



HHS Public Access

Author manuscript

Health Aff (Millwood). Author manuscript; available in PMC 2024 January 31.

Published in final edited form as:

Health Aff (Millwood). 2017 March 01; 36(3): 524–530. doi:10.1377/hlthaff.2016.1256.

Reference Pricing Changes The ‘Choice Architecture’ Of Health Care For Consumers

James C. Robinson [Leonard D. Schaeffer Professor of Health Economics],

School of Public, Health, at the University of California, Berkeley.

Timothy T. Brown [associate professor of health, economics],

School of Public Health, University of California, Berkeley.

Christopher Whaley [assistant professor of health, economics]

School of Public Health, University of California, Berkeley.

Abstract

Reference pricing in health insurance creates incentives for patients to select for nonemergency services providers that charge relatively low prices and still offer high quality of care. It changes the “choice architecture” by offering standard coverage if the patient chooses cost-effective providers but requires considerable consumer cost sharing if more expensive alternatives are selected. The short-term impact of reference pricing has been to shift patient volumes from hospital-based to freestanding surgical, diagnostic, imaging, and laboratory facilities. This article summarizes reference pricing’s impacts to date on patient choice, provider prices, surgical complications, and employer spending and estimates its potential impacts if expanded to more services and a broader population. Reference pricing induces consumers to select lower-price alternatives for all of the forms of care studied, leading to significant reductions in prices paid and spending incurred by insurers and employers. The impact on consumer cost sharing is mixed, with some studies finding higher copayments and some lower. We conclude with a discussion of the incentives created for providers to redesign their clinical processes and for efficient providers to expand into price-sensitive markets. Over time, reference pricing may increase pressures for price competition and lead to further cost-reducing innovations in health care products and processes.

Innovation in health care processes often flows from changes in the site where care is delivered, especially from reduced use of high-acuity institutional settings in favor of low-acuity alternatives. Significant cost reductions have accompanied the movement of care from inpatient to outpatient hospital departments, from hospital-based to freestanding surgery centers, from freestanding centers to the physician office, and from the physician office to the patient’s home.^{1,2}

Reference pricing is a new component of health insurance design that motivates the patient to select low-price and low-acuity care settings. The implementation of reference pricing has been associated with changes in market shares favoring facilities that charge low prices, with consequent reductions in expenditures for payers. If expanded to a broader population,

reference pricing could stimulate competition, market entry, and cost-reducing innovation in products and processes.

Reference pricing represents a basic change in the structure of incentives—sometimes referred to as the “choice architecture”—that confronts patients who are deciding where to obtain care.^{3,4} Deductibles require patients to pay the first part of the costs they incur, with insurance paying the remainder. In contrast, reference pricing offers generous insurance coverage if the patient selects a low-price facility, laboratory, or drug but requires a higher patient payment if a more expensive alternative is chosen. Reference pricing embodies a “defined contribution” approach to consumer cost sharing, with the employer or insurer guaranteeing the patient access to care while the patient assumes financial responsibility for his or her choice between high- and low-price alternatives.

We analyzed the experience to date with reference pricing in the United States, by examining previous studies published by the authors since reference pricing began. In this article we summarize the impacts on patient choice, provider prices, surgical complications, consumer cost sharing, and employer spending, and we estimate the potential impact if reference pricing were expanded to more services and a broader population. The article concludes with a discussion of the incentives created for providers to redesign their clinical processes and for efficient providers to expand into increasingly price-sensitive markets.

Reference Pricing In Insurance Design

A salient feature of the contemporary healthcare market is the wide variability in prices charged for similar tests and treatments. Studies have reported tenfold price differences for services ranging from inpatient hospitalization to ambulatory surgery, physician visits, preventive screenings, advanced imaging, and common laboratory tests.⁵ The combination of low consumer price-sensitivity (resulting from generous insurance coverage) and high provider pricing power (resulting from market consolidation) has weakened the pricing leverage of managed care plans. These plans thus negotiate contracts at very different price points within, as well as across, local markets.

