stays**

	Simulated Effect (% Difference Between Simulated Outcome Under Reference Pricing and Actual Outcome)
<b>Spending by the Health Plan on Inpatient Hospital Care</b>	-2.4%
<b>Distance from Patient's Home to Hospital</b>	0.2%
<b>Hospital Quality Scores</b>	
Readmission Rate for Inpatient Knee Replacements	-0.1%
Death Rate Following Inpatient Knee Replacements	-0.8%
Rate of Serious Complications	-1.1%
Death Rate Following Serious Complications	-0.8%

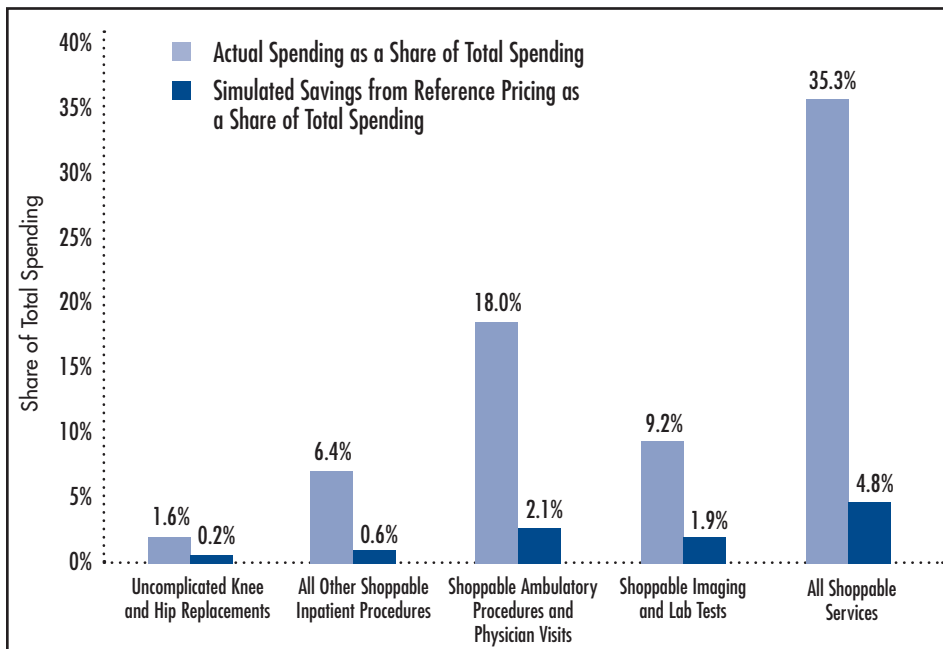
Source: Authors' calculations using 2011 claims data from nonelderly privately insured autoworkers and dependents

than an hour to a designated hospital in Indianapolis.

The simulated effects of applying reference pricing to all shoppable inpatient stays are fairly modest (see Table 2). Although it was assumed that 30 percent of patients who went to non-designated

hospitals would switch to designated hospitals, there was almost no change (plus 0.2%) in the average distance from the patient's home to the hospital. Total simulated spending by the plan on inpatient care was 2.4 percent lower, and, in the simulation, patients were treated at hospi-

**Figure 2**  
**Simulation of Reference Pricing on Spending**



Source: Authors' calculations using 2011 claims data from nonelderly privately insured autoworkers and dependents

tals with slightly better quality metrics on average, as measured by readmission rates and rates of serious complications and death. The potential additional financial liability faced by patients was equal to 4.4 percent of actual total spending on inpatient hospital care. Based on the CalPERS experience, however, hospitals tend to forgo collection from patients of amounts exceeding the reference price.

### Potential Savings Concentrated in Ambulatory Services

Imaging and laboratory tests accounted for 13.9 percent of total spending in the autoworker claims, but most of that spending is for shoppable services, and the prices for shoppable services vary widely. As a result, the simulated savings to the plan from applying reference pricing to imaging and laboratory tests equals 1.9 percent of total spending, roughly three times as large as the potential savings from applying reference pricing to all shoppable inpatient hospital stays (see

Figure 2). Steering enrollees to lower-price providers was not included in the simulation of ambulatory services, therefore, the potential savings to the plan are equal to the potential additional liability faced by patients receiving services with prices above the reference price.

