Economic Evaluation of Four Treatments for Low-Back Pain

Results From a Randomized Controlled Trial

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Objective: We sought to compare total outpatient costs of 4 common treatments for low-back pain (LBP) at 18-months follow-up.
Methods: Our work reports on findings from a randomized controlled trial within a large medical group practice treating HMO patients. Patients (n = 681) were assigned to 1 of 4 treatment groups, ie, medical care only (MD), medical care with physical therapy (MDPt), chiropractic care only (DC), or chiropractic care with physical modalities (DCPm). Total outpatient costs, excluding pharmaceuticals, were measured at 18 months. We did not perform a cost-effectiveness analysis because previously published findings showed no clinically meaningful difference in outcomes among the 4 treatment groups. Thirty-seven participants were lost to follow-up at 18 months, leaving a final sample size of n = 654.
Results: Adjusting for covariates, DC was 51.9% more expensive than MD ($P < 0.001$), DCPm 3.2% more expensive than DC ($P = 0.76$), and MDPt 105.8% more expensive than MD ($P < 0.001$). The adjusted mean outpatient costs per treatment group were $369 for MD, $560 for DC, $579 for DCPm, and $760 for MDPt.
Conclusions: This study is the first randomized trial to show higher costs for chiropractic care without producing better clinical outcomes, but our findings are likely to understate the costs of medical care with or without physical therapy because of the absence of pharmaceutical data. Physical therapy provided in combination with medical care and physical modalities provided in combination with chiropractic care do not appear to be cost-effective strategies for treatment of LBP; they produce higher costs without clinically significant improvements in outcome.

Key Words: low-back pain costs, medical versus chiropractic care, physical therapy, physical modalities

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The costs of low-back pain (LBP) have a substantial impact on the US health care system. Low-back pain is the second most frequently cited reason for seeking primary care services[1] and is believed to result in more disability among working-age adults than any other health condition.[2] National estimates of the direct costs of care for LBP range from $25 to $33 billion annually.[3,4] These data suggest a central role for research in identifying cost-effective treatments for LBP, as well as those patient characteristics associated with relatively greater costs.

Although various treatments are available for LBP, outcome studies to date have not provided conclusive findings regarding their cost effectiveness. A prospective cohort study of 1555 patients who had chosen treatment by chiropractors, orthopedic surgeons, or primary care physicians (PCPs) found no differences in health outcomes at 6 months; however, treatment costs were lower for health maintenance organization (HMO) providers and PCPs.[5] Shortly after Sweden began reimbursing chiropractic services in its national health program, researchers conducted a randomized controlled trial of chiropractic versus physical therapy (PT) among patients with either neck or low-back pain and found no differences in either outcomes or costs at 6 months.[6] In the United States, however, the 3 major previous studies to conduct a direct comparison of the costs of chiropractic versus medical care for LBP have shown conflicting results regarding which providers are less expensive, with 2 of the studies indicating chiropractors having higher costs.[5,7,8]

Observational and experimental studies suggest inconsistent or no differences in LBP or physical functioning in patients receiving chiropractic care versus medical care,[5] PT,[6,9,10] or care provided by orthopedic surgeons,[5] which has led some to speculate that changes in LBP may owe more to the natural history of the condition than to treatment.[5] This absence of conclusive findings on differences in treatment effectiveness, combined with pressures to control expenditures, has increased the usefulness of analyses of the marginal costs of alternative LBP treatments. However, previous work on costs has been limited in several important respects. Although research from Sweden has made important contributions to this area, it is problematic to generalize findings from countries with national health insurance to the United States. Studies relying solely on administrative databases lack health status measures that can adequately account for the impact of case-mix differences on costs.[7] Other studies have failed to include medical care[6] or PT,[5] 2 of the most commonly used approaches to LBP, as comparison treatments.

