

# THE EFFECT OF PAYER TYPE ON ORTHOPAEDIC PRACTICE EXPENSES

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**Background:** Orthopaedic practice expenses are the costs associated with providing treatment that are incurred by a physician's practice. Certain payer types are thought to increase orthopaedic practice expenses by increasing paperwork and other administrative activities. Our study investigated the hypothesis that orthopaedic practice expenses would vary significantly by payer type.

**Methods:** With use of the method of activity-based costing, data on the orthopaedic practice expenses for 518 consecutive patients (286 men and 232 women) who had a sports-related knee condition were collected. For each patient enrolled in the study, all employees recorded the actual amount of time that they spent on each of seventeen specific activities previously shown to be associated with orthopaedic practice. The seventeen activities were categorized as either a value-added activity, which adds value to the services provided to the patient, or a nonvalue-added activity, which does not add value. The total orthopaedic practice expense was the sum of the value-added and nonvalue-added activity expenses. To capture all practice expenses associated with a particular episode of care, data collection continued until the patient was discharged and the financial account had been settled. We evaluated the differences in orthopaedic practice expenses among six payer types: self-pay, indemnity plan, Medicare, health maintenance organization/point-of-service plan (HMO/POS), preferred provider organization (PPO), and Workers' Compensation.

**Results:** The differences among payer types with respect to orthopaedic practice expenses were significant ( $p = 0.0000000004$ ). The total orthopaedic practice expense per episode of care was \$123 for self-pay, \$195 for an indemnity plan, \$148 for Medicare, \$178 for PPO, \$208 for HMO/POS, and \$299 for Workers' Compensation. These differences among payer types persisted even after accounting for patient age, gender, treatment type (nonoperative versus operative), and number of office visits. Nonvalue-added activity expenses differed to a greater degree among the payer types than did value-added activity expenses.

**Conclusions:** The payer type was found to be an important factor affecting orthopaedic practice expenses, particularly with respect to nonvalue-added activity expenses.

The advent and growth of managed health-care systems has generated interest in the expenses associated with providing health care<sup>1-3</sup>. Practice expenses are the costs incurred by a medical office, excluding physician time and effort<sup>4,5</sup>. The process of costing, or measuring the resources used per patient or per procedure, is necessary to determine the practice expenses<sup>1,3,5-7</sup>. Several reports have outlined the method of performing activity-based costing to identify and account for practice expenses<sup>1,5,8-10</sup>.

Most previous medical cost analyses have used data from large third-party payer databases<sup>11-14</sup>. Those studies defined the cost of medical care as the payments made to physicians. Very few studies have investigated the actual cost of providing care from the physicians' perspective. In a retrospective study of a large orthopaedic group practice, Brinker et al.<sup>8</sup> found that the average practice expense per office visit was approximately \$99.

To the best of our knowledge, no study has examined

how payer type affects practice expenses. Anecdotally, certain payer types seem to increase the burden of administrative activities and therefore would likely increase practice expenses<sup>2,15,16</sup>. The current study was undertaken to examine the effect of payer type on practice expenses. We hypothesized that practice expenses would vary significantly by payer type even after accounting for other factors that affect practice expenses. To date, no empirical evidence that supports this contention has been presented.

## Materials and Methods

Data were collected prospectively for 518 consecutive patients of one orthopaedic surgeon who specialized in sports-related disorders of the knee in a large orthopaedic group practice. A power analysis (an alpha of 0.05 and a power of 0.95) revealed that a sample size of at least 510 subjects was needed to identify a factor that accounted for at least 2.5% of

TABLE I Gender Distribution and Patient Age According to Payer Type

Payer Type*	All Patients		Men		Women	
	No. of Patients	Mean Age (yr)	No. of Patients	Mean Age (yr)	No. of Patients	Mean Age (yr)
Self-pay	43	38.3	25	35.4	18	42.5
Indemnity plan	11	51.2	4	48.9	7	52.5
Medicare	42	69.3	24	69.2	18	69.5
PPO	227	39.1	123	38.2	104	40.2
HMO/POS	156	36.0	82	35.6	74	36.5
Workers' Compensation	39	42.6	28	40.8	11	47.2
All payer types	518	41.1	286	40.2	232	42.2

\*PPO = preferred provider organization, HMO = health maintenance organization, and POS = point-of-service agreement.

practice expenses. There were 286 men (with an average age of forty years) and 232 women (with an average age of forty-two years). The distribution of gender and the mean age of the patients by payer type are shown in Table I. Nonoperative treatment was provided for 344 patients (66%), and 174 patients (34%) underwent operative treatment.