Outpatient hospital services and physician office visits accounted for almost one-third of total spending, and most of that spending was on shoppable services. The pool of spending on shoppable services is much larger for outpatient and office-based services than for imaging and laboratory tests (18.0% of total spending vs. 9.2%). However, the potential savings from applying reference pricing to outpatient and office-based services (2.1% of total spending) is similar to that of imaging and laboratory services (1.9%). Although prices for outpatient and office-based services vary widely, they do not vary as widely as for imaging and laboratory tests, which limits the potential savings from reference pricing.<sup>13</sup>

## Implications

The CalPERS reference pricing experience tells two different but equally true stories—a dramatic percentage decline in prices and spending on knee and hip replacements and an extremely small percentage decline in total spending. To significantly impact spending among the privately insured, reference pricing would have to be applied quite broadly. And, even using a very inclusive list of shoppable services, the potential savings are relatively modest. Alternatively, purchasers might want to consider a targeted reference pricing program aimed at especially egregious provider pricing practices. Based on this study's findings, ambulatory services generally and imaging and lab tests in particular are potential candidates for a more-targeted reference pricing program.

Both conventional network-based plans—preferred provider organizations and health maintenance organizations—and reference pricing suffer some of the same limitations. Both types of plans rely on patient cost-sharing differentials to steer patients to certain providers, but the higher cost sharing cannot reasonably be applied in emergencies when patients can't choose their provider. Also, both types of plans are vulnerable to the demands of dominant “must-have” providers, either to be in network or to be both in network and designated.<sup>14</sup>

Compared to a limited-network plan, reference pricing faces at least three additional logistical hurdles. First, the health plan must have reliable price data for specific providers for specific services so that it can set the reference price and designate providers. Even very large plans will lack the historical data to accurately measure the prices they typically pay to smaller hospitals. Second, the plan would ideally have provider-specific quality metrics on hand that can be used to assure patients that they are not being steered to

low-quality providers. Although hospital quality metrics and rankings abound, the methodologies behind those rankings are still under development. Third, reference pricing requires new customer-service tools to support shopping by patients and to deal with inevitable member complaints. These efforts might include traditional mailings, a call center and online support. Implementation would require commitment of significant resources by the plan, potentially offsetting some or all of the savings from reductions in payments to high-price providers.

Reference pricing has some advantages and disadvantages compared to a conventional network-based plan. The main advantage of reference pricing is that it can steer patients to more-efficient providers but without the disruption of outright excluding some providers from the plan's network. The main disadvantage of reference pricing is that it adds a new layer of complexity for plan administrators and enrollees. Rather than facilities simply either being in or out of the network, there are now three types of facilities: in-network designated, in-network non-designated and out of network. Even more confusingly, a single facility might be designated for one type of service—for example, an inpatient hospital providing a knee replacement—but not designated for another—that same hospital providing a colonoscopy in an outpatient department. Additional complexity raises significant concerns, given that the basic elements of conventional benefit design are already beyond the grasp of many consumers.<sup>15</sup>

One question is whether a reference pricing program can steer patients to lower-price, adequate-quality providers. The answer, based on the CalPERS experience, appears to be yes. But, that may not be the right question. A better question may be why private health plans would ever pay negotiated prices over \$30,000

for inpatient knee and hip replacements. The CalPERS reference pricing program seemingly took a hard line against hospitals charging unreasonably high prices—\$30,000 or more—for knee and hip replacements. But, is \$30,000 really a reasonable price for an inpatient knee or hip replacement? To put that amount in perspective, the Medicare program on average paid \$14,324 for inpatient knee and hip replacements in 2011.<sup>16</sup>

Reference pricing can be helpful in exposing and drawing scrutiny to high and widely varying negotiated prices that private health plans pay. However, reference pricing lays the responsibility for dealing with those prices on patients. Along with leaving patients potentially liable for significant cost sharing if they receive services from non-designated providers, reference pricing adds another layer to already complex benefit designs. From a plan management perspective, the analytical and financial resources needed to establish a reference pricing system might be better invested in other activities, such as narrowing the plan's physician network or renegotiating outlier facility contracts. Reference pricing may be a useful step on the path to more reasonable pricing, but it is by no means the final destination. ■