This article reports on findings from the UCLA Low-back Pain Study, a randomized controlled trial within a large medical group practice in which LBP patients were randomly assigned, in a balanced design, to 4 treatment groups: medical care without PT (MD); medical care with PT (MDPt); chiropractic care without physical modalities (DC); and chiropractic care with physical modalities (DCPm). By examining 4 treatment categories, this study provides more specific information regarding the costs of LBP care. Advances over previous work also include extensive patient-reported health-status measures and an 18-month follow-up period with relatively little loss to follow-up (10%). Our findings also may be more applicable in light of current methods of financing health care because the study was conducted in a prepaid group practice located in a geographic region (Southern California) with the highest level of managed care penetration in the United States.[11]

METHODS

The sampling frame was a large medical group practice with 3 sites in Southern California that contracted with multiple HMOs on a capitated basis. Eligible subjects were members of various HMOs who chose this 200-physician medical group as their primary care provider. Members were considered potential subjects if, at some time between October 30, 1995 and November 9, 1998, they presented with a complaint of LBP (with or without leg symptoms) to a staff clinician at one of the 3 facilities serving as study sites. Additional inclusion criteria included not receiving treatment of LBP in the previous month and being at least 18 years of age. All patients presenting with LBP were interviewed by the study team's on-site field coordinator to determine their eligibility for the study. Patients meeting the inclusion criteria were asked if they were willing to participate in a randomized study designed to assess the effectiveness and costs of different treatment strategies for their LBP.

Potential subjects were excluded if they had LBP as the result of fracture, tumor, infection, spondyloarthropathy, or other diagnosed nonmechanical cause; had any severe coexisting condition that threatened their 18-month survival or may have otherwise interfered with their ability to maintain study participation; had a blood coagulation disorder or were using anticoagulant medications; had progressive muscle weakness in a lower extremity; had signs or symptoms of cauda equina syndrome; planned to relocate within the study period; were not easily accessible by telephone; could not read English; or were involved with third-party liability or workers' compensation as a result of their low-back problem.

A total of 2355 patients were approached to enroll in the study; 886 were excluded using the aforementioned criteria and 788 refused to participate, leaving 681 study participants. Of these, 37 were lost to follow-up, leaving 654 participants with completed 18-month follow-up utilization and outcome data. Additional detail on the process of enrolling patients and study design has been published previously.[12]

Study Design

After giving informed consent to participate in the study, subjects were randomly assigned to 1 of the 4 treatment groups. The specific therapies received by study participants varied with treatment group; our study did not impose treatment protocols on providers.

Medical Care (MD)

Subjects assigned to this group received one or more of the following at the discretion of a primary care physician: instruction in proper back care and exercises, bed rest, pain relievers (primarily narcotic analgesics), muscle relaxants, antiinflammatory agents, and other medications for symptom reduction (primarily over-the-counter pain relievers).

Medical Care with Physical Therapy (MDPt)

Subjects assigned to this group received medical care as described above, instruction in proper back care and exercises from a physical therapist, plus one or more of the following at the discretion of the physical therapist: heat, cold, ultrasound, electrical muscle stimulation, soft tissue and joint mobilization, mechanical traction, and supervised exercise.

Chiropractic Care (DC)

Subjects assigned to this group received spinal manipulation or another spinal-adjusting technique and instruction in proper back care and exercises.

Chiropractic Care with Physical Modalities (DCPt)

Subjects assigned to this group received chiropractic care as described above, plus one or more of the following at the discretion of the chiropractor: heat, cold, ultrasound, and electrical muscle stimulation. These services were described as physical modalities because they were provided by a chiropractor rather than a physical therapist.

Because the study site was a large medical-group practice treating only HMO patients, and all providers received capitated payments, providers in this study had no financial incentive for overutilization. We did not have data on out-of-plan utilization. However, because HMO members would incur 100% of the cost of out-of-plan treatments, we do not view this as a serious limitation.