Under reference pricing, the employer or insurer establishes its maximum contribution toward payment for a service, product, or episode of care, typically selecting some midpoint in the distribution of prices in each local market.⁶ Employees retain the ability to select their own physician and facility and, if they use one charging less than the reference payment limit, receive full coverage after satisfying their customary copayment provisions. If they select a facility charging above the reference level, however, they pay the difference between that level and the price charged. Reference pricing has been applied to procedures (for example, joint replacement and colonoscopy) and to components of care (such as laboratory and imaging tests). It derives from initiatives in Europe, where some public payers limit reimbursement for each drug to the lowest price charged for any drug within its therapeutic class.⁷

The most immediate impact of reference pricing is to increase the percentage of patients who select providers charging prices below the reference level. These changes in market

share reduce the average price paid for each service, even if no facility discounts its rates in response. Some facilities may decide to reduce their prices to expand or retain their volumes in light of the newly price-sensitive consumer demand, which in turn instigates competitors to offer retaliatory discounts. Price competition and discounting may then lead employers and insurers to establish a new, lower contribution level while still guaranteeing patients access to a wide range of facilities, in a process known as “endogenous” reference pricing.⁸

The combination of market shifts and price discounts leads to reduced spending by the employer or insurer. The amounts paid by patients increase for those who continue to receive care from providers that charge above the reference level. Cost sharing decreases, however, for patients who shift to low-price providers. Patients who need to use a specific high-price provider, because of special clinical considerations or because they reside in a remote geographic area, are exempted from extra cost sharing. Shifts in the site of care may affect the quality of care obtained by the patient if low-price facilities differ from high-price alternatives in their processes and outcomes.

Impacts On Choice, Spending, And Outcomes

In summarizing published empirical findings^{9–14} on the tests and treatments that have been subjected to reference pricing (Exhibit 1), we found increases in the percentages of patients selecting facilities that charged below the reference price by the end of the second year after reference pricing was implemented. The increases ranged from 8.6 percentage points for cataract removal surgery¹³ to 18.6 percentage points for laboratory tests.¹¹ There were also reductions in the average prices paid in the two years after implementation. The results captured the effects of price discounts, if any, but mostly reflected patients’ switching from high- to low-price facilities. Average price reductions clustered between 17 percent and 21 percent, with a low of 10.5 percent for magnetic resonance imaging (MRI) and a high of 32.0 percent for laboratory tests.^{9–14}

Several studies have examined the impact of reference pricing on one measure of care quality—the rate of surgical complications—as patients move from high-cost hospital-based to low-cost ambulatory sites of care.^{12,14} None of the published studies found a change in the rate of complications. This is not surprising, since the ambulatory surgery centers were accredited facilities and already within the relevant insurer’s contractual network.

Several of the studies also examined the impact of reference pricing on consumer out-of-pocket spending. The impact of reference pricing on cost sharing varied, even though expenditures by employers and insurers declined in all instances. For cataract removal¹³ and diagnostic colonoscopy,¹⁴ reference pricing was associated with increases in consumer cost sharing, while for joint replacement,⁹ advanced imaging,¹⁰ and laboratory tests¹¹ it was associated with decreases. Cost sharing declines if reference pricing motivates patients to move to lower-acuity settings, where they are subject to lower deductibles and copays.

Potential Savings If Reference Pricing Were Expanded

We estimated the potential reductions in spending that would be obtained if reference pricing were expanded to the entire commercially insured US population for the limited

set of procedures that already have been subject to reference pricing by some employers. We calculated the fraction of total spending devoted to each procedure by analyzing claims data provided by the Health Care Cost Institute,¹⁵ which aggregates claims for fifty million enrollees in Aetna, Humana, and UnitedHealthcare. Total spending for the procedures to which reference pricing has been applied by at least one US employer totaled \$100.62 billion in 2013 (Exhibit 1).

We estimated the potential savings from extending reference pricing by multiplying the price reductions by the spending figures. Potential savings ranged from a low of \$340 million for cataract removal surgery to a high of \$7.59 billion for laboratory tests, with a total across all included procedures of \$19.59 billion (Exhibit 1).

Conditions For Successful Implementation

To date, reference pricing has been applied to a variety of tests and treatments as employers learn about its advantages and limitations. It can be effective and appropriate in some contexts, but ineffective and inappropriate in others. It is most likely to be successful when applied to procedures that permit informed comparisons, in settings where consumer choice is supported, and in policy contexts that are not averse to consumer financial responsibility.