## Notes

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3. Robinson, James C., and Kimberly MacPherson, "Payers Test Reference Pricing and Centers of Excellence to Steer Patients to Low-Price and High-Quality Providers," *Health Affairs* Vol. 31, No. 9 (September 2012); Robinson, James C., and Timothy T. Brown, "Increases in Consumer Cost Sharing Redirect Patient Volumes and Reduce Hospital Prices for Orthopedic Surgery," *Health Affairs* Vol. 32, No. 8 (August 2013); Robinson, James C. "Reference Pricing: Stimulating Cost-Conscious Purchasing and Countering Provider Market Power," National Institute for Health Care Management Foundation (October 2013); Lechner, Amanda E., Rebecca Gourevitch and Paul B. Ginsburg, *The Potential of Reference Pricing to Generate Health Care Savings: Lessons from a California Pioneer*, Research Brief No. 30, Center for Studying Health System Change, Washington, D.C. (December 2013); and Fronstin, Paul, and M. Christopher Roebuck, *Reference Pricing for Health Care Services: A New Twist on the Defined Contribution Concept in Employment-Based Health Benefits* Issue Brief No. 398, Employee Benefit Research Institute, Washington, D.C. (April 2014).

4. Terhune, Chad, "Hospitals Cut Some Surgery Prices After CalPERS Caps Reimbursements," *The Los Angeles Times* (June 23, 2013).
5. Lechner, Gourevitch and Ginsburg (2013).
6. Robinson and Brown (2013).
7. Among the top-10 spending DRGs, the eight identified as shoppable are major joint replacement or reattachment of lower extremity without major comorbid conditions or complications (w/o MCC) (MS-DRG 470), Spinal fusion except cervical w/o MCC (MS-DRG 460), Rehabilitation with CC/MCC (MS-DRG 945), Cardiac valve and other major cardiothoracic procedures with cardiac catheterization with MCC (MS-DRG 216), Coronary bypass with cardiac catheterization with MCC (MS-DRG 233), Vaginal delivery without complicating diagnoses (MS-DRG 775), Major small and large bowel procedures with CC (MS-DRG 330), and Uterine and adnexa procedures for non-malignancy w/o CC/MCC (MS-DRG 743). The two identified as nonshoppable are: MS-DRG 003 and MS-DRG 885. Any procedure occurring within 72 hours of an emergency department visit was considered unshoppable.
8. Examples of unshoppable ambulatory services included "Other" CPTs (22551, 36478, 36561, 93458 and 93351, 93459, 96365), emergency department visits and cesarean deliveries.
9. Cowling, David, *CalPERS Reference Pricing Program for Hip or Knee Replacement*, presentation before the National Governors Association Convening on State Employee and Retiree Health Care, Washington, D.C. (June 25, 2013).
10. Li, Chia-hsuan, Sze-jung Wu, Michael J. Belman and Andrea DeVries, *Effects of a Reference-Based Purchasing Design on Healthcare Utilization and Outcomes of Knee and Hip Replacement Surgeries*, presentation before the AcademyHealth Annual Research Meeting, Baltimore, Md. (2013); and Robinson and Brown (2013).
11. The concept of reference pricing has been applied to prescription drugs, which account for 21 percent of total spending in the autoworker claims data. But, the issues that arise in setting reference prices are substantially different for prescription drugs than for inpatient and ambulatory services. For examples of reference pricing as applied to pharmaceuticals, see Hoadley, Jack, *Adapting Tools from Other Nations to Slow U.S. Prescription Drug Spending*, Policy Analysis No. 10, National Institute for Health Care Reform, Washington, D.C. (August 2012); and Ruggeri, Kai and Ellen Nolte, *Pharmaceutical Pricing: The Use of External Reference Pricing*, Research Report, RAND Corp., Santa Monica, Calif. (2013).
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15. Loewenstein, George, et al., "Consumers' Misunderstanding of Health Insurance," *Journal of Health Economics*, Vol. 32, No. 5 (September 2013).
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## REFERENCE PRICING: A SMALL PIECE OF THE HEALTH CARE PRICE AND QUALITY PUZZLE