Data

Baseline and 18-month follow-up data for these analyses were obtained using a detailed questionnaire developed for this study. Utilization data were obtained directly from the billing department of the medical group and consisted of itemized services provided during each patient encounter using Current Procedural Terminology, 4th Edition (CPT-4) codes to define services. We defined categories of service according on the following ranges of CPT codes: (1) office visits, 99200–99215, 99241–99245, 99381–99398, and 98931–98944; (2) physical therapy, 97000–97999; (3) LB surgery, 63030–36034; (4) LB injection, 62260–63029, and 64400–64451; and (5) all other outpatient services included all remaining CPT codes.

Each service also had as many as 5 *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) diagnoses codes, which were used to distinguish services for LBP care from services for other, non-LBP conditions. A service was categorized as LBP care if one of the ICD-9-CM codes listed in Table 1 was associated with the service.

Outcome Variables

Our primary objective is to compare costs among treatment groups rather than to conduct a formal cost-effectiveness analysis because we found in previously reported analyses that there were no clinically meaningful differences in outcomes among the 4 treatment groups after 6 months.[12] Thus, the primary outcome variable for this analysis was outpatient costs for LBP care, which included office visits and diagnostic and therapeutic services. We collected outpatient utilization data for LBP care during the 18-month period, including baseline visits.

TABLE 1. IC9-CM Codes Used to Define Low-Back Pain

353.1, 353.4
715.0, 715.5, 715.90
719.4
720.0, 720.2
721.3, 721.4, 721,42, 721.8, 721.90, 721.91
722.1, 722.10, 722.3, 722.51, 722.52, 722.6, 722.7, 722.73, 722.8, 722.83, 722.9, 722.93
724.00, 724.02, 724.2, 724.3, 724.4, 724.5, 724.6, 724.7, 724.79, 724.8, 724.9
729.1
737.0, 737.30, 737.39
739.3, 739.4, 739.5
839.2, 839.20, 839.3, 839.30, 839.41, 839.42
846.0, 846.1, 846.2, 846.3, 846.8, 846.9
847.2, 847.3, 847.4, 847.9

To estimate costs for LBP outpatient care, we used charges reported by the medical group practice for each CPT code. Because all participants in this study were HMO members, they did not pay for their care on a fee-for-service basis. However, these charges represent what the patients would have been billed had they been fee-for-service patients. In separate analyses not presented here, we confirmed that these charges were comparable to payment rates under the Medicare Fee Schedule, so we used these charges without further adjustment. LBP care costs included charges for diagnostic and therapeutic modalities directly related to low-back conditions, whether licensed professionals or clinical support staff such as aides and assistants provided these services.

Study participants had the same benefits for LBP care, but because the medical group where the study took place contracts with multiple HMOs, patient copayments vary. We incorporated the impact of these varying copayments into our multivariate analyses.

Data on the costs of pharmaceuticals for our study participants were not available because the medical group's patient utilization database does not track pharmaceutical use. Our ambulatory cost estimates are thus understated. Specifically, patients in the medical care treatment groups were more likely to report initial prescription drug use (69% versus 15% at 2 weeks, and 46% versus 16% at 6 weeks), but at 6 months this difference was less pronounced (32% versus 24%). Chiropractic patients were more likely to report use of over-the-counter pain medications (58% versus 50% at 2 weeks, 56% versus 51% at 6 weeks, and 56% versus 59% at 6 months). As a result, our findings likely understate the costs of medical care treatment relative to chiropractic treatment.

Independent Variables

Our basic conceptual model in these analyses estimates total outpatient costs as a function of treatment group, demographics, baseline functional status and pain, and copayment for office visits. The key independent variable in the statistical analyses is random treatment assignment, as defined by the 4 groups described previously. We examined all 6 possible contrasts between the 4 groups, but were particularly interested in 3 comparisons among the 4 treatment groups, namely, DC versus MD, DC versus DCPm, and MDPt versus MD. These contrasts were of particular interest because we are interested in identifying the additional impact on outcomes and costs of physical therapy for patients treated by physicians and of physical modalities for patients treated by chiropractors. Additional variables that might affect costs of care regardless of treatment assignment, such as demographic characteristics and baseline indicators of pain and functioning, also are included. Because previous work suggests that medical comorbidity increases care seeking among patients with LBP,[13] we initially included several chronic medical diagnoses present at baseline (eg, diabetes, depression, and hypertension) in the analyses but eventually dropped these from our final model because they had no predictive power.