SHOPPABLE SERVICES

Services subject to reference pricing should be “shoppable.” The tests and treatments to which reference pricing can successfully be applied are those for which the consumer has the time and ability to compare providers on price and performance. Emergency services are not shoppable, nor are individual components of an ongoing course of care, such as laboratory tests ordered as part of a complex diagnostic effort.

MEASURABLE QUALITY

Quality should be measurable. Reference pricing has been applied to services whose quality is relatively standardized (such as diagnostic imaging) or can be relatively easily compared (such as joint replacement). It is not reasonable to expect patients to select providers based on price when quality is variable and unmeasured. In addition, patients cannot shop successfully for complex treatments whose outcomes are heavily dependent on disease severity.

AVAILABLE INFORMATION

Information should be available. Reference pricing initiatives need to point the consumer toward low-price products and providers. This communication strategy can be as informal as a list of low-price and high-quality hospitals, such as the one provided by the California Public Employees’ Retirement System (CalPERS), or as formal as the online price transparency tool provided by Safeway to its employees.¹⁶ Some patients will be content to know where they can find low cost sharing without needing to know the specific prices charged by competing facilities. Other patients will want to compare prices across the full range of providers, an approach being implemented by initiatives that publish measures of price and quality online and through mobile applications.

'CONTESTABLE' MARKETS

Markets should be “contestable.” To effectively stimulate efficiency and innovation by providers, reference pricing is best applied in markets with excess capacity, or where the entry of new competitors from other markets is not excessively difficult. In economic language, markets are “contestable” if they have low barriers to competitive entry.¹⁷ Reference pricing will be most effective in markets with actual or potential competition between high- and low-acuity providers. Consumer demand for low-price services could stimulate competitive entry by national chains of retail clinics, ambulatory surgery and imaging centers, and clinical laboratories. Even markets for infrequent and costly procedures become more contestable when employers offer travel subsidies for patients to use high-volume regional centers.

EXEMPTION FOR SPECIAL NEEDS

Patients with special needs should be exempted. As noted above, some patients need to use a high-price facility because they have special clinical considerations or live in a remote geographic area. Reference pricing programs have incorporated generous exceptions policies, and it will be important for them to continue doing so to avoid patient backlash.

ACCOMMODATING REGULATORS

Regulators should be accommodating. As one example, under reference pricing, consumers' payments above the employer's contribution limit do not count toward the deductible or annual out-of-pocket maximum. They are treated as exclusions, analogous to payments for noncovered benefits or to out-of-network providers, rather than as copayments for use of covered benefits. Though controversial, this interpretation of consumer payments under reference pricing has been approved by the Department of Health and Human Services.^{18,19}

How Broadly Could Reference Pricing Be Applied?

Reference pricing could be extended from joint replacement to spine fusion, from colonoscopy to sigmoidoscopy, and from computerized tomography (CT) scans to ultrasound. However, it is not clear how broadly the design could be implemented across the entire range of tests and treatments.

Chapin White and Megan Eguchi sought to quantify the level of spending for services where reference pricing could be applied.²⁰ Their estimates included nonemergency procedures that are scheduled in advance, that take place in markets with multiple providers, and for which some quality metrics are available to patients. Included in their definition were seventy-three high-volume inpatient services (based on Medicare diagnosis-related group [DRG] codes) and 90 percent of the most common ambulatory procedures (based on Healthcare Common Procedure Coding System [HCPCS] and Current Procedural Terminology [CPT] codes). Using claims data on 530,000 individuals covered by the self-insured benefits plan of the automobile workers' union, White and Eguchi estimated that these shoppable services and procedures accounted for one-third of total spending for the nonelderly commercially insured population.

To estimate the potential impact that reference pricing would have if it were used broadly, we used White and Eguchi's definition of shoppable services and applied it to claims data from the Health Care Cost Institute database. We calculated the percentage reductions in spending for inpatient, ambulatory, imaging, and laboratory services, respectively. Details are in the online Appendix.²¹ Using these data and measures of impact, we estimated that reference pricing could reduce spending for the commercially insured population by approximately 8 percent.

