

Patients' Perceptions of the Costs of Total Hip and Knee Arthroplasty

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Abstract

With medical economics in the national sociopolitical spotlight, we conducted a study to assess patients' understanding of the cost of 2 common orthopedic procedures: total hip and knee arthroplasty (THA, TKA). We surveyed 284 consecutive THA or TKA patients, at their first postoperative visit, regarding their understanding of reimbursement and cost.

On average, patients estimated surgeon reimbursement at \$12,014. They estimated that the hospital was reimbursed \$28,392 for their perioperative care and that it cost the hospital \$24,389 to provide it. The cost of the implant used was estimated at \$6447.

There is wide variation in patients' estimates and understanding of health care costs. However, patients substantially overestimate reimbursement to the surgeon both in isolation and as a proportion of the total cost of the surgical procedure.

Medical economics has been a major sociopolitical issue in the United States for the past 20 years, with concerns focused on increasing medical spending. These costs are projected to continue to rise, from 15.3% of gross domestic product in 2002 to 19.6% in 2017.¹

Multiple steps have been taken to help reduce the cost of health care, many of which center on physician reimbursement. The Balanced Budget Act of 1997 worked to control Medicare spending by increasing reimbursement for clinic visits by setting reductions for procedural reimbursements. This specifically affects orthopedic surgeons, who between 1991 and 2002 experienced a 28% reduction in reimbursement, after inflation, for commonly performed orthopedic procedures, including hip and knee arthroplasty.² Unfortunately, this system does not take into account the value of services as perceived by patients.

Total hip and knee arthroplasty (THA, TKA) are well-established surgical treatments for advanced osteoarthritis of the hip and knee, respectively. Much research has been done on patient satisfaction with these procedures and on their long-

term results and cost-effectiveness. These procedures rank among the highest in patient satisfaction, and improvements in technique and technology have steadily improved long-term results. THA and TKA have proved to be cost-effective in appropriately indicated patients.

The demand for THA and TKA is projected to increase by 174% and 673%, respectively, from 2005 to 2030.³ Legislators, payers, health care providers, and patients are understandably concerned about the rising cost of health care and the implications for access to elective surgical procedures. In a recent study by Foran and colleagues,⁴ surveyed postoperative patients indicated that Medicare reimbursement was "much lower" for arthroplasty than it should be. In addition, they overestimated (compared with national averages) what Medicare reimburses for hip and knee arthroplasty. Many raised concerns that orthopedic surgeons might drop Medicare entirely.⁴

These misconceptions about reimbursement may stem partly from the inaccessibility of health care cost information. Rosenthal and colleagues⁵ recently queried a random selection of US hospitals and demonstrated the difficulty in obtaining THA pricing information.

In a system in which consumers and payers are often not one and the same, it is unclear if consumers understand the cost of their health care. We conducted a study to assess patients' perceptions of the cost of total joint arthroplasty (TJA) and gain insight into their understanding of health care costs and their sense of the value of this elective surgical procedure.

Materials and Methods

After obtaining institutional review board approval and informed consent for this study, we surveyed 284 consecutive patients who underwent THA or TKA at an academic medical center. Patients had either primary or revision surgery performed (by Dr. Hallstrom or Dr. Urquhart) and were surveyed during their first (2-week) postoperative visit, between March 1, 2012 and December 20, 2012.

Surveys were labeled with patient identifiers to facilitate abstraction of data from electronic medical records. Operative reports and discharge summaries were reviewed for data that included sex, age, diagnosis, procedure, surgeon, implant, admission date, and length of stay.

The survey asked for demographic information, including

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.

level of education, insurance coverage, and annual household income, and included a question to verify the surgical procedure and a question to determine if the patient had reviewed a hospital billing statement pertaining to the patient's admission. The survey also included these questions about reimbursement and cost:

- How much do you feel your orthopedic surgeon was reimbursed for your surgery? (EXCLUDING payments to the hospital)
- How much do you think your surgeon gets reimbursed to see you IN THE HOSPITAL after surgery?
- How much do you think your surgeon gets reimbursed per visit to see you IN CLINIC for follow-up during the first 3 months after surgery?
- How much do you think the implant used in your surgery cost?
- How much do you think the hospital was reimbursed for your surgery and admission to the hospital after surgery? (EXCLUDING payments to the surgeon)
- How much do you think it cost the hospital to provide your surgery and admission to the hospital after surgery?