The study was exempt from institutional review and informed-consent requirements because it involved simple observation of public behavior and study of existing data and records. At the conclusion of data collection, the information was written into a database such that the subjects could not be identified either directly or through identifiers linked to the subjects.

This particular surgeon's practice was chosen for its relative homogeneity with respect to case presentation and management. Knee ligament injuries, osseous injuries about the knee, meniscal injuries and lesions, patellofemoral problems, inflammatory soft-tissue conditions, and articular cartilage injuries and lesions of the knee defined the scope of this surgeon's practice.

The dependent variable in the study was total practice expense, which was the expense incurred by the physician's practice while the seventeen activities performed in the daily function of an orthopaedic practice, as described in detail by Brinker et al.<sup>8</sup>, were conducted. Total practice expense is reported in two ways in the current investigation: (1) the total practice expense per episode of care (the grand total of all expenses for all activities and all office visits associated with the patient's specific condition) and (2) the total practice expense per office visit (the grand total of all expenses for all activities divided by the total number of office visits).

Total practice expense comprised two components: value-added activity expenses and nonvalue-added activity expenses. Value-added activity expenses add value to the services provided to the patient. Value-added activity expenses include providing service to patients in the office, scheduling and performing in-office surgical procedures, scheduling and coordinating surgery patients in the hospital or other external facility, providing service to patients in the hospital or in an external fa-

cility, billing, collecting payments, applying a cast, providing occupational or physical therapy, maintaining professional education, sustaining the business by managing and coordinating the practice, maintaining the facility, and teaching and research<sup>8</sup>. By contrast, nonvalue-added activity expenses do not add value to the services provided to the patient. Nonvalue-added activity expenses include obtaining insurance authorization, resolving collection disputes and rebilling charges, and providing information to third parties<sup>8</sup>. Value-added activity expenses and nonvalue-added activity expenses were reported on the basis of the cost per episode of care and per office visit.

Practice expense data were collected on 518 consecutive new patients whose initial office visit was between July 17, 2000, and November 14, 2000 (the enrollment period). The various practice expenses were calculated on an individual patient basis with use of the method of activity-based costing<sup>5,8,9</sup>. Prestudy workshops were conducted with the entire staff of the large orthopaedic group practice (167 employees, who were equivalent to 164 full-time employees) so that the purpose and methods of the study could be described in detail. All new office visits for the physician during the study period were routed through a single employee at the appointment desk. In addition to recording the interaction time with the patient for the initial phone call, the employee set up a special computer file to flag the patient as a subject in the study. All employees were linked to the same computerized system, making it possible for all employees to rapidly identify each patient throughout the entire episode of care.

Practice expenses were related solely to direct interaction between the patient and the employees for eight of the activities in the study. These activities included providing service to patients in the office, scheduling and coordinating surgery patients in the hospital or an external facility, obtaining insurance authorization, maintaining medical records, billing, collecting payments, resolving collection disputes and rebilling charges, and providing information to third parties. Data for these activities were collected via a time-motion study on a per patient basis. All employees were issued a study notebook

and a stopwatch. The notebook contained individual data sheets for each patient so that the employees could record the time spent (to the nearest minute) on any and all activities related to the particular patient's care. Employees had access to a printed copy of a roster of all study subjects, which was updated daily. In addition, a roster, which was continually updated, was available through the clinic's computer network. Practice expenses were calculated as the product of the time spent and the employees' wages plus related expenses.