### TECHNICAL APPENDIX

#### Shoppable Services

The 100 inpatient service diagnosis-related groups (DRGs) that comprised the highest spending in 2011 were included for consideration as shoppable inpatient services. Inpatient stays were assigned DRGs based on the Medicare Severity DRG (MS-DRG) grouper, version 27. Each DRG was determined by a clinician to be either generally shoppable or unshoppable. Seventy-three DRG codes were selected as shoppable.<sup>1</sup> The top 300 ambulatory service Healthcare Common Procedure Coding System (HCPCS) and Current Procedural Terminology (CPT) codes were considered in the identification of shoppable ambulatory services. Among the top 300 services identified, 276 were determined to be shoppable.<sup>2</sup> Individual inpatient stays and ambulatory services, even if they were a shoppable type of service, were considered to be unshoppable if they occurred within three days of an emergency department visit.

#### Measuring Quality

The quality measures used to designate hospitals for shoppable inpatient stays were obtained from the Agency for Healthcare Research and Quality and the Outcome of Care Measures data available in the Centers for Medicare and Medicaid Services (CMS) Hospital Compare downloadable databases. For knee and hip replacements, the two quality measures were the rate of readmission following knee or hip replacement and the rate of complications and deaths following knee or hip replacement. For all shoppable stays, the two quality measures were the rate of serious complications—“how often adult patients had certain serious, but potentially preventable, complications related to medical or surgical inpatient hospital

care”<sup>3</sup>—and the death rate among surgical inpatients with serious treatable complications.<sup>4</sup> These quality metrics are measured at the hospital level and were not specific to the individual hospital stays provided to the autoworkers. CMS designates roughly 5 percent of hospitals as performing significantly worse than the U.S. national rate on each measure.

#### Volume Minimum

Hospitals had to provide a minimum of three shoppable inpatient stays (either just knee and hip replacements or all types) to enrollees in the autoworker plan in 2011. The three-stay cutoff was chosen to ensure that the facility provides at least a minimum volume of services and that the price measure has some, albeit limited, reliability.

#### Measuring Prices

The data for this analysis were provided as claims-level records with an allowed amount provided for each claim. The allowed amount is the total amount paid to the provider, including payments from the insurer and the enrollee. For each of the various types of care examined, aggregation of individual claims was required to obtain the total allowed amount for the entire service. For inpatient care, claims were aggregated by person, facility, date of service and DRG code to obtain the total allowed amount for the stay. For ambulatory services, individual claims, which might account for one item such as a procedure or a physician visit, were first aggregated by person, service date and procedure code to produce the total price paid for the entire ambulatory service. Professional and facility claims may contribute to the allowed amount for a single ambulatory service,

such as when both are both submitted on the same day for the same imaging procedure. Where possible, missing procedure codes were imputed based on other claims that were filed with the same person, service date and service category, which is a broader categorization than a procedure code. The missing code was assigned to the procedure that contributed the most to the service category allowed amount.

Because inpatient service reference pricing was centered on the designation of hospitals, the analysis required the determination of hospital-level prices. For knee and hip procedures, all stays filed with a DRG code of 470 were aggregated for each individual hospital. Stays with service dates within three days of an emergency department visit by the same person were excluded and subsequently treated as unshoppable. For each facility, the allowed amounts for applicable stays were summed and then divided by the sum of all corresponding DRG weights. DRG weight values have been developed by CMS to account for the cost differences of services related to the complexity and resources required for a service. When looking only at DRG 470 for knees and hips, all claims were assigned the same weight value. This hospital-level ratio of allowed amounts to DRG weight was used to represent the hospital-level price of knee and hip procedures.

For all shoppable services, stays filed with a DRG code identified as shoppable were aggregated by hospital, excluding claims within three days of an emergency department visit. The price for all shoppable stays was adjusted for the severity of patient conditions—case mix—and was set equal to the total allowed amount for shoppable stays divided by total DRG

relative weights for those stays.<sup>5</sup> The relative weights, created by CMS, account for differences in complexity and expected resources by service. The DRG weights were important in eliminating differences in hospital-level prices resulting from differences in the types of services provided by the hospitals. This resulted in hospital-level prices for a comparable level of service complexity. All hospitals within the selected markets with at least three applicable stays and available quality metrics were included in the calculation of the 65th percentile of hospital-level prices.