Demographic characteristics are represented by 4 variables. Age is a continuous variable measured in 5-year increments. Race/ethnicity is categorized as black, Asian/Pacific Islander, Latino, white, and other (the latter category includes Native Americans and Alaskan Natives). Highest educational attainment is categorized as less than high school, high school diploma, some college, and bachelor degree or more. Gender also is included.

Functional health status is measured at baseline by 3 scales that index the ability to perform activities of daily living and the extent of LBP. The questions that constitute the physical functioning and role/emotional functioning subscales of the Short Form-36 developed in the Medical Outcomes Study[14] were administered at the baseline interview. Briefly, the physical functioning subscale assigns a numeric score ranging between 0 and 100 that summarizes respondents' ability to engage in activities such as stair climbing, walking, running, and shopping. The role/emotional functioning subscale does the same for social activities such as work.

Participants were asked to rate their average LBP in the week before the baseline interview on a 0–10 pain scale, with 0 indicating no pain and 10 unbearable pain. In addition, patients also were asked to indicate whether they had LB-related lower-extremity pain. To estimate the effects of chronic and recurrent LB problems on costs of care in the study period, a dichotomous variable was created that identified participants who had reported experiencing 10 or more lifetime episodes of LBP. Duration of the current episode of back pain at baseline was used to create the following variables: acute (<3 weeks); subacute (3 weeks to 1 year); and chronic (>1 year). These definitions of acute, subacute, and chronic were based on break points determined after empirical analysis of this variable's distribution. Dichotomous variables also were included to represent whether patients had ever had an epidural spinal injection or attended back school.

To control for the possible effect of office copayments on utilization and, thus, costs, we included a variable indicating the patient's copayment amount per office visit. This may be particularly important because cost sharing has been shown to have a greater impact on the use of chiropractic services than medical services.[15]

Statistical Analyses

The first analysis we conducted was an ordinary least squares (OLS) regression, using only 3 indicator variables to reflect treatment-group comparisons: chiropractic care (DC), chiropractic care plus PM (DCPm), and medical care plus PT (MDPt), compared with medical care alone (MD) as the reference category. In addition, we directly estimated and tested for differences between DC and DCPm. Because the cost variable was highly skewed, we conducted our analysis after transforming costs using the logarithmic scale, which made the cost variable nearly normal.

After examining the residuals of these regressions for normality and checking for heteroscedasticity, we retransformed the regression coefficients for the categorical variables using the formula $(e^{B} - 1) \times 100$. This transformation is appropriate when the errors are normal and homoscedastic[16] and should be interpreted as the percentage difference in costs between that variable and the comparison (ie, excluded) group.

RESULTS

Descriptive information about the study sample is shown in Table 2. There are some slight differences between the 4 treatment groups across the independent variables; however, the groups appear to be generally comparable. In general, study participants in the chiropractic treatment groups had more visits (6.91 for DC and 7.46 for DCPm) relative to those in the medical treatment groups (4.40 for MD and 6.60 for MDPt). This difference in utilization of office visits primarily accounts for the higher average outpatient costs observed in the chiropractic treatment groups. A substantial portion (59%) of the average outpatient costs of the MDPt treatment group is attributable to PT.

Results for the unadjusted analysis of treatment group effects are shown in Table 3. The LBP outpatient costs are lowest for patients assigned to medical care alone (MD group). DC is 71.8% more expensive than MD ($P < 0.001$); DCPm 13.5% more expensive than DC ($P = 0.27$); and MDPt 114.0% more expensive than MD ($P < 0.001$).