Practice expenses were related solely to overhead expenses and not directly to interaction between the patient and the employees for three of the activities in the study. These activities included maintaining professional education, sustaining the business by managing and coordinating the practice, and maintaining the facility. Expenses associated with these three activities were calculated by dividing the total annual expenses of each of these activities by the total number of patient office visits. This method is logical to the extent that fixed overhead costs do not vary by payer type on a per office visit basis.

Practice expenses were related both to interactions between the patient and the employees and to overhead or supply expenses for two of the activities in this study. These activities included making radiographs of the patient and applying a cast. Expenses associated with these activities were calculated with use of a combination of the two calculation methods described above.

Four activities were not performed by the physician or clinic in this study and therefore had no associated practice expenses. These included scheduling and performing surgeries in the office, providing service to patients in a hospital or other external facility, providing occupational therapy or physical therapy, and teaching and research.

The age and gender of the patient, the diagnosis, and the procedures were recorded and stored electronically. Collection of practice expense data continued throughout the patient's episode of care. An episode of care was considered to be complete when the patient was discharged from care and the financial account was settled (an account balance of \$0). All data were entered into an Excel spreadsheet (Microsoft, Redmond, Washington) by a team of five administrative employ-

ees. Two additional administrative employees independently validated the accuracy of the data entry and practice expense computations.

The data were analyzed by dividing the patients into two groups: nonoperative treatment and operative treatment. No patient in the operative treatment group underwent more than one operation during the study. Six payer types were identified: self-pay, indemnity plans, Medicare, preferred provider organizations (PPO), health maintenance organization/point-of-service plans (HMO/POS), and Workers' Compensation. Medicaid was not a payer for any of the patients in this study.

The characteristics of each payer type are listed in Table II. The payer types differed with respect to who was responsible for payment, whether a contractual arrangement was in place with the orthopaedic group, whether access to orthopaedic care was restricted or open, and whether pretreatment authorization was required.

#### Data Analyses

The means and standard deviations or frequencies were computed for each variable as appropriate. The Pearson product-moment correlation coefficients were used to examine the relationships among the age (years) of the patient at the time of the first office visit, the number of office visits, total practice expense, value-added activity expenses, and nonvalue-added activity expenses. One-way analyses of variance were used to determine whether gender, treatment type (i.e., nonoperative or operative), or payer type was significantly related to practice expenses.

General linear model analyses were used to examine the relative importance of the payer type, treatment type, and number of office visits to the practice expenses, with use of total practice expense, value-added activity expenses, and nonvalue-added activity expenses as dependent variables. The self-pay payer type was compared with the other payer types in planned post hoc comparisons. Self-payment did not typically involve expenses attributable to the influence of a third party. Thus, the self-pay payer type was selected as a "control group" since it was a theoretical lower bound for practice expenses. The significance level was adjusted for the multiple

TABLE II Comparison of Payer Types

Payer Type*	Party Responsible for Payment	Contractual Agreement with Orthopaedic Group	Open or Restricted Access to Specialty Care	Requirement for Pretreatment Authorization
Self-pay	Patient	No	Open	None
Indemnity plan	Payer	No	Open	Some
Medicare	Payer	No	Open	None
PPO	Payer	Yes	Open	Yes
HMO/POS	Payer	Yes	Restricted	Yes
Workers' Compensation	Payer	No	Open	Yes

\*PPO = preferred provider organization, HMO = health maintenance organization, and POS = point-of-service agreement.