Responses were limited to numeric currency format using a response area as shown in Figure 1. Overall patient satisfaction was elicited with use of a 5-point scale ranging from 1 (very unsatisfied) to 5 (very satisfied). Regarding type of implant used, patients could select from 6 prominent vendors or indicate "other" or "don't know." They were also asked which of several factors should primarily determine surgeon reimbursement: overall patient satisfaction, technical difficulty, amount of risk/possible harm, duration/amount of time, and rate of complications. A free-response comments section was provided at the end of the survey.

Data from the survey and the electronic medical records were collected using Research Electronic Data Capture (REDCap; Vanderbilt University, Nashville, Tennessee). Statistical analysis was performed with SAS Version 9.3 (SAS Institute, Cary, North Carolina). Data were screened before further analysis. Patients who provided nonnumeric responses in numeric response fields were excluded from further analysis. Numeric ranges were applied in subsequent analysis using the mean of the range. Implausible responses resulted in the removal of the entire encounter from subsequent analysis.

Demographic data used to define categories for further subgroup analysis are presented as percentages of the group. Medians, means, and interquartile ranges were calculated for all responses regarding reimbursement and cost. Differences

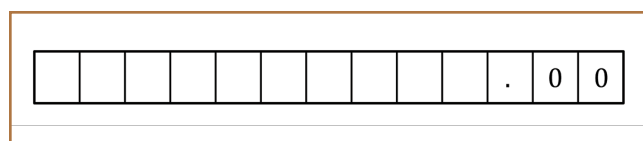


Figure 1. Response area for estimated cost or payment was limited to numeric currency format.

in perceptions of reimbursement and cost based on subgroups, including procedure type, diagnosis, education level, and satisfaction, were calculated. Independent-samples Student t tests were used to determine the statistical significance of the differences detected.

Results

Of the 400 eligible patients seen at the first postoperative follow-up, 284 (71%) were enrolled in the study. Mean (SD) age was 62.6 (12.6) years. Of the 284 patients enrolled, 154 (54%) were female. Of the participants who reported their education and income, 125 (44%) had a bachelor's degree or higher degree, and 68 (23.9%) reported income of more than \$100,000 per year. The largest payers reported by patients were private insurance (80%) and Medicare (46%). Additional demographic details are listed in Table 1.

Of the 284 patients enrolled in the study, 159 (56%) had THA, and 88 (31%) had TKA (Table 2). Thirty-seven patients (13%) underwent revision procedures. Only 5 patients (2%) indicated they had reviewed their hospital billing statement from

Table 1. Study Participants' Demographic Data

Highest Education Level Attained	n	%
Some high school	14	5
High school graduate	52	18
Some college	66	23
Associate's degree	23	8
Bachelor's degree	61	21
Master's degree	37	13
Professional degree	7	2
Doctoral degree	20	7
No response	4	1
Annual Household Income	n	%
<\$25,000	55	19
\$25,000-\$50,000	58	20
\$50,000-\$75,000	53	19
\$75,000-\$100,000	32	11
\$100,000-\$150,000	36	13
>\$150,000	32	11
No response	15	5
Payer Identified by Participant	n	%
Private insurance	227	80
Self-pay/uninsured	1	0.4
Medicare	132	46
Medicaid	20	7
Other	25	9
Unsure	1	0.4

their most recent admission. Two hundred forty-two patients (85%) were satisfied or very satisfied with their procedure.

Regarding the implant used in their surgery, 216 patients (76%) indicated they did not know which company manufactured it. Of the 68 patients (24%) who named a manufacturer, 53 (78%) were correct in their selection (intraoperative records were checked). Patients indicated they thought the implant used in their surgery cost \$6447 on average (95% CI, \$5581-\$7312).