That figure could overestimate the potential impact of reference pricing, since White and Eguchi's definition of shoppable services likely included treatments for which patients lacked the ability to compare price and performance. However, the figure also could underestimate the potential impact of reference pricing. White and Eguchi excluded prescription drugs from their definition, despite the fact that reference pricing was pioneered in Europe specifically for pharmaceutical products. Some employers in the United States are already using reference pricing for nonspecialty drugs, and the Centers for Medicare and Medicaid Services has proposed applying the approach to specialty drugs.²²

More important, providers facing newly price-conscious consumers might reduce their charges to retain volume, introducing price competition into health care markets. After the implementation of reference pricing for joint replacement, for example, the CalPERS self-insured benefits program was approached by hospitals that wanted to lower their prices. CalPERS reopened negotiations on a selective basis and negotiated price discounts (Robert Honaker, Anthem Blue Cross of California, personal communication, September 1, 2016). The number of hospitals designated by CalPERS as high-value (that is, hospitals that charge prices below its reference level while maintaining quality) increased from forty-three in the year of reference pricing implementation to fifty-three four years later. A reduction in the average level of prices could lead employers to lower reference levels or even change how such levels are set. The reference price limits in some European countries are periodically reset based on the most recent distribution of prices.²³ The institutionalization of this process in the United States would allow low-acuity providers to strategically lower their prices to induce continued shifts in market share over time.⁸

Choice Incentives And Clinical Innovation

Process innovation requires health care organizations to structure themselves around major conditions and procedures instead of seeking to offer all services to all patients.²⁴ Specialization can lead to efficiencies through learning and focus, igniting a virtuous cycle of higher patient volumes, lower unit costs, improved performance, and further volume gains. A focused organizational structure can sustain the team-based cycle of experimentation, review, and revision that cumulatively leads to major performance improvements.²⁵

The efficiencies of specialization can be achieved by large hospital-based organizations if they are restructured as service lines with their own leadership, license to innovate, and accountability. Many hospital systems now feature cardiac, stroke, and primary care units that strive to compete with stand-alone centers and those owned by other hospitals.

Reference pricing can serve as the first step in this process. Consumer price-sensitivity can drive provider price competition, which in turn can intensify the pressure on providers to improve efficiency. Recent research has found consumers' responsiveness to medical care prices to be an order of magnitude greater than previously estimated.²⁶

Bundled episode-of-care payment is the natural form of reimbursement for many major acute care services. A single bill that covers all of the contributors to the patient's care creates a culture of joint destiny quite different from the disjointed accountability fostered by fee-for-service payment.²⁷ Under bundled payment, every participant in a patient's care shares in the savings if care is shifted to lower-cost settings and clinical processes are redesigned to reduce duplication, complexity, and waste. By extension, bundled payment exposes participants to shared losses if they fail to use efficient sites and processes of care.

If bundled payment is the natural payment method for condition-specific episodes of care, reference pricing is the natural benefit design for consumers choosing among providers of those service lines. Without some version of reference pricing, reduced prices will not be rewarded by a gain in patient volume, and providers will tend to compete on nonprice dimensions. Reference pricing for consumers also supports efforts by accountable care organizations (ACOs) to use low-price facilities for services they are not able to deliver directly. Many ACO contracts create financial incentives for primary care physicians to refer patients to specialists and facilities that charge low prices, but the contracts do not create commensurate incentives for patients to comply. ACO case studies have identified the importance of this "referral management" as well as care management.²⁸

Encouraging Competition In Consolidated Markets

Large, hospital-centered delivery systems are acquiring primary care, ambulatory surgery, advanced imaging, chemotherapy infusion, laboratory testing, and other once-independent facilities. These acquisitions reduce competition and raise entry barriers in local markets. The short-term impact of this consolidation can be measured through changes in prices.²⁹ The long-term impacts may result from creating obstacles to market entry and innovation.

To the extent that reference pricing leads consumers to prefer freestanding and low-acuity sites of care, it will reduce barriers to entry and increase the contestability of local health care markets.³⁰ New entrants may come from other geographic regions, upstream suppliers or downstream distributors, or other industries, or they may be entrepreneurs who see an opportunity and are willing to take the risks necessary to seize it.