TABLE III Practice Expenses by Payer Type per Episode of Care (and per Office Visit)

Payer Type*	Total Practice Expenses			Value-Added Activity Expenses			Nonvalue-Added Activity Expenses		
	Both Treatment Types	Non-operative Treatment	Operative Treatment	Both Treatment Types	Non-operative Treatment	Operative Treatment	Both Treatment Types	Non-operative Treatment	Operative Treatment
Self-pay	\$122.85 (\$63.75)	\$84.06 (\$62.45)	\$235.69 (\$65.06)	\$111.15 (\$57.61)	\$77.34 (\$56.84)	\$209.52 (\$57.55)	\$11.70 (\$6.56)	\$6.73 (\$5.61)	\$26.17 (\$7.51)
Indemnity plan	\$194.71 (\$73.71)	\$111.96 (\$75.23)†	\$339.54 (\$72.19)	\$159.02 (\$59.71)	\$84.45 (\$60.92)	\$289.52 (\$58.49)	\$35.69 (\$14.01)†	\$27.51 (\$14.31)†	\$50.03 (\$13.70)
Medicare	\$148.01 (\$78.77)†	\$118.14 (\$75.73)†	\$222.70 (\$81.80)†	\$116.07 (\$62.81)†	\$92.41 (\$62.37)†	\$175.23 (\$63.24)	\$31.94 (\$15.96)†	\$25.72 (\$13.36)†	\$47.47 (\$18.55)†
PPO	\$178.38 (\$78.86)†	\$123.96 (\$75.58)†	\$308.34 (\$86.80)†	\$135.93 (\$60.63)†	\$92.09 (\$59.95)	\$240.63 (\$63.00)	\$42.44 (\$18.24)†	\$31.86 (\$15.63)†	\$67.71 (\$23.80)†
HMO/POS	\$207.83 (\$81.19)†	\$125.00 (\$75.02)†	\$336.83 (\$82.70)†	\$163.25 (\$61.47)	\$93.65 (\$59.70)	\$271.64 (\$61.55)	\$44.58 (\$19.72)†	\$31.35 (\$15.33)†	\$65.19 (\$21.15)†
Workers' Compensation	\$298.85 (\$93.45)†	\$149.65 (\$83.63)†	\$455.90 (\$103.27)†	\$233.14 (\$69.31)†	\$106.93 (\$63.78)†	\$365.99 (\$74.85)†	\$65.71 (\$24.14)†	\$42.73 (\$19.85)†	\$89.91 (\$28.43)†
All payer types	\$189.59 (\$78.29)	\$121.27 (\$74.61)	\$324.66 (\$81.98)	\$148.30 (\$61.85)	\$91.88 (\$60.59)	\$229.84 (\$63.12)	\$41.29 (\$16.44)	\$29.39 (\$14.02)	\$64.82 (\$18.86)

\*PPO = preferred provider organization, HMO = health maintenance organization, and POS = point-of-service agreement. †Practice expenses per office visit were significantly higher ( $p \leq 0.03$ ) than those in the self-pay group.

comparisons with use of the Sidak method.

A  $p$  value of 0.05 was considered significant for all analyses.

## Results

The results of the current investigation revealed significant ( $p = 0.000000004$ ) differences in total practice expenses per episode of care across the various payer types (Table III). The significant differences persisted even after we controlled for patient age, gender, treatment type (nonoperative versus operative), and number of office visits.

A summary of orthopaedic practice expenses by activity and payer type is shown in Table IV.

### Effect of Payer Type

The observed total practice expense per episode of care differed significantly by payer type ( $p = 0.000000004$ ). The average practice expense per episode of care across all payer types was \$189.59, with a low of \$122.85 in the self-pay group and a high of \$298.85 in the Workers' Compensation group. The total practice expense per episode of care by payer type differed significantly for both value-added activity expenses ( $p = 0.00000006$ ) and nonvalue-added activity expenses ( $p < 0.000000001$ ). Self-pay was well below average for both value-added activity expenses (\$111.15) and nonvalue-added activity expenses (\$11.70), whereas Workers' Compensation was well above the average (\$233.14 and \$65.71, respectively).

### Effects of Age and Gender

After accounting for payer type, patient age ( $p = 0.11$ ) and patient gender ( $p = 0.97$ ) were not significantly related to prac-

tice expenses and thus were excluded from additional analyses.