Table 2. Distribution of Total Hip and Knee Arthroplasty (THA, TKA) Cases by Primary and Revision Surgery

	THA		TKA		Total	
	n	%	n	%	n	%
Primary	159	56.0	88	31.0	247	87.0
Revision	24	8.5	13	4.6	37	13.0
Total	183	64.4	101	35.6	284	100.0

Table 3. Perceived Reimbursement and Cost Based on Responses of All Patients

Parameter	Mean	95% CI		Median	Quartile	
		Lower	Upper		Lower	Upper
Surgeon reimbursement	\$12,014	\$10,845	\$13,183	\$10,000	\$5000	\$15,000
Surgeon rounding fee	\$534	\$451	\$617	\$300	\$100	\$700
Surgeon clinic follow-up fee	\$336	\$295	\$378	\$250	\$100	\$500
Implant cost	\$6447	\$5581	\$7312	\$5000	\$2000	\$9000
Hospital reimbursement	\$28,392	\$25,271	\$31,512	\$20,000	\$10,000	\$35,000
Hospital cost	\$24,389	\$21,612	\$27,165	\$18,500	\$7000	\$35,000

Table 4. Perceived Reimbursement and Cost Comparing Total Hip and Knee Arthroplasty (THA, TKA)

Parameter	Subtype	Mean	95% CI		Median	Quartile	
			Lower	Upper		Lower	Upper
Surgeon reimbursement ^a	TKA	\$12,263	\$10,399	\$14,127	\$10,000	\$5000	\$17,500
	THA	\$11,872	\$10,360	\$13,384	\$10,000	\$5000	\$15,000
Surgeon rounding fee ($P < .02$)	TKA	\$590	\$437	\$742	\$300	\$166	\$1000
	THA	\$500	\$403	\$596	\$300	\$90	\$600
Surgeon follow-up fee ($P < .01$)	TKA	\$342	\$263	\$421	\$200	\$100	\$450
	THA	\$333	\$285	\$381	\$250	\$150	\$500
Implant cost ^a	TKA	\$5764	\$4357	\$7171	\$4900	\$2000	\$8000
	THA	\$6823	\$5720	\$7925	\$5000	\$2000	\$10,000
Hospital reimbursement ^a	TKA	\$30,230	\$24,683	\$35,778	\$20,000	\$11,000	\$40,000
	THA	\$27,366	\$23,582	\$31,151	\$20,000	\$10,000	\$35,000
Hospital cost ^a	TKA	\$26,998	\$21,738	\$32,257	\$20,000	\$10,000	\$35,000
	THA	\$22,981	\$19,762	\$26,201	\$15,000	\$6000	\$35,000

^aDid not reach statistical significance ($P < .05$).

On average, patients thought their surgeon was reimbursed \$12,014 (95% CI, \$10,845-\$13,183) for their procedure, and they estimated that the hospital was reimbursed \$28,392 (95% CI, \$25,271-\$31,512) for their perioperative care and that it cost the hospital \$24,389 (95% CI, \$21,612-\$27,165) to provide it. Means, confidence intervals, medians, and interquartile ranges for parameters of reimbursement and cost are listed in **Table 3**. Seventy-one patients (25%) thought on average that the hospital took a net loss for each TJA performed, and 146 patients (51%) thought on average that the hospital generated a net profit for each TJA.

On average, patients thought surgeons were reimbursed \$11,872 for a THA and \$12,263 for a TKA. Patients also estimated a higher hospital cost (THA, \$22,981; TKA, \$26,998) and reimbursement (THA, \$27,366; TKA, \$30,230) after TKA than THA. These differences in perceptions of cost and reimbursement for THA and TKA appear in **Table 4** and **Figure 2**.

