Chiropractic and Medical Care Costs of Low Back Care: Results From a Practice-Based Observational Study

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Objective: To compare the 1-year costs for patients treated for acute and chronic ambulatory low back pain by medical physicians and chiropractors.

Study Design: Prospective, practice-based observational study undertaken in 13 general medical practices and 51 chiropractic community-based clinics.

Patients and Methods: Of 2872 study patients, 2263 had complete 1-year records of services. Service data, collected from billing records, chart audits, and provider questionnaires, were assigned relative value units that were converted into 1995 dollar costs. Prescription drug costs for medical patients were included. Patient data on health status, pain and disability, and socioeconomic characteristics were obtained from self-administered questionnaires.

Results: The direct office costs of treating both chiropractic and medical patients over a 1-year period were relatively small. Forty-three percent of chiropractic patients and 57% of medical patients incurred costs of less than $100. However, the mean costs associated with chiropractic patients ($214) were significantly higher than those for medical patients ($123), especially when compared with medical patients who were not referred for further treatment or evaluation ($103). Chiropractic patients had somewhat lower baseline levels of pain and disability than nonreferred medical patients, but the 2 groups were relatively similar on most patient characteristics. There also were no statistically significant differences in the improvements in pain and disability between these 2 groups of patients.

Conclusion: The results of this study indicate that patients treated in chiropractic clinics incur higher costs over a 1-year period, but have about the same degree of relief as nonreferred patients treated in medical clinics.

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The economic costs of back pain are substantial. A 1994 US Department of Health and Human Services report placed this nation's annual healthcare bill for back problems in the $20 to $50 billion range.[1] Other findings suggest that the indirect costs associated with absenteeism and lost productivity are even greater than the direct treatment costs.[2]

Nonmedical providers, particularly chiropractors, account for a significant share of back care provided.[3-7] It is thus important to determine what chiropractic patients are getting for their spending and whether chiropractors are relatively cost-efficient providers of care. These issues are becoming more relevant as chiropractic and other forms of alternative medicine are being increasingly integrated into managed care.[8-11]

Using literature reviews[12] as well as original studies,[13-15] Shekelle and colleagues provide a concise summary of the evidence on chiropractic cost effectiveness.[16] They acknowledge that most studies have found that chiropractic care is relatively cost efficient compared with medical care. Nevertheless, they also argue that chiropractic's favorable evaluation "has not been convincingly established" because "most studies have failed to compare equivalent patients, measure clinically useful outcomes, and include both direct and indirect costs in the comparisons."[16(p6)] Concerns about the methodologic rigor of existing chiropractic studies have been echoed elsewhere.[17,18] Some inves-

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tigators have found that chiropractic care costs even more than treatment by primary care physicians[19,20] while providing marginal patient benefits.[21]

In the face of unclear and sometimes contradictory results, more work is needed to guide patients, providers, and third-party payers. The research community faces a formidable challenge to developing a more complete picture of the economic impact of chiropractors and other practitioners. The costs of back care are difficult to measure due to the variability in the needs for treatment and the long-term duration of treatment for chronic patients. In addition, it is difficult to distinguish between care for the back and care for unrelated conditions or other conditions that are aggravated by the patient's back problems. For example, chiropractors who routinely perform full-spine manipulation may include manipulation of the lumbar spine in the treatment of neck pain.

Long-term, randomized clinical trials are widely recognized as the gold standard for determining efficacy. But, as the back pain research indicates, such trials do not necessarily ensure high quality.[18] They also are expensive, and in the case of chiropractic treatment, best suited to comparisons of methods of manipulation similar to chiropractic methods.[22] As a result of these limitations, investigators have adopted other approaches, such as administrative and survey databases, that can provide useful information about the efficacy and efficiency of alternative treatments for back problems.[23]

This report is derived from an ongoing longitudinal, prospective, practice-based observational study undertaken in general medical practices and chiropractic community-based clinics. A prospective, observational study of clinical activities and associated patient outcomes offers a pragmatic approach to assessment of therapeutic modalities by defining and quantifying the clinical problems seen by the physician in practice and the nature of the interaction between the physician's approach and the patient's response to treatment. An observational study also can be a useful complement to randomized clinical trials because the latter may not be generalizeable when therapist, setting, and patients are atypical.[24]

METHODS

Described in detail elsewhere,[25-27] the project involves 111 medical physicians in 13 general medical clinics and 60 chiropractic physicians in 51 chiropractic clinics. Except for 1 medical clinic located in Washington State, all other medical and chiropractic clinics are located in Oregon. The vast majority of participating chiropractors were in solo practice; only 8 practices consisted of 2 chiropractors. In contrast, the medical doctors generally worked in group practices. Four medical clinics were Oregon Health & Science University academic practices.