The simulated reference pricing for ambulatory services was applied on a service-by-service basis. Prices for all visits for the same service, regardless of facility or provider, were included in the calculation of the 65th percentile, again excluding those that occurred within three days of an emergency department visit.

## Simulation

In the simulation of reference pricing applied to inpatient care, the amount paid for applicable services was set to be no higher than the determined reference price. Additionally, it was assumed that 30 percent of patients using a non-designated hospital for the service of interest would be steered instead to a designated hospital. Hypothetical prices changed among patients with the service of interest in the following situations: (1) those who switched from a non-designated to a designated hospital and (2) those who remained at the non-designated hospital. Patients who switched were assigned the mean price of the service among designated hospitals. For patients who remained at non-designated hospitals, the reference price limit was assigned as the cost to the insurer, and a balance bill to cover the remainder of the cost was assigned to the enrollee. Patients who already opted for a designated hospital and patients who did not have a shoppable service maintained the same allowed

amount under the simulation.

The additional simulation outcomes included the quality measures obtained from CMS Hospital Compare and hospital characteristics from hospital cost reports and the American Hospital Association survey.<sup>6</sup> The 30 percent of patients who, under the simulation, switched from non-designated to designated hospitals experienced changes in these measures. For those who switched, the actual value for each outcome was replaced by hypothetical values. The hypothetical values were set equal to the mean of the outcome among patients who lived in the same geographic area but treated at a designated hospital. To define geographic areas, zip codes were used if there were sufficient stays at designated hospitals, and, if not, metropolitan statistical areas were used instead. Characteristics for all other patients remained the same.

In the simulation of reference pricing for ambulatory services, the only outcome that was estimated was the change in spending by the health plan. For any shoppable service with a price above the reference price, the plan spending was reduced by the difference between the actual price and the reference price. Because steering of patients toward lower-price providers was not included, the remaining amounts would be transferred as a liability to the patient. Allowed amounts paid for shoppable services that were lower than the reference price and amounts paid for unshoppable services remained the same.

## Notes

1. The 73 shoppable DRGs are: 005, 009, 023, 025, 026, 027, 039, 101, 163, 164, 165, 166, 190, 191, 216, 217, 219, 227, 228, 229, 233, 234, 237, 238, 246, 247, 249, 251, 253, 254, 286, 287, 310, 314, 326, 327, 328, 329, 330, 331, 392, 405, 406, 454, 455, 457, 460, 462, 466, 467, 468, 469, 470, 472, 473, 484, 490, 491, 493, 494, 620, 621, 627, 641, 708, 742, 743, 765, 766, 775, 795, 847 and 945.
2. The shoppable ambulatory HCPCS codes are: 00142, 00170, 00300, 00320, 00400, 00670, 00740, 00790, 00810, 00840, 00952, 01400, 01402, 01480, 01630, 01810, 01967, 11042, 11100, 17000, 17110,