Statistically significant differences were also found in perceptions of cost and reimbursement based on level of education and overall patient satisfaction. Patients with a bachelor's degree or higher estimated physician reimbursement at \$11,006, whereas patients with a lower level of education estimated reimbursement at \$12,890. In addition, patients with a lower level of education gave estimates of hospital cost and reimbursement that were \$7698 and \$10,799 higher, respectively, than the estimates given by patients with a higher level of education (**Table 5, Figure 3**). Patients who were satisfied or very satisfied with their overall TJA experience estimated surgeon reimbursement at \$11,673. Patients who indicated they were unsatisfied, very unsatisfied, or neutral regarding their overall experi-

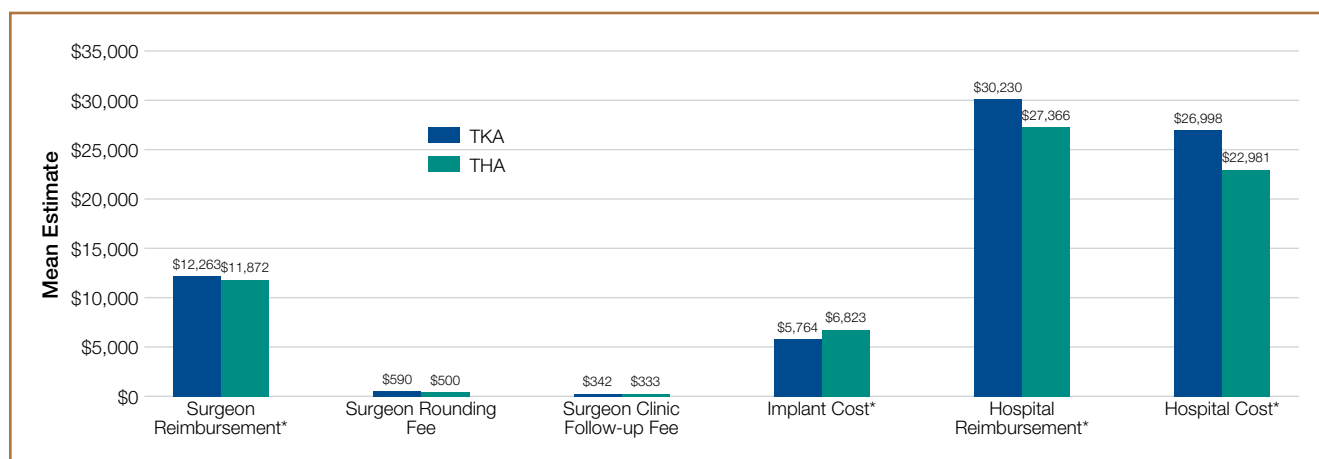


Figure 2. Perceived reimbursement and cost comparing total hip and knee arthroplasty (THA, TKA). Parameters marked with asterisk (*) did not reach statistical significance ($P < .05$).

Table 5. Perceived Reimbursement and Cost Based on Level of Education

Parameter	Bachelor's Degree	Mean	95% CI		Median	Quartile	
			Lower	Upper		Lower	Upper
Surgeon reimbursement ($P < .01$)	No	\$12,890	\$11,134	\$14,645	\$10,000	\$5,000	\$20,000
	Yes	\$11,006	\$9,493	\$12,520	\$10,000	\$5,000	\$15,000
Surgeon rounding fee ^a	No	\$554	\$443	\$666	\$350	\$175	\$800
	Yes	\$516	\$389	\$642	\$300	\$0	\$600
Surgeon follow-up fee ($P < .01$)	No	\$312	\$262	\$362	\$250	\$125	\$400
	Yes	\$365	\$294	\$435	\$250	\$100	\$500
Implant cost ^a	No	\$6,598	\$5,392	\$7,804	\$5,000	\$2,000	\$10,000
	Yes	\$6,247	\$4,959	\$7,535	\$4,000	\$2,000	\$8,000
Hospital reimbursement ($P < .01$)	No	\$33,097	\$28,426	\$37,769	\$25,000	\$12,000	\$45,000
	Yes	\$22,298	\$18,435	\$26,162	\$15,000	\$10,000	\$25,000
Hospital cost ^a	No	\$27,840	\$23,848	\$31,833	\$20,000	\$10,000	\$40,000
	Yes	\$20,142	\$16,353	\$23,931	\$15,000	\$5,000	\$25,000

^aDid not reach statistical significance ($P < .05$).