This difference in outpatient costs is reduced somewhat in the model that includes demographic characteristics, baseline functional status and pain indicators, and other patient characteristics (Table 4). All 3 of our primary contrasts of interest have lower cost differences after adding the covariates; DC is 51.9% more expensive than MD ($P < 0.001$), DCPm 3.2% more expensive than DC ($P = 0.77$), and MDPt 105.8% more expensive than MD ($P < 0.001$). These cost differences correspond to LBP outpatient costs per treatment category, adjusted for the covariates, equal to \$369 for MD, \$560 for DC, \$579 for DCPm, and \$760 for MDPt.

Several of the covariate have a significant impact on outpatient costs at the $P = 0.05$ level. Age is associated with

TABLE 2. Patient Characteristics by Treatment Groups: Frequencies and Means*

	Mean (SD) or % (n) Within Each Treatment Group				
Characteristic	**Chiropractic (DC)**	**Chiropractic + PM (DCPm)**	**Medical (MD)**	**Medical + PT (MDPt)**	***P* Value**
Age	51.9 (16.5)	53.6 (16.8)	49.6 (16.7)	49.2 (16.7)	0.056
Female	48.8 (79)	58.3 (95)	46.9 (76)	53.9 (90)	0.159
Race/ethnicity					0.631
Black	3.1 (5)	3.1 (5)	1.0 (3)	3.6 (6)	
Asian/Pacific Islander	6.8 (11)	3.1 (5)	4.3 (7)	4.8 (8)	
Hispanic	27.8 (45)	25.2 (41)	30.3 (49)	34.1 (57)	
White	61.1 (99)	66.3 (108)	61.1 (99)	53.0 (90)	
Other	1.2 (2)	2.5 (4)	2.5 (4)	3.6 (6)	
Education					0.096
Less than high school	9.5 (16)	8.1 (14)	7.7 (13)	7.7 (13)	
High school degree	22.5 (38)	23.3 (40)	16.5 (28)	23.5 (40)	
Some college	46.2 (78)	38.4 (66)	38.8 (60)	34.7 (59)	
Bachelor's or more	21.9 (37)	30.2 (52)	37.1 (63)	34.1 (58)	
Stage of chronicity					0.826
Acute	11.1 (18)	12.3 (20)	13.6 (22)	12.0 (20)	
Subacute	43.2 (70)	43.6 (71)	35.8 (58)	39.5 (66)	
Chronic	45.7 (74)	44.1 (72)	50.6 (82)	48.5 (81)	
Pain scale at baseline	4.6 (1.9)	4.7 (1.8)	4.4 (1.9)	4.9 (2.0)	0.217
Lower-extremity pain at baseline	61.1 (99)	56.4 (92)	54.3 (88)	60.5 (101)	0.547
Epidural, ever	8.0 (13)	8.6 (14)	8.0 (13)	12.0 (20)	0.544
Back school, ever	8.0 (13)	4.3 (7)	3.0 (5)	8.4 (14)	0.104
SF-36 Physical function score at baseline	65.9 (25.1)	59.1 (23.9)	63.7 (22.8)	59.3 (26.0)	0.028
SF-36 Emotional function score at baseline	74.7 (38.9)	66.3 (40.9)	68.5 (38.3)	69.9 (39.1)	0.262
Average LBP OP costs, 18 months	$550 (834)	$565 (547)	$463 (1255)	$765 (1040)	0.032
Average number of visits	6.91 (6.41)	7.46 (5.56)	4.40 (5.00)	6.60 (5.91)	<0.001
Average visit costs†	$393 (378)	$414 (307)	$238 (269)	$201 (249)	<0.001
Average PT costs†	$64 (261)	$93 (268)	$66 (226)	$448 (511)	<0.001
Average LB surgery costs†	$43 (544)	$0 (0)	$49 (626)	$54 (699)	0.796
Average LB injection costs†	$12 (89)	$9 (88)	$39 (205)	$26 (137)	0.179
Average other OP costs†	$17 (102)	$27 (81)	$60 (292)	$26 (103)	0.097
Average total copayments	$21 (32)	$21 (29)	$11 (17)	$10 (17)	<0.001
n	162	163	162	167	

Variables are measured at baseline unless otherwise indicated. Patients were assigned to treatment groups, randomized in blocks of 12, within each of the 3 study sites; no other patient characteristics were accounted for in the randomization scheme.