The scope of reference pricing is not limited to locally provided services such as ambulatory surgery and imaging. When coupled with travel subsidies, it can motivate patients to use regional centers for complex treatments that benefit from economies of scale and specialization. The availability of price-sensitive travel medicine, whether the travel is to India or Indianapolis, expands geographic market scope and there by intensifies competition. Many employers already promote the use of centers of excellence for organ transplantation, and some are extending these programs to more common procedures such as joint replacement, spine fusion, and interventional cardiology.¹⁶ Patients willing to use these

lower-price but geographically distant hospitals are rewarded by reductions in or elimination of cost sharing.

The Architecture Of Consumer Choice

Reference pricing is just one of several purchaser initiatives that seek to increase the economic engagement of employees and enrollees. Some of these initiatives diffuse rapidly after an initially slow start, as evidenced by high-deductible benefit designs, narrow provider networks, and price transparency platforms.^{31–34} Reference pricing complements these initiatives but also changes the structure of the incentives facing patients. It ensures patient access to cost-effective products and providers within each market, but it shifts full responsibility for the extra payment to the consumer if high-price alternatives are selected.

In this sense, reference pricing changes the health care “choice architecture” from one that imposes a financial responsibility on patients regardless of which provider is selected to one that minimizes access barriers to cost-effective options while increasing cost sharing if expensive providers are favored. Changes in the incentives facing patients will change the incentives facing providers. If they wish to retain their shares of increasingly price-sensitive markets, providers will need to redesign their processes in ways more radical than are being considered.

Reference pricing is not a panacea for the shortcomings in the health care system. It targets price rather than utilization, neither reducing demand for inappropriate services nor increasing adherence to appropriate alternatives. It can be applied to acute episodes of care but not to treatments for patients suffering from chronic conditions that require frequent interactions with nearby caregivers. It requires consumers to have access to information on price and quality and adds to the complexity of choice. It will flourish only if care is restructured and reimbursed around clinically meaningful conditions and episodes of care.

In spite of the limitations of reference pricing, its potential is worth recognizing. It is not easy to identify other purchaser strategies that reduce service-specific spending by double-digit percentages in the first two years after implementation. Moreover, reference pricing may have an even greater impact on changes in the way consumers view health care. Some employers have adopted reference pricing to foster a culture of patient engagement, shopping, and informed choice (Kent Bradley, Safeway Health, personal communication, February 24, 2015). Differences in price are easy for consumers to understand, relative to differences in quality and appropriateness. The employers hope that the experience of shopping for price will stimulate employees to take another step forward on the journey toward value-based health care.

Acknowledgments

The authors received funding support for this research from the California Public Employees’ Retirement System through a research contract (Agreement No. 2011–6342), the Agency for Healthcare Research and Quality (Grant No. RO1 HS022098), the Robert Wood Johnson Foundation (Grant No. 71870), and the Laura and John Arnold Foundation through a grant. The content is solely the responsibility of the authors and does not necessarily represent the official views of the funders.