### Effect of Treatment Type

The treatment type was significantly ( $p < 0.000000001$ ) related to practice expenses; the average practice expenses per episode of care were \$121.27 (range, \$52.64 to \$367.75) and \$324.66 (range, \$86.74 to \$733.65) for nonoperative and operative treatment, respectively. Patients undergoing operative treatment had significantly higher value-added activity expenses ( $p < 0.000000001$ ) and nonvalue-added activity expenses ( $p < 0.000000001$ ).

### Effect of the Number of Office Visits

The number of office visits was significantly ( $r = 0.97$ ,  $p < 0.000000001$ ) related to total practice expenses per episode of care. The number of office visits was significantly correlated with both value-added activity expenses per episode of care ( $r = 0.98$ ,  $p < 0.000000001$ ) and nonvalue-added activity expenses per episode of care ( $r = 0.70$ ,  $p < 0.000000001$ ). The number of office visits also varied significantly by payer type ( $p = 0.000003$ ) and treatment type ( $p < 0.000000001$ ). Thus, payer type, treatment type, and the number of office visits were all included in the general linear model analyses of practice expenses.

### Combined Effects of Payer Type, Treatment Type, and Number of Office Visits

The general linear model analyses found that payer type ( $p < 0.000000001$ ), treatment type ( $p = 0.001$ ), and the number of office visits ( $p < 0.000000001$ ) were each significantly related to total practice expense per episode of care. The number of

office visits was the most important predictor of total practice expense per episode of care ( $p < 0.0000000001$ ). The next most important predictor was payer type ( $p < 0.0000000001$ ) (Table V). Overall, all three factors together accounted for 95% of the total practice expense per episode of care. Payer type and treatment type together accounted for 65% of the total practice expense per episode of care, with the number of office visits accounting for an additional 30%.

The general linear model analyses found that payer type ( $p = 0.0000000001$ ) and the number of office visits ( $p < 0.0000000001$ ) were each significantly related to value-added activity expenses per episode of care. Treatment type was not significantly ( $p = 0.064$ ) related to value-added activity expenses. The number of office visits was the most important factor ( $p < 0.0000000001$ ), accounting for >90% of the value-

added activity expenses. Payer type, although significant ( $p = 0.0000000001$ ), was much less important in explaining the value-added activity expenses.

The general linear model analyses found payer type ( $p < 0.0000000001$ ), treatment type ( $p = 0.0001$ ), and the number of office visits ( $p < 0.0000000001$ ) were each significantly related to nonvalue-added activity expenses per episode of care. Payer type was the most important factor accounting for nonvalue-added activity expenses, followed by the number of office visits. Overall, the three factors together accounted for 64% of the nonvalue-added activity expenses per episode of care. The payer type and the number of office visits together accounted for 59% of the nonvalue-added activity expenses. Interestingly, payer type and treatment type together accounted for 56% of nonvalue-added activity expenses. Thus,

TABLE IV Orthopaedic Practice Expenses by Activity\*

Activity	Self-Pay	Indemnity Plan	Medicare	PPO	HMO/POS	Workers' Compensation	Average of All Payer Types
Providing service to patients in office	\$21.49	\$29.15	\$20.43	\$22.69	\$29.95	\$55.06	\$27.17
Scheduling and performing in-office surgeries	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Scheduling and coordinating surgery patients in hospital or external facility	\$7.61	\$11.38	\$6.99	\$8.79	\$11.42	\$17.97	\$10.09
Providing service to patients in hospital or external facility	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Obtaining insurance authorization	\$0.51	\$5.55	\$2.32	\$8.91	\$10.65	\$16.39	\$8.70
Maintaining medical records	\$13.96	\$20.94	\$12.51	\$16.71	\$21.92	\$30.45	\$18.83
Billing	\$1.58	\$4.25	\$4.17	\$4.72	\$4.78	\$6.95	\$4.59
Collecting payments	\$2.99	\$8.06	\$7.92	\$8.97	\$9.08	\$13.20	\$8.72
Resolving collection disputes and rebilling charges	\$7.88	\$21.23	\$20.85	\$23.61	\$23.90	\$34.73	\$22.96
Providing information to third parties	\$3.31	\$8.92	\$8.76	\$9.92	\$10.04	\$14.59	\$9.64
Making radiographs	\$5.43	\$5.31	\$7.65	\$5.79	\$4.62	\$5.99	\$5.56
Applying cast	\$0.39	\$0.52	\$0.14	\$0.25	\$0.22	\$0.44	\$0.26
Providing occupational therapy or physical therapy	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Maintaining professional education	\$0.17	\$0.28	\$0.23	\$0.28	\$0.32	\$0.48	\$0.29
Sustaining business by managing and coordinating practice	\$25.53	\$31.02	\$27.47	\$29.57	\$31.53	\$33.85	\$30.01
Maintaining facility	\$32.00	\$48.11	\$28.56	\$38.15	\$49.42	\$68.75	\$42.77
Teaching and research	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$122.85	\$194.71	\$148.01	\$178.38	\$207.83	\$298.85	\$189.59