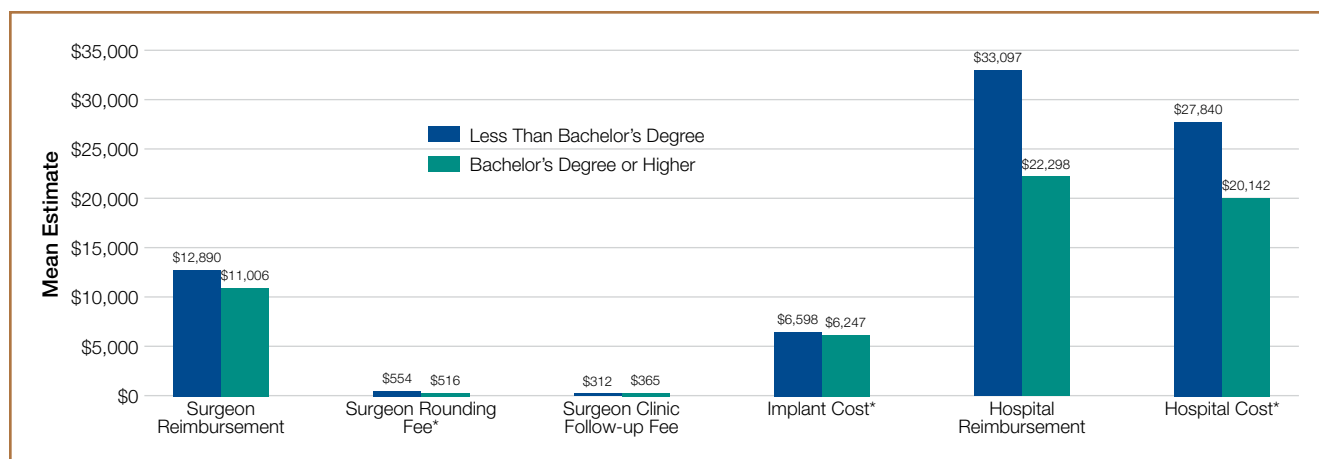


Figure 3. Perceived reimbursement and cost based on level of education. Parameters marked with asterisk (*) did not reach statistical significance ($P < .05$).

ence gave a higher estimate of surgeon reimbursement: \$14,317 (Table 6, Figure 4).

Because of the small number of enrolled patients who had revision surgery and the high variability in patient responses, there were no meaningful or statistically significant differences in perceptions of cost and reimbursement based on revision or primary surgery.

Patients also estimated substantial additional reimbursements to physicians for services included at no additional charge with the global surgical package. Median estimates were \$300 for reimbursement to a physician making rounds in the hospital and \$250 for reimbursement for an outpatient follow-up. Only 47 patients (17%) and 35 patients (12%) correctly indicated there is no additional payment for making rounds and outpatient follow-up, respectively. Estimates of these reimbursements varied by education level, procedure, and overall satisfaction (Tables 4–6).

Discussion

The sustainable growth rate (SGR) formula, part of the Balanced Budget Act of 1997, was constructed to manage health care costs in the context of overall economic growth. By 2001, Medicare health care expenditures had begun to outpace economic growth, and the SGR formula dictated a reduction in reimbursement to physicians. Each year over the past decade, Congress has passed legislation providing a temporary reprieve, staving off a drastic reduction of as much as 25% in 2010.⁶ Despite these adjustments, reimbursement continues to decrease because of overall inflation.