NOTES

1. Chandy RK, Tellis GJ. The incumbent's curse? Incumbency, size and radical product innovation. *Journal of Marketing*. 2000;64(3):1–17.
2. Higgins A, Veselovskiy G, Schinkel J. National estimates of price variation by site of care. *Am J Manag Care*. 2016;22(3):e116–21. [PubMed: 26978238]
3. Thaler RH, Sunstein CR. *Nudge: improving decisions about health, wealth, and happiness*. New Haven (CT): Yale University Press; 2008.
4. Robertson CT, Yokum DV. Cost sharing as choice architecture. In: Cohen IG, Fernandez Lynch H, Robertson CT, editors. *Nudging health: health law and behavioral economics*. Baltimore (MD): Johns Hopkins University Press; 2016. p. 146–57.
5. Cooper Z, Craig SV, Gaynor M, Van Reenen V. The price ain't right? Hospital prices and health spending on the privately insured [Internet]. Cambridge(MA): National Bureau of Economic Research; 2015 Dec [cited 2017 Jan 17]. (NBER Working Paper No. 21815). Available for download (fee required) from: <http://www.nber.org/papers/w21815>
6. Fronstin P, Roebuck MC. Reference pricing for health care services: a new twist on the defined contribution concept in employment-based health benefits [Internet]. Washington (DC): Employee Benefit Research Institute; 2014 Apr [cited 2017 Jan 17]. (Issue Brief No. 298). Available from: https://www.ebri.org/publications/ib/index.cfm?fa=ibDisp&content_id=5378
7. Lee JL-Y, Fischer MA, Shrank WH, Polinski JM, Choudhry NK. A systematic review of reference pricing: implications for US prescription drug spending. *Am J Manag Care*. 2012;18(11):e429–37. [PubMed: 23198752]
8. Brown TT, Robinson JC. Reference pricing with endogenous or exogenous payment limits: impacts on insurer and consumer spending. *Health Econ*. 2016;25(6):740–9. [PubMed: 25903495]
9. Robinson JC, Brown TT. Increases in consumer cost-sharing redirect patient volumes and reduce hospital prices for orthopedic surgery. *Health Aff (Millwood)*. 2013;32(8):1392–7. [PubMed: 23918483]
10. Robinson JC, Whaley C, Brown TT. Reference pricing, consumer cost sharing, and insurer spending for advanced imaging tests. *Med Care*. 2016;54(12):1050–5. [PubMed: 27479594]
11. Robinson JC, Whaley C, Brown TT. Association of reference pricing for diagnostic laboratory testing with changes in patient choices, prices, and total spending for diagnostic tests. *JAMA Intern Med*. 2016; 176(9):1353–9. [PubMed: 27454826]
12. Robinson JC, Brown TT, Whaley C, Bozic KJ. Consumer choice between hospital-based and freestanding facilities for arthroscopy: impact on prices, spending, and surgical complications. *J Bone Joint Surg Am*. 2015;97(18):1473–81. [PubMed: 26378263]
13. Robinson JC, Brown T, Whaley C. Reference-based benefit design changes consumers' choices and employers' payments for ambulatory surgery. *Health Aff (Millwood)*. 2015;34(3):415–22. [PubMed: 25732491]
14. Robinson JC, Brown TT, Whaley C, Finlayson E. Association of reference payment for colonoscopy with consumer choices, insurer spending, and procedural complications. *JAMA Intern Med*. 2015;175(11):1783–9. [PubMed: 26348851]
15. Health Care Cost Institute [home page on the Internet]. Washington (DC): HCCI; c 2017 [cited 2017 Jan 31]. Available from: <http://www.healthcostinstitute.org>
16. Robinson JC, MacPherson K. Payers test reference pricing and centers of excellence to steer patients to low-price and high-quality providers. *Health Aff (Millwood)*. 2012;31(9):2028–36. [PubMed: 22949452]
17. Baumol WJ, Panzar JC, Willig RD. Contestable markets: an uprising in the theory of industry structure. *Am Econ Rev*. 1983;73(3):491–6.
18. Department of Labor, Department of Health and Human Services, Treasury Department. FAQs about Affordable Care Act implementation (part XXI) [Internet]. Washington (DC): The Departments; 2014 Oct 10 [cited 2017 Jan 17]. Available from: <https://www.dol.gov/agencies/ebsa/about-ebsa/our-activities/resource-center/faqs/aca-part-xxi.pdf>