19103, 19120, 19125, 19318, 20610, 20680, 22612, 23412, 26055, 27130, 27447, 28296, 29824, 29826, 29827, 29877, 29880, 29881, 29888, 30520, 33240, 33249, 36415, 42820, 43235, 43239, 45378, 45380, 45384, 45385, 47562, 47563, 49505, 49585, 49650, 50590, 52000, 52332, 52353, 55866, 57288, 58558, 58563, 58661, 58662, 59400, 62310, 62311, 63030, 63047, 63685, 64483, 64622, 64721, 66984, 69436, 70450, 70486, 70491, 70544, 70551, 70553, 71020, 71250, 71260, 72110, 72141, 72146, 72148, 72156, 72158, 73221, 73562, 73630, 73721, 74160, 74170, 74176, 74177, 74178, 74183, 76536, 76645, 76700, 76705, 76770, 76830, 76856, 76942, 77052, 77057, 77059, 77080, 77290, 77295, 77300, 77301, 77334, 77336, 77413, 77414, 77421, 77427, 78223, 78306, 78452, 78815, 80048, 80050, 80053, 80061, 80101, 82306, 83036, 84153, 84439, 84443, 85025, 88175, 88304, 88305, 88307, 88342, 90471, 90658, 90670, 90716, 90801, 90805, 90806, 90807, 90847, 90853, 90862, 90935, 90999, 92004, 92012, 92014, 92083, 92250, 92980, 93000, 93005, 93015, 93017, 93306, 93320, 93325, 93350, 93620, 93651, 93798, 93880, 93970, 93971, 94060, 95004, 95117, 95165, 95810, 95811, 95861, 95900, 95903, 95904, 97001, 97014, 97035, 97110, 97112, 97140, 97530, 98941, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99222, 99223, 99231, 99232, 99233, 99238, 99243, 99244, 99245, 99385, 99386, 99391, 99392, 99393, 99394, 99395, 99396, A0428, A4253, A7034, A9500, A9502, A9552, C1300, C1874, D0120, D1110, D2140, D2150, D2750, D2790, D3330, D4910, D8080, E0784, E1390, G0105, G0121, G0151, G0154, G0202, G0204, G0206, G0290, J0129, J0585, J0878, J1559, J1561, J1569, J1745, J2323, J2353, J2357, J2469, J2505, J3487, J3490, J7325, J9033, J9035, J9041, J9055, J9171, J9201, J9263, J9305, J9310, J9355, Q4081, Q9967, S3820, and S9083. The unshoppable ambulatory services included "Other" CPTs (22551, 36478, 36561, 93458, and 93351, 93459, 96365), emergency department visits and cesarean deliveries.

3. Centers for Medicare and Medicaid Services, *Surgical Complications - AHRQ Patient Safety Indicators* (2014).
4. Agency for Healthcare Research and Quality, *Death Rate Among Surgical Inpatients with Serious Treatable Complications, Patient Safety Indicators #4, Technical Specifications Version 4.4* (March 2012).
5. The price for knee and hip replacements was not adjusted for case mix, because, by definition, all of those stays were in the same DRG and had the same DRG relative weight.
6. For a description of data sources, see White, Chapin, James D. Reschovsky and Amelia M. Bond, "Understanding Differences Between High- and Low-Price Hospitals: Implications for Efforts to Rein in Costs," *Health Affairs*, Vol. 33, No. 2 (February 2014).

## REFERENCE PRICING: A SMALL PIECE OF THE HEALTH CARE PRICE AND QUALITY PUZZLE

### SUPPLEMENTARY TABLE

#### Supplementary Table 1

#### Availability of Designated Hospitals Under a Reference Pricing Simulation, by Market

	Enrollees (Thousands)	Number of Hospitals	Number of Designated Hospitals	Number of Shoppable Stays	Share of Shoppable Stays at Designated Hospitals
Akron, Ohio	3.9	8	3	71	69%
Ann Arbor, Mich.	16.1	5	0	1,006	0%
Cleveland	18.0	27	12	531	63%
Dayton, Ohio	7.7	9	3	130	57%
Detroit	111.2	20	4	2,025	33%
Flint, Mich.	37.0	3	1	679	37%
Grand Rapids, Mich.	7.4	9	1	86	48%
Indianapolis	11.7	24	4	368	19%
Kansas City	24.8	35	8	557	70%
Kokomo, Ind.	12.7	4	0	114	0%
Lansing, Mich.	14.6	6	1	336	44%
Louisville, Ky.	20.6	24	4	384	42%
Monroe, Mich.	14.4	1	1	134	100%
Rockford, Ill.	6.7	3	2	98	72%
Saginaw, Mich.	9.3	4	2	153	98%
St. Louis	13.7	15	10	229	69%
Toledo, Ohio	15.5	13	4	471	66%
Warren, Mich.	167.1	27	10	2,783	49%
Youngstown, Ohio	15.6	7	4	173	53%
All	528.3	244	74	10,328	43%

Source: Authors' calculations using 2011 claims data from nonelderly privately insured autoworkers and dependents