

Article

Treatment of Patients with Low Back Pain: A Comparison of Physical Therapy and Chiropractic Manipulation

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Abstract: Low back pain (LBP) is a pandemic and costly musculoskeletal condition in the United States. Patients with LBP may endure surgery, injections, and expensive visits to emergency departments. Some suggest that using physical therapy or chiropractic in the earlier stage of LBP reduces the utilization of expensive health services and lowers the treatment costs. Nevertheless, there is no consistent evidence to declare which one of these methods is a cost-effective treatment within a short (less than a year) period of time. The purpose of this study was to investigate the cost-effectiveness of chiropractic versus physical therapy in the United States. A decision tree analytic model was used for estimating the economic outcomes. The findings showed that in the chiropractic group, the total average cost was \$48.56 lower than the physical therapy group, and daily adjusted life years (DALY) was 0.0043 higher than the physical therapy group. Chiropractic care was shown to be a cost-effective alternative compared with physical therapy for adults with at least three weeks of low back pain over six months.

Keywords: Chiropractic; Physical Therapy; Treatment Outcome; Low Back Pain; Therapy; Economics; Patient satisfaction; Recurrence; Health Care Costs; Illness

1. Introduction

Low back pain (LBP) is a chief cause of years lost to disability in the world [1]. It is also an encumbrance to the patients and a burden to the societies. In the industrialized countries, LBP causes the high cost of medical expenses and loss-of-work [2-4]. Only in the United States, over \$80 billion, directly and indirectly, are spent over the LBP, of which about \$7.4 to \$28 billion is the cost of loss-of-work and \$26 billion is the cost related to pharmacologic, non-pharmacologic, and therapies [5,6]. In fact, LBP is the second most common reason for visits to physicians in the US. LBP mostly resolves between 8 to 12 weeks; however, in 15% of the patients, it takes more than three months and grows to chronic pain [5,7]. Thus, it is essential to identify and promote early interventions for acute LBP that are cost-effective [8,9] to reduce the burden of chronic back pain, which might lead to lower productivity, lower quality of life, and higher financial liability to society [10].

According to the clinical guidelines, the primary recommendations for managing acute LBP is to stay active and use pharmacologic therapies. Such therapies are including using acetaminophen or nonsteroidal anti-inflammatory drugs in conjunction with self-care. However, in cases that patients do not recover from the pharmacologic treatments, it is recommended to use non-pharmacologic therapies. Physical therapy, for example, is shown to be a better treatment than no treatment or medical treatment [11]. Gatchel et al. (2003) demonstrated that the treatment of early intervention (e.g., physical therapy) is more cost-effective versus the no early intervention group for acute low-back pain patients after 1 year [9]. Fritz et al. (2017) found that physical therapy is cost-effective relative to usual primary care after 1 year for patients with acute, nonspecific LBP [12].

Similarly, Fritz et al. (2008) showed that physical therapy reduces subsequent utilization of specific types of care (e.g., prescription medication, diagnostic imaging procedures, MRI, use of injection procedures, use of fluoroscopically-guided procedures). They also indicated that receiving physical therapy reduces the likelihood of incurring high charges for subsequent healthcare [13]. Comparably, Carey et al. (1995) found that the patients who saw chiropractors were more satisfied than those who saw orthopedic surgeons [8]. Goertz et al. (2013) also found a statistically and clinically significant benefit to those receiving chiropractic manipulative therapy in addition to standard medical care compared with only standard medical care [14]. Nevertheless, chiropractic therapy and physical therapy are both shown to have a better effect compared with other non-pharmacologic interventions [7,15]. Overall, it is shown that for patients with low back pain, physical therapy, and chiropractic manipulation had similar effects and cost [13].

However, it is not indicated which one of the two interventions is a more cost-effective choice over a short period of time. Because of this and the fact that the assessment of acute LBP focusing on the cost-effectiveness of physical therapy and chiropractic within a short period of time in the U.S is rare [8, 16, 17], this paper aims to fill the gap by studying the cost-effectiveness of chiropractic compared with physiotherapy within 6 months.

2. Materials and Methods

A decision tree model was used for cost-effectiveness analysis. Model inputs were extracted from the existing literature. The probabilities of certain results and the final outcomes of a decision path were adjusted according to the national estimates. Medline and PubMed databases were searched up from 2000 to September 2018. In search of PubMed, ten clinical studies that examined the costs and outcomes of non-pharmacologic treatments for LBP were found. Two of these studies have focused on the non-US countries, which were excluded from the pool of studies. From the remaining, only two studies have examined the cost-effectiveness of either physiotherapy or chiropractic in the US. Similarly, the MedLine (Ovid) was searched for the studies that examined non-pharmacologic treatments for LBP. Eleven articles were found, of which four studies examined the cost-effectiveness of chiropractic and physiotherapy versus the placebo test.

2.1. Sample of Study

The patient's sample included both men and women age 18 to 60 years old with the mean age of 40 years old. All samples had at least three weeks of LBP over six months and experienced one of the two non-pharmacologic treatments, including physiotherapy and chiropractic. Fifty-five percent of the population were assigned to the chiropractic group, and the remaining 45% were assigned to the physiotherapy treatment. The pregnant patients or those who received prior treatment were excluded from the selected sample. The summary of patients' characteristics is depicted in Table 1.

Table 1. Baseline Characteristics of Patients.

Treatment Strategies ¹	Ch	Pt
Subjects	55%	45%
Mean (SD) age (year)	41.4 (11.6)	40.5 (11.9)
Percent Women	60%	65%
Smokers	36%	31%
Similar prior problem	72%	70%
Treated previously	70%	77%
Treated with Ch	24%	35%
Treated with Pt	31%	32%
<i>Duration of current episode</i>		
<=6 Week	55%	48%
Using pain medication	20%	26%
Sick leave less than a week	61%	58%
<i>Duration of sick leave before treatment</i>		
<=1wk	61%	58%

1–4 wk	37%	33%
>=mo	2%	9%
No of treatment sessions of Ch or Pt		
0-6 months	4.9	6.4
No of treatment sessions of both Ch and Pt		
0-6 months	7	7.9

¹ Ch represents Chiropractic, Pt represents physical Therapy.

To assess the outcome in the short-term, this article focuses on the effects of the assigned treatment on the sick-leave [18]. A high duration of sick-leave may halt employee engagement and impose economic costs on the organization [19, 20]. Correspondingly, this study uses the duration of sick leave before treatment for chiropractic and physiotherapy groups. The literature showed