19. Frankford D, Rosenbaum S. Go slow on reference pricing: not ready for prime time. Health AffairsBlog[blog on the Internet]. 2015 Mar 9 [cited 2017 Jan 17]. Available from: <http://healthaffairs.org/blog/2015/03/09/go-slow-on-reference-pricing-notready-for-prime-time/>
20. White C, Eguchi M. Reference pricing: a small piece of the health care price and quality puzzle [Internet]. Washington (DC): National Institute for Health Care Reform; 2014 Oct [cited 2017 Jan 17]. (Research Brief No. 18). Available for download from: http://nihcr.org/wp-content/uploads/2016/07/Research_Brief_No._18.pdf
21. To access the Appendix, click on the Appendix link in the box to the right of the article online.
22. Program Medicare. Part B drug payment model. Federal Register [serial on the Internet]. 2016 Mar 11 [cited 2017 Jan 17]. Available from: <https://www.federalregister.gov/documents/2016/03/11/201605459/medicare-program-part-bdrug-payment-model>
23. Kaiser U, Mendez SJ, Rønne T, Ullrich H. Regulation of pharmaceutical prices: evidence from a reference price reform in Denmark. J Health Econ. 2014;36:174–87. [PubMed: 24879578]
24. Porter ME, Teisberg EO. Redefining health care: creating value-based competition on results. Boston (MA): Harvard Business School Press; 2006
25. Bohmer RMJ. The hard work of health care transformation. N Engl J Med. 2016;375(8):709–11. [PubMed: 27557297]
26. Kowalski A Censored quantile instrumental variable estimates of the price elasticity of expenditure on medical care. J Bus Econ Stat. 2016;34(1):107–17. [PubMed: 26977117]
27. De Brantes F, Rosenthal MB, Painter M. Building a bridge from fragmentation to accountability—the Prometheus Payment model. N Engl J Med. 2009;361(11):1033–6. [PubMed: 19692682]
28. Robinson JC. Referral management and disease management in California’s accountable care organizations [Internet]. Oakland (CA): Integrated Healthcare Association; 2015 May [cited 2017 Jan 17]. (Issue Brief No. 15). Available from: <http://www.ihc.org/sites/default/files/resources/issue-brief-rwjf-aco-case-study-referral-management-2015.pdf>
29. Robinson JC, Miller K. Total expenditures per patient in hospital-owned and physician-owned physician organizations in California. JAMA. 2014;312(16):1663–9. [PubMed: 25335148]
30. MedPAC staff. Meeting highlight: hospital consolidation and its implications for Medicare. MedPAC Blog [blog on the Internet]. 2016 Nov 15 [cited 2017 Jan 17]. Available from: <http://medpac.gov/-blog-/medpacblog/2016/11/15/meeting-highlight-hospital-consolidation-and-its-implications-for-medicare>
31. Sinaiko AD, Mehrotra A, Sood N. Cost-sharing obligations, high-deductible health plan growth, and shopping for health care: enrollees with skin in the game. JAMA Intern Med. 2016;176(3):395–7. [PubMed: 26784644]
32. Beeuwkes Buntin M, Haviland AM, McDevitt R, Sood N. Healthcare spending and preventive care in high-deductible and consumer-directed health plans. Am J Manag Care. 2011;17(3):222–30. [PubMed: 21504258]
33. Sinaiko AD, Rosenthal MB. The impact of tiered physician networks on patient choices. Health Serv Res. 2014;49(4):1348–63. [PubMed: 24611599]
34. Gruber J, McKnight R. Controlling health care costs through limited network insurance plans: evidence from Massachusetts state employees [Internet]. Cambridge (MA): National Bureau of Economic Research; 2014 Sep [cited 2017 Jan 17]. (NBER Working Paper No. 20462). Available from: <http://www.nber.org/papers/w20462>

EXHIBIT 1

Impact of two years of reference pricing on consumers' choices, prices paid, and health care spending

	Study population	Increase in use of low-price facilities (percentage points) ^a	Reduction in price paid (percent) ^b	2013 spending by commercially insured individuals in the US (billions)	Potential spending reductions from reference pricing (billions)
Joint replacement	CaIPERS (see Note 10 in text)	14.2	19.8	\$ 17.09	\$ 3.38
Arthroscopy of the knee	CaIPERS (see Note 13 in text)	14.3	17.6	5.70	1.00
Arthroscopy of the shoulder	CaIPERS (see Note 13 in text)	9.9	17.0	3.80	0.65
Cataract removal	CaIPERS (see Note 14 in text)	8.6	17.9	1.90	0.34
Colonoscopy	CaIPERS (see Note 15 in text)	17.6	21.0	11.39	2.39
Laboratory tests	Safeway (see Note 12 in text)	18.6	32.0	23.73	7.59
CT scans	Safeway (see Note 11 in text)	9.0	12.5	17.09	2.14
MRI procedures	Safeway (see Note 11 in text)	16.0	10.5	19.93	2.09
Total		— ^c	— ^c	100.62	19.59

SOURCE Authors' analysis of data for the period 2008–14 from the California Public Employees Retirement System and Safeway and of data on total 2013 spending for commercially insured individuals from the Health Care Cost Institute database. **NOTES** The estimates shown were adjusted for the characteristics of patients subject to reference pricing and of patients in comparison groups not subject to such pricing. CT is computed tomography. MRI is magnetic resonance imaging.

^aEstimated through difference-in-differences linear probability models. Comparable parameters were obtained when we used logistic models.

^bEstimated from difference-in-differences general linear models, with a log link and using the gamma distribution.

^cNot applicable.