More worrisome is that “more than half of the nearly trillion dollar price tag for expanding coverage under the Affordable Care Act (ACA) will be paid by decreasing spending for the more than 46.3 million individuals covered by Medicare.”⁷ ACA provisions will also create an Independent Payment Advisory Board (IPAB) to oversee health care costs and reduce

Table 6. Perceived Reimbursement and Cost Based on Overall Satisfaction

Parameter	Satisfied	Mean	95% CI		Median	Quartile	
			Lower	Upper		Lower	Upper
Surgeon reimbursement (<i>P</i> < .03)	No	\$14,317	\$9,987	\$18,646	\$10,000	\$5,000	\$25,000
	Yes	\$11,673	\$10,471	\$12,874	\$10,000	\$5,000	\$15,000
Surgeon rounding fee (<i>P</i> < .02)	No	\$629	\$315	\$942	\$500	\$100	\$500
	Yes	\$519	\$434	\$604	\$300	\$100	\$725
Surgeon follow-up fee ^a	No	\$284	\$183	\$386	\$200	\$100	\$400
	Yes	\$341	\$296	\$387	\$250	\$100	\$500
Implant cost ^a	No	\$5,863	\$3,836	\$7,890	\$5,000	\$1,500	\$10,000
	Yes	\$6,545	\$5,587	\$7,503	\$5,000	\$2,000	\$9,000
Hospital reimbursement ^a	No	\$31,936	\$22,993	\$40,879	\$20,000	\$11,000	\$50,000
	Yes	\$27,895	\$24,537	\$31,254	\$20,000	\$10,000	\$35,000
Hospital cost (<i>P</i> < .04)	No	\$29,251	\$19,828	\$38,675	\$20,000	\$6,000	\$35,000
	Yes	\$23,651	\$20,769	\$26,532	\$18,000	\$7,000	\$35,000

^aDid not reach statistical significance (*P* < .05).

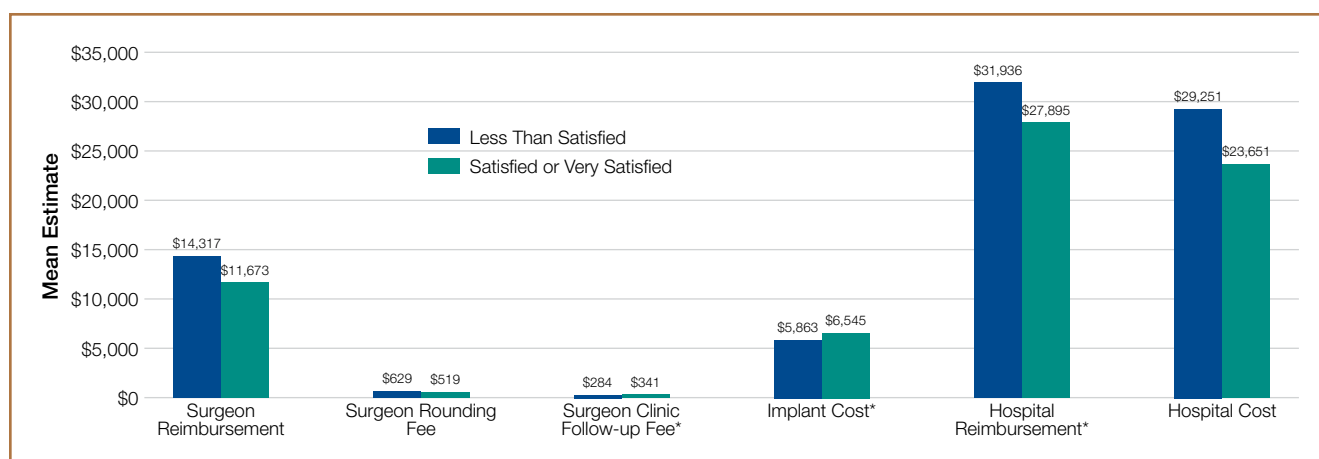


Figure 4. Perceived reimbursement and cost based on overall satisfaction. Parameters marked with asterisk (*) did not reach statistical significance (*P* < .05).