The study enrolled 2872 patients (1950 chiropractic and 922 medical) with acute and chronic ambulatory low back pain of mechanical origin between December 8, 1994, and June 30, 1996. The mean numbers of patients treated by the medical and chiropractic clinics, respectively, were 52.9 (SD = 93.9, median = 11.5, interquartile range = 7.0-61.0) and 33.1 (SD = 37.6, median = 17, interquartile range = 6.3-49.8). Information was collected on patient demographics, insurance type (though not whether it was managed care), health status, psychosocial characteristics, complaint characteristics, and physicians' practice activities. Patient data were obtained using self-administered questionnaires at the initial visit and at 5 follow-up periods (1 month, 3 months, 6 months, 9 months, and 1 year). Data on physician practice activities were obtained by questionnaire at each patient visit for treatment of low back pain and by chart audit at the end of the study.

Two patient outcomes measures were adopted:

1. Severity of present pain, as assessed by a 100-mm visual analog scale (VAS) score with the descriptive anchors "no pain" (0) and "excruciating pain" (100).
2. Functional disability, as measured with the Revised Oswestry Disability Questionnaire (OSW), a 10-item instrument designed to measure the effects of low back pain on daily activities such as personal care, lifting, walking, sitting, sleeping, and social life. For each question, patients choose 1 of 6 descriptive statements indicating the degree of dysfunction. The OSW score ranges from 0 to 100, with higher values reflecting greater disability.

These 2 outcome measures, widely used in back pain research,[28] are analyzed in other reports for this study.[26,27] Here, we focus on the costs of care that were provided in the participating clinicians' offices over a 1-year period and on cost comparisons between chiropractic and medical patients.

Services provided in the medical and chiropractic clinics were collected from billing records, chart audits, and provider questionnaires. The services were assigned Current Procedural Terminology (CPT) codes that were converted to relative value units

(RVUs) using 1995 Medicare RVUs for medical physicians[29] and 1995 RVUs from *The ChiroCode Book* for chiropractors.[30] ChiroCode RVU values correspond closely to Medicare RVUs but provide a more complete list than Medicare. If a procedure code did not have an RVU, an RVU value was interpolated based on the national charge for that procedure code compared with the national charge[31,32] for the most common procedure code for each group: an office visit (CPT code 99213) for medical physicians and regional manipulation (CPT code 97260) for chiropractors. We used the same methods to interpolate RVUs for procedure codes with no Medicare or ChiroCode RVUs and no national charge data. Based on relative charges from the billing information we collected, RVUs were interpolated from the mean billing charge of that procedure code compared with the mean billing charges for CPT codes 99213 for medical physicians and 97260 for chiropractors.

Costs were cumulated for each medical patient based on the RVUs and the national Medicare conversion factors for 1995. Prescription drug costs for medical patients, based on 1995 *Red Book* prices,[33] were calculated separately. As the RVUs for chiropractors are often the same as or very similar to Medicare RVUs, a different conversion factor was developed for chiropractors to reflect their lower fees. For example, CPT code 97260 (regional manipulation) is assigned 0.41 RVUs for both medical physicians[29] and chiropractic physicians.[30] However, the 1995 median national fee for CPT code 97260 provided by chiropractic physicians[32] was $19 compared with $27 for medical physicians[31]—a 70% ratio. Similarly, the respective national fees for CPT code 99212 (office/outpatient visit for an established patient) were $26 and $36—a 72% ratio. Based on the average fee ratios for procedure codes that were the most common to both medical physicians and chiropractic physicians, the Medicare conversion factor was multiplied by 0.71 to cumulate the costs of the RVUs provided to each chiropractic patient.