\*PPO = preferred provider organization, HMO = health maintenance organization, and POS = point-of-service agreement. Totals may not equal column sums because of rounding.

**TABLE V Summary of Each Factor's Effect Size (Partial R<sup>2</sup> Value) for Explaining Practice Expenses per Episode of Care\***

Variables	Total Practice Expenses	Value-Added Activity Expenses	Nonvalue-Added Activity Expenses
Payer type	18.3%	10.4%	22.7%
Treatment type	2.1%	0.7%	3.0%
Number of office visits	85.3%	92.6%	16.6%
Combined effect of payer type, treatment type, and number of office visits	94.9%	97.3%	63.6%

\*The values represent the proportion of practice expenses that is accounted for by each factor in the general linear model analyses.

the number of office visits accounted for only an additional 8% (64% minus 56%) of nonvalue-added activity expenses.

### Self-Pay Versus Other Payer Types

The total practice expense per office visit incurred by the patients in the self-pay group was significantly ( $p < 0.00008$ ) lower for both nonoperative and operative treatment compared with all other payer types (see Table III). One exception was for operative treatment in the patients in the indemnity group who had an average of only \$7.13 more per office visit than did patients in the self-pay group; the difference did not reach significance ( $p = 0.44$ ).

The differences in total practice expense per office visit between self-pay and the other payer types were primarily attributable to the significant ( $p < 0.00008$ ) differences in nonvalue-added activity expenses per office visit. Most of the payer types did not differ significantly from the self-pay type for value-added activity expenses per office visit.

### Discussion

Activity-based costing produces a detailed accounting of the actual expenses that are associated with all of the functions required for the practice of orthopaedic medicine<sup>5,8,9</sup>. The methodology of activity-based costing was applied by Brinker et al.<sup>8</sup> to a large orthopaedic group practice. In that study, Brinker et al.<sup>8</sup> reported an average cost of approximately \$99 per office visit. While the data from that investigation offered important new information with regard to orthopaedic practice expenses, the retrospective nature of the study did not allow for detailed multivariate analyses.

The current study used activity-based costing prospectively to track practice expenses for each individual patient. This allowed a detailed analysis of the actual practice expenses. Our results supported our hypothesis that payer type was related to practice expenses per episode of care even after accounting for age, gender, and the number of office visits. Patients in the self-pay group incurred the lowest total practice expenses per episode of care, whereas patients in the Workers' Compensation group incurred the highest.

The treatment type also affected practice expenses. Operative treatment increased practice expenses, but the effect of treatment type differed among the various payer types. For example, the increase in total practice expense per office visit in

the operative subgroup was only \$2.61 for the patients in the self-pay group compared with increases of \$11.22 per office visit for the patients in the PPO group and \$19.64 per office visit for the patients in the Workers' Compensation group.

Both payer type and treatment type must be considered when interpreting orthopaedic practice expenses, particularly for nonvalue-added activity expenses. The combined effects of payer type and treatment type explained 56% of the nonvalue-added activity expenses per episode of care. The number of office visits accounted for only an additional 8% of the nonvalue-added activity expenses. In contrast, the number of office visits was the primary determinant of value-added activity expenses per episode of care.