Medicare spending when it is expected to exceed target levels.⁸ As IPAB cannot recommend increasing revenues or changing benefits, and because it is initially prohibited from recommending decreasing payments to hospitals, the decreases will likely have the greatest impact on physician reimbursement.⁷⁻⁹

Health care policy has been a major campaign issue during recent US elections. The public and popular media remain engaged in this important discussion. Although patients, policymakers, and physicians are understandably concerned about cost and access to health care, it is unclear if patients understand the distribution of health care cost and reimbursement.

Other authors have studied patients' perceptions of physician reimbursement for TJA. Hayden and colleagues¹⁰ surveyed 1000 residents of a Texas city. The 121 who responded to the survey thought that fair compensation for performing a TKA was \$5080, on average.¹⁰ Although this was significantly higher than the actual Medicare reimbursement at the time, a later study, by Foran and colleagues,⁴ found patients' estimates of both fair reimbursement and Medicare reimbursement for TJA to be even higher. Foran and colleagues⁴ surveyed 1120 patients who thought surgeons deserved to be paid \$14,358 for THA and \$13,322 for TKA, on average. These reimbursement values are nearly an order of magnitude higher than actual reimbursements. For Medicare payments, patients lowered their estimates to \$8212 for THA and \$7196 for TKA.⁴

To our knowledge, the present study is the first to use a "postconsumer" survey to assess patients' perceptions of THA and TKA costs. Our results confirmed that patients substantially overestimated reimbursement for THA and TKA at \$11,872 and \$12,263, respectively, relative to the average Medicare reimbursements of \$1467 and \$1530, respectively.¹¹ We also found that patients overestimated both hospital cost and reimbursement for THA at \$22,981 and \$27,366, respectively, relative to recently published hospital economic analyses showing THA cost and reimbursement to be \$11,688 and \$15,789, respectively.¹² Few patients enrolled in our study demonstrated an understanding of the services included in the global surgical package. Only about 12% of patients correctly indicated there was no additional payment to the physician for initial follow-up appointments. However, patients were fairly accurate in their estimates of implant cost. On average, patients who underwent THA priced their implant at \$6823, which is only about 9% higher than the reported median cost of \$6072 to \$6400.^{13,14}

We also found significant differences in perceptions of cost based on level of education, joint replaced, and overall level of satisfaction. On average, patients with a bachelor's degree or higher gave estimates of cost and reimbursement that were lower than those given by patients with a lower level of education. Estimates of physician reimbursement and hospital reimbursement and cost were higher from patients who had TKA than from patients who had THA.

Comparing perceptions of reimbursement for appendectomy and coronary artery bypass with perceptions for TJA, Foran and colleagues⁴ found that patients understood the relative complexity of each procedure, as evidenced by their estimates

of fair reimbursement for each. However, in comparing patient estimates for the different components of cost and reimbursement for TJA, we found great variability in understanding. Patients in our study overestimated payments to the hospital by 73% but overestimated the cost of the THA implant by only 9%. However, the same patients overestimated physician reimbursement for THA by about 800%. If these patients' estimates of reimbursement are considered surrogates for relative value, then physicians, based on actual payments, are grossly undervalued relative to implant manufacturers.

Our study had several limitations. First, the enrolled patients were all seen at one medical center, in Ann Arbor, Michigan, and our results may not be generalizable outside the region. Second, the survey respondents were postoperative patients who had an established relationship with the study's principal investigators—a relationship that may have been a source of bias in the consideration of reimbursement as a function of value. Third, despite our efforts to carefully design a survey with open-ended responses, the order in which the survey questions were presented may have influenced patient responses. Fourth, the open-ended question design may have had an impact on responses where the correct answer would have required entering 0.00.

Despite these limitations, our study results demonstrated general public misconceptions about cost and reimbursement for common orthopedic procedures. Although more transparency in health care cost information may not immediately result in a more well-informed population,¹⁵ our patients, given the opportunity to develop an understanding of the economics of their own medical treatment, may become better prepared to make informed choices regarding changes in health care policy.

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