*Because of rounding, column percentages for each variable may not add to 100.

†CPT codes used to define categories of service: visits: 99200–99215, 99241–99245, 99381–99398, 98931–98944; PT: 97000–97999; LB surgery: 63030–36034; LB injection: 62260–63029, 64400–64451; other OP services: all remaining CPT codes.

LBP indicates low-back pain; PT, physical therapy; PM, physical modalities.

an 11.5% increase in costs for every 5-year age increment. Lower education levels generally result in lower costs. Higher pain at baseline is associated with increased outpatient costs, and higher physical and emotional functioning as measured by the SF-36 is associated with lower costs. Finally, higher copayments result in lower overall costs. For every 5-dollar increase in copayment per visit, total costs are increased by 32.0%.

TABLE 3. Unadjusted Percent Difference in LBP Outpatient Costs at 18 Months, by Treatment Group

Comparison	% Difference	95% CI	*P* Value
MDPt versus MD	114.0	(70.5–168.6)	<0.001
DCPm versus DC	13.5	(−9.7–42.6)	0.269
DC versus MD	71.8	(36.6–116.1)	<0.001
MDPt versus DCPm	9.8	(−12.5–37.7)	0.410
DCPm versus MD	95.0	(55.1–145.1)	<0.001
MDPt versus DC	24.5	(−0.8–56.3)	0.054
n	654		
Adjusted R^2	0.07		
F statistic (3, 650)	17.75		
P value	<0.001		

CONCLUSIONS

Previous studies comparing the costs of medical versus chiropractic treatment of LBP have demonstrated conflicting evidence regarding which providers have the lowest costs. Our findings that medical care is less expensive than chiropractic care supports the evidence found in 2 of 3 previous studies focusing on costs of alternative treatments.[5,8] Our study produced additional information about the impact of medical care combined with physical therapy, and chiropractic care combined with physical modalities provided by the chiropractor. PT more than doubled the cost of treatment of medical care patients, whereas physical modalities had a minimal impact on the costs of chiropractic care. Some of this differential impact could be attributable to reduced use of CPT codes for physical modalities by chiropractors. Physical

TABLE 4. Percent Difference in LBP Outpatient Costs at 18 Months

Variable (Reference Group Omitted)	% Difference	95% CI	*P* Value
Treatment			
MDPt versus MD	105.8	(67.3–153.2)	<0.001
DCPm versus DC	3.2	(−16.3–27.3)	0.763
DC versus MD	51.9	(22.7–88.0)	<0.001
MDPt versus DCPm	31.3	(6.4–62.0)	0.010
DCPm versus MD	56.8	(26.9–93.7)	<0.001
MDPt versus DC	35.5	(9.6–67.4)	<0.001
Age (5-year increments)	11.5	(8.8–14.3)	<0.001
Female gender (male)	6.5	(-8.4–23.7)	0.40
Race/ethnicity (white)			
Black	32.4	(−15.0–106.3)	0.206
Asian/Pacific Islander	22.9	(−14.1–76.0)	0.250
Hispanic	−6.7	(−21.6–11.2)	0.431
Other	61.5	(−1.5–164.8)	0.053
Education (college or higher)*			
<High school	−26.9	(−46.2 to −0.6)	0.042
High school	−12.1	(−29.1–9.1)	0.233
Some college	−12.3	(−26.7–4.9)	0.143
Stage (chronic)			
Acute	−8.7	(−28.5–16.4)	0.452
Subacute	0.7	(−14.2–18.2)	0.919
Pain scale at baseline (0–10 scale)	5.1	(0.6–9.7)	0.022
Lower-extremity pain at baseline (none)	2.0	(−12.7–19.2)	0.800
Epidural (1 = ever, 0 = never)	−3.5	(−25.8–25.6)	0.789
Back school (1 = ever, 0 = never)	28.5	(−6.1–75.7)	0.110
SF-36 Physical function score at baseline (0–100 scale)	−0.4	(−0.7 to −0.1)	0.018
SF-36 Emotional function score at baseline (0–100 scale)	−0.2	(−0.4–0.0)	0.076
Copayment ($5 increments)	32.0	(20.1–45.1)	<0.001
Constant	73.8	(43.6–125.0)	<0.001
F	11.46		
Adjusted R^2	0.2525		

CI indicates confidence interval.

therapists may be more likely to record appropriate CPT codes when they deliver care, whereas chiropractors delivering the same services may view those services as part of the office visit.

In separate analyses,[12] we found no difference in clinical outcomes at 6 months when comparing the MD versus DC or the DC versus DCPm treatment group. MDPt produced a significant improvement relative to the MD treatment group measured by the Roland–Morris Disability score (1.26 points; $P < 0.05$), but this difference is not clinically significant. In further analyses, we found that patient satisfaction was higher for chiropractic patients than for medical care patients.[17] The fact that clinical outcomes were generally not different between treatment groups suggests that higher utilization of chiropractic care, either alone or combined with physical modalities, is not necessarily a cost-effective strategy for treatment of LBP. On the basis of our previous findings and findings reported here, physical therapy combined with medical care does not appear to be cost-effective when compared with medical care alone because the higher costs do not appear to produce clinically significant improvements in outcomes. This finding merits further investigation because it is inconsistent with other recent findings from a randomized clinical trial showing that exercise combined medical care is a cost-effective LBP treatment relative to medical care alone.[18]

Our study design had several notable advantages over previous economic evaluations of LBP treatment. It is the first randomized clinical trial to directly assess the costs and outcomes of medical care versus chiropractic care for treatment of LBP in the United States. Our study design also benefited from being based in a large medical group practice treating HMO patients, in which all providers were capitated and thus faced the same economic incentives to avoid overutilization of services. Our study included physical therapy and physical modalities, which are common strategies for LBP treatment that have not been compared in previous studies. Finally, we were successful in enrolling a large study population (n = 681) with little loss to follow-up at 18 months (n = 654).

Our findings also are subject to several important limitations. Our findings may not be generalizable to other target populations with LBP, specifically, those in fee-for-service settings, those in managed-care settings without capitation, and those with work-related injuries treated by worker's compensation. Because of our inability to obtain detailed pharmaceutical data on our study participants, our cost comparisons between treatment groups may be biased. On the basis of previous findings,[5] we are likely to have overstated the cost difference between chiropractic care alone versus medical care alone. At least one previous study found that chiropractic care was less costly because of lower rates of hospitalization.[7] In separate analyses not presented here, we examined inpatient hospitalization rates and costs for LBP and found that inpatient costs were essentially the same across the treatment groups because 3 of the 4 groups had only 1 hospitalization for LBP, whereas the other had none. Furthermore, we observed little difference between the treatment groups in the rates of surgery for non-LBP conditions. However, our study population may have been too small to detect relevant differences in surgery rates.

LBP continues to be a major source of disability throughout the United States. and the world. Effective treatments of LBP, as well as cost-effective treatments, have been difficult to identify. We conclude, on the basis of our study results, that chiropractic care with or without physical modalities is more expensive than medical care without physical therapy, but produced similar clinical outcomes after 6 months.[12] Because our study did not have pharmaceutical data, however, our findings most likely overstate the higher costs of chiropractic care. MDPt was the most expensive of the treatment groups, and the higher costs of this group are understated by the absence of pharmaceutical data. Therefore, it appears from the combined results of our previously work and the cost analyses presented here that PT provided in combination with medical care and physical modalities provided in combination with chiropractic care are not cost-effective strategies for treatment of LBP. These additional treatments lead to higher costs without clinically significant improvements in outcomes.

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