The estimated total practice expense per episode of care by payer type reported in the present study is useful to orthopaedic practices in discussions with payers about contracted fee schedules. Our findings allow an orthopaedic practice to evaluate whether a negotiated reimbursement rate is adequate to provide services for the payer's population. In addition, specific third-party payers can be compared with other third-party payers within the same payer type, which may be useful when deciding whether renewal of a contract with a specific insurance company would be profitable.

Both PPO and HMO/POS payers, for example, establish contracted reimbursement arrangements for orthopaedic surgical services. The total practice expense associated with operative treatment of sports-related knee disorders for the average patient in the PPO group was \$308.34 per episode of care. For the average patient in the HMO/POS group, the total practice expense was \$336.83 per episode of care. Thus, the orthopaedic group should negotiate a contracted arrangement with HMO/POS payers that will reimburse the additional \$28.49 of practice expenses. It is intriguing and counterintuitive that use of the HMO/POS providers, who promote their network as an effective method of controlling health-care costs, resulted in a 9.2% increase in orthopaedic practice expenses compared with the PPO group and a 42.9% increase in expenses compared with the self-pay group (\$235.69 per episode of care).

The differences among payer types with respect to total practice expense per episode of care were shown to be primarily due to differences in nonvalue-added activity expenses. Payer type, treatment type, and the number of office visits each independently affected nonvalue-added activity ex-

penses. As the nonvalue-added activities do not add value to the treatment that the patient receives, the practice expenses associated with them can be considered wasted resources<sup>8</sup>.

There is a rational explanation for the differences among the payer types with respect to nonvalue-added activity expenses. The payer types differed with respect to four factors: (1) the party responsible for payment, (2) the presence of a contractual arrangement with the orthopaedic group, (3) whether access to specialty care is open or restricted, and (4) the requirements for pretreatment authorization. These four factors are directly reflected in the three nonvalue-added activities: obtaining insurance authorization, resolving collection disputes and rebilling charges, and providing information to third parties. The differences in nonvalue-added activity expenses among the various payer types found in the present study can be explained in terms of these activities.

In the current study, the estimated proportion of total employee hours spent on the three nonvalue-added activities varied by payer type. Only 14% of total employee hours were allotted to nonvalue-added activities for patients in the self-pay group, whereas >30% of total employee hours were allotted to nonvalue-added activities for the patients in the PPO, HMO/POS, and Workers' Compensation groups. Nonvalue-added activities accounted for 25% of total employee hours for patients in the indemnity and Medicare groups. Previously, Brinker et al.<sup>8</sup> found that an average of 26% of total employee hours was spent in the performance of the three nonvalue-added activities.

More specifically, since the various payer types require different degrees of pretreatment authorization, they should differ with respect to the practice expenses associated with the nonvalue-added activity of obtaining insurance authorization. Post hoc exploratory multivariate regression analyses of our data revealed that payer type and treatment type accounted for 81% of the practice expenses associated with the activity of obtaining insurance authorization. The number of office visits was not a substantial contributing factor when accounting for expenses associated with the activity of obtaining insurance authorization.

With use of similar analyses, an exhaustive investigation of the determinants of practice expenses associated with all seventeen practice activities is possible. This detailed information could be used to analyze different cost centers within an orthopaedic practice, to make operational changes, to control or decrease practice expenses, to negotiate insurance contracts, or to estimate a budget<sup>3-6</sup>.

We performed an extensive analysis of the sources of orthopaedic practice expenses in one surgeon's practice. The total practice expense per episode of care and the nonvalue-added activity expenses per episode of care for patients with a sports-related knee disorder depend more on payer type and treatment type than on the number of office visits. Orthopaedic practice expenses vary widely according to payer type. The practice expenses incurred by patients in the Workers' Compensation group are higher than those incurred by patients in any of the other payer groups. Patients who self-pay have the lowest nonvalue-added activity expenses, whereas patients in PPO and HMO/POS groups have higher nonvalue-added activity expenses than do patients on an indemnity plan and those on Medicare. ■

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