Of the 2872 patients enrolled in the study, 2263 (1524 chiropractic and 739 medical) had complete cost records, as determined from billing and chart abstraction, with no missing values for any of the data collection points over the 1-year period. Of those patients with complete 1-year cost records, 1360 (916 chiropractic and 444 medical) patients had both their baseline and 1-year VAS scores, and 1372 (925 chiropractic and 447 medical) had both their baseline and 1-year OSW scores.

RESULTS

Table 1 shows the most frequent chiropractic and medical services provided to all 1920 chiropractic and 952 medical patients and the total number of services provided. Of the 23 procedure codes used by chiropractic physicians more than 100 times, regional manipulation is by far the dominant, accounting for 31% of the total chiropractic services provided. (Eighty-four percent of chronic chiropractic patients received manipulation at some point in time.[26]) Chiropractors also use a wider set of therapies than medical physicians. The top 5 procedure codes accounted for only 64% of all chiropractic services. By contrast, an office outpatient visit for an established patient is easily the leading medical procedure code; and the top 5 medical procedure codes, consisting mainly of office visit codes, account for 85% of all medical services. Chiropractors also used far more services per patient (14.4 vs 2.7 for medical patients) over the course of care.

Table 1 shows the ChiroCode and Medicare RVUs for the leading chiropractic procedure codes and the Medicare RVUs for the medical procedure codes. ChiroCode RVUs are generally the same as or very similar to Medicare RVUs, but the ChiroCode list is more complete. The cost assigned to each procedure code shown in Table 1 was determined by using the methods described in the Methods section.

Table 2 shows the mean and median costs per patient for those with complete 1-year cost records. The medical patients are further divided into 2 groups: those who were referred for evaluation or treatment to a surgeon or physical therapist and those who were not referred. Of the 128 referred patients, 33 were referred to surgeons only, 80 to physical therapists only, and 15 to both. There were too few chiropractic patients with complete cost records who were referred to a surgeon (n = 3) or to a physical therapist (n = 12) to warrant separate analysis.

Overall, the mean costs were relatively low. Nevertheless, the mean for the chiropractic group ($214) was nearly double that of the total medical group ($123), although it was slightly less than that of the medical referred group ($217). These cost data, however, do not capture the costs of any referral treatment, including possible surgical and postsurgical care, as well as the costs of advanced imaging. The cost values also do not include the costs of care that may have been independently sought by either chiropractic or medical patients.

Table 1. Most Frequent Chiropractic and Medical Procedure Codes*

CPT Code	CPT Description	Frequency	RVU		Cost ($)
			ChiroCode	Medicare	
Chiropractic					
97260	Regional manipulation	8712	0.41	0.41	10.08
97010	Hot or cold packs therapy	2744	0.45	0.34	11.06
99212	Office/outpatient visit, EST	2522	0.68	0.68	17.57
97014	Electric stimulation therapy	2205	0.42	0.40	10.32
99211	Office/outpatient visit, EST	1735	0.38	0.38	9.82
97124	Massage therapy	1449	0.41	0.47	10.08
97035	Ultrasound	1245	0.41	0.33	10.08
99070	Special supplies pepper patch	893	—	—	6.57
97261	Supplemental manipulations	577	0.24	0.24	5.90
97122	Manual traction therapy	547	0.40	0.57	9.83
97118	Manual electric stimulation	541	—	—	4.71
97128	Ultrasound therapy	528	—	—	4.02
99213	Office/outpatient visit, EST	410	0.96	0.96	24.80
2000	Manipulation of spine	406	0.75	0.75	18.43
97250	Myofascial release	332	0.84	0.84	20.64
99203	Office/outpatient visit, new	298	1.72	1.72	44.43
99202	Office/outpatient visit, new	246	1.25	1.25	32.29
97032	Electric stimulation, manual	236	0.51	—	12.53
99201	Office/outpatient visit, new	231	0.79	0.79	20.41
72100	X-ray exam of lower spine	225	1.01	1.01	24.82
97110	Therapeutic exercises 30 min	186	0.52	0.60	12.78
97122	Traction, manual	151	0.40	0.57	9.83
99212	Office visit, EST, focused	149	0.68	0.68	17.57
	Other procedure codes	1493			
	Total: all procedure codes	**28 061**			
Medical					
99213	Office/outpatient visit, EST	1404	—	0.96	34.93
99212	Office/outpatient visit, EST	319	—	0.68	24.74
99214	Office/outpatient visit, EST	195	—	1.48	53.85
72100	X-ray exam of lower spine	128	—	1.01	34.96
99202	Office/outpatient visit, new	62	—	1.25	45.48
81000	Urinalysis with microscopy	53	—	—	9.35
99203	Office/outpatient visit, new	46	—	1.72	62.58
99201	Office/outpatient visit, new	25	—	0.79	28.74
	Other procedure codes	235			
	Total: all procedure codes	**2467**			

ChiroCode indicates the *ChiroCode Book*[30]; CPT, Current Procedural Terminology; EST, established; RVU, relative value unit.
*The frequencies are based on data for 1950 chiropractic and 922 medical patients.

Two other features are apparent. First, the cost of prescription drugs is an important component of medical costs, accounting for nearly 30% of the total. Second, there are large discrepancies between mean and median costs. These discrepancies arise because the distributions of total costs, especially for chiropractors, are highly skewed. Forty-three percent of the chiropractic patients with complete 1-year costs incurred costs of less than $100, but nearly 10% had costs exceeding $500 and 2 percent had costs of more than $1000 (maximum = $3111). In comparison, the majority of the medical patients (57%) incurred costs of less than $100 and fewer than 2% incurred costs of more than $500 (maximum = $1698).

We also assessed the potential role of patient demographics and health indicators in costs. **Table 3** shows mean values for selected patient characteristics and the baseline pain (VAS) and disability (OSW) scores for chiropractic, medical (nonreferred), and medical

Table 2. Mean and Median Costs Per Patient

Type of Treatment	Mean ± SD (Median) Cost in 1995 Dollars		
	CPT Code	Prescription	Total
Chiropractic (n =1524)	214 ± 284 (124)	NA	214 ± 284 (124)
Total medical (n = 739)	89 ± 80* (70)	34 ± 71 (17)	123 ± 128* (89)
Nonreferred medical (n = 611)	78 ± 65* (60)	25 ± 44 (17)	103 ± 83* (78)
Referred medical (n = 128)	140 ± 116 (105)	77 ± 135 (45)	217 ± 228 (159)

CPT indicates Current Procedural Terminology; NA, not applicable.
*$P < .01$ compared with chiropractic costs.

Table 3. Patient Characteristics*

Characteristic	Mean ± SD		
	Chiropractic	Medical (Nonreferred)	Medical (Referred)
Health			
Baseline VAS score	52.0 ± 24.2†	56.1 ± 24.3	59.3 ± 22.1
Baseline OSW score	41.3 ± 17.4†	47.5 ± 17.5	51.4 ± 17.2‡
Stage (%)			
Chronic	27.1	26.1	42.9†
History (%)			
With history of back pain	89.7†	84.4	81.9
Location (%)			‡
Pain in back only	49.0	44.7	34.6
Pain travels into thigh	28.7	32.9	33.9
Pain travels below the knee	22.3	22.4	31.5
Smoker (%)			
Currently a smoker	23.5	24.8	22.9
Depression (%)			
2 or more weeks in past year	34.4	38.7	29.3‡
2 years or more	23.3	24.1	16.3
Much of time in past year	16.7	19.5	14.8
Socioeconomic			
Age (y)	41.4 ± 12.8†	39.3 ± 12.3	39.2 ± 11.8
Sex (%)			
Male	50.1	52.0	62.5‡
Race (%)			
White, non-Hispanic	92.2	92.5	94.2
Income (%)	†		
Less than $12 000	7.1	12.2	5.9
$12 000-$35 999	37.2	33.2	36.5
$36 000-$59 999	30.4	33.7	30.5
More than $60,000	25.4	20.9	27.1
Health insurance (%)			
Patient has health insurance	83.8†	89.6	91.2
Pay (%)	†		†
Out of pocket	42.1	6.8	2.9
Insurance and other	50.7	86.4	81.4
Workers' Compensation	7.2	6.8	15.7

OSW indicates Revised Oswestry Disability Questionnaire; VAS, visual analog scale.
*Sample sizes vary due to missing observations. For chiropractic: minimum = 1212 (health insurance); maximum = 1524 (sex); For medical (nonreferred): minimum = 480 (health insurance); maximum = 611(age, sex); For medical (referred): minimum = 102 (health insurance, pay); maximum = 128 (age, sex).
†$P < .01$ compared with medical (nonreferred).
‡$P < .05$ compared with medical (nonreferred).

(referred) patients. Chiropractic patients reported less pain and disability at baseline than the nonreferred medical patients, even though a somewhat higher proportion had a history of back pain. Chiropractic and nonreferred medical patients were generally similar on most other characteristics, including some not shown in Table 3 (eg, education, occupation). The most striking difference is method of payment: nearly half of chiropractic patients paid out-of-pocket compared with only 7% of nonreferred medical patients (and just 3% of those who were referred).

The referred patients appear to form a distinct group with more serious back problems. This group had the highest baseline pain and disability scores. Significantly higher proportions of referred patients had chronic conditions and pain traveling below the knee. The high proportions that were male and covered through workers' compensation also stand out.

Table 4 shows the change in pain (calculated as the numerical difference between end-of-year VAS and baseline VAS) and the change in disability (calculated as the

numerical difference between end-of-year OSW and baseline OSW). Chiropractic and nonreferred medical patients showed about the same average improvement in VAS, whereas the improvement for the referred group was substantially and significantly lower. All 3 groups had about the same mean outcomes according to the OSW scores: none of the small differences were statistically significant.

Table 4. Health Outcomes and Costs

Outcome	Mean ± SD (Median)		
	Chiropractic*	Medical (Nonreferred)†	Medical (Referred)‡
Change in VAS score	37.2 ± 28.5 (38.0)	38.7 ± 30.1 (38.0)	27.6 ± 31.8§ (26.5)
Change in OSW score	26.3 ± 21.0 (24.0)	27.2 ± 26.7 (26.0)	25.0 ± 21.8 (21.0)
Change in VAS score per dollar	0.46 ± 0.81§ (0.22)	0.75 ± 0.76 (0.57)	0.38 ± 0.61§ (0.20)
Change in OSW score per dollar	0.32 ± 0.62§ (0.16)	0.53 ± 0.55 (0.37)	0.35 ± 0.45§ (0.17)

OSW indicates Revised Oswestry Disability Questionnaire; VAS, visual analog scale.
*The number of patients in each outcome group was 916 (change in VAS score and change in VAS score per dollar) and 925 (change in OSW score and change in OSW score per dollar).
†The number of patients in each outcome group was 366 (change in VAS score and change in VAS score per dollar) and 371 (change in OSW score and change in OSW score per dollar).
‡The number of patients in each outcome group was 78 (change in VAS score and change in VAS score per dollar) and 76 (change in OSW score and change in OSW score per dollar).
§$P < .01$ compared with medical (nonreferred).

The changes in the VAS and OSW scores per dollar also are shown in Table 4. The most relevant comparisons were between the chiropractic and nonreferred medical groups. In accordance with our results showing that chiropractic patients incurred higher costs and had about the same outcomes as the nonreferred medical patients, the improvements in both VAS and OSW scores per dollar were significantly lower for the chiropractic group. The mean values were about 60% of the nonreferred medical ratios, and the ratios of the medians were even lower.

Comparisons of the chiropractic patients with a group consisting of all medical patients (not shown in Table 4) had little effect on the results because the changes in outcomes per dollar for all medical patient groups were just slightly smaller than those for the nonreferred group. The differences in the mean changes in VAS or OSW scores per dollar between chiropractic and all medical patients remain striking (0.46 vs 0.69 for the change in VAS per dollar, $P < .01$; 0.32 vs 0.50 for the change in OSW per dollar, $P < .01$).

DISCUSSION

This project adopted an observational, practice-based approach to examine costs and outcomes of patients treated for acute and chronic ambulatory low back pain. Using standardized RVU costing methods, we found that 1-year direct office costs per chiropractic patient were significantly higher than 1-year costs per medical patient, especially when chiropractic patients are compared with medical patients not referred for further care. The former 2 groups of patients appeared to be relatively homogeneous, whereas referred medical patients appeared to have more severe problems. Patient improvement, as measured by VAS and OSW scores, also was very similar for chiropractic and nonreferred medical patients.

The results found here are consistent with those reported by Carey et al,[20] who also conducted an observational study. The authors found that the total direct outpatient costs among patients with acute low back pain were highest for those treated by orthopedic surgeons and chiropractors and lowest for those treated by primary care providers. Patient outcomes were similar among the 3 groups.

However, the costs in our study were considerably lower than those reported by Carey et al. We used a Medicare payments standard rather than actual charges, which typically are higher, sometimes much higher, than Medicare reimbursements. Other limitations of our work that contribute to the lower costs compared with those in the Carey study also caution against strong conclusions that are favorable to medical treatment. Our cost data do not include costs for imaging or referral services rendered (or independently sought by patients) outside the sample providers' clinics. This explains why the chiropractic patients had no prescription costs.

Costs for patients who might have undergone surgery also were not considered. These costs can

dwarf the cost of services in physician clinics or offices. For example, hospital and physician charges per claim processed by a major insurer for surgical back hospitalizations averaged $13 990 in 1993[34] (about $18 300 in year 2000 dollars after adjustment by the medical care services component of the Consumer Price Index). Nonsurgical hospitalizations averaged $7120 per admission in 1993 or about $9300 in 2000 dollars. The rate of surgery for low back pain increased substantially in the 1980s,[35] and the rate of increase continued into the 1990s.[34]

Our cost estimates are confounded in at least 2 other important ways. First, chiropractors may bill for cervical and thoracic spine manipulation either as treatment for low back pain (full-spine approach), for treatment of separate cervical/thoracic problems, or both. Thus, there is a potential upward bias in our estimate of chiropractic costs. Second, prescription drug use as determined from the charts of medical patients may be underestimated. Health insurance claims data for a large national sample of Medicaid patients under 65 years of age indicated that those with low back pain incurred an average of $163 per year in expenditures on prescription drugs.[36] This figure is substantially above the estimated mean for our sample.

We also note that the standardized Medicare costing method used here does not represent the actual cost (as measured by patient and third-party payments) for the health services that were provided. Standardized Medicare costing was popularized by the Patient Outcomes Research Teams (PORTS) established over a decade ago by the Agency for Health Care Policy and Research[37] and adopted by subsequent investigators.[38] It is a valuable research method that provides a common yardstick for cumulating and comparing different services and, in this study, largely different sets of services between 2 groups of providers.

One additional limitation of the study needs to be addressed. Despite an elaborate protocol to obtain completed patient surveys, the response rate for outcomes for both groups was 60%. This response rate is not unusual for surveys,[39,40] and fortunately, there was no differential response rate for outcomes between chiropractic and medical patients. Furthermore, regression models of chronic patients who did not return follow-up questionnaires predicted less than 3% increases in pain and disability outcomes for nonresponders.[27] When there are substantial differences between respondents and nonrespondents, it is generally accepted that a 75% response rate is needed to ensure minimal bias.[41] Our 60% response rates are below this threshold value, but they seem adequate to avoid serious bias in light of the minimal differences between respondents and nonrespondents.

Finally, we recognize that more sophisticated modeling approaches need to be applied, especially on longer-term outcomes and costs. In preliminary work, we found that very little variation in 1-year costs could be explained (R^2 values on the order of 0.05) for either medical physicians or chiropractic physicians through multiple regression estimates on the chiropractic and medical (nonreferred) groups. This study is an ongoing one that is collecting data on longer-term costs (up to 3 years), including referral costs and outcomes. Future findings with these more comprehensive data may be consistent with these short-term results, or they could lead to very different conclusions. Longer-term studies also will provide a better assessment of the extent of the attrition (some of our missing patients were subsequently recaptured) and possible reasons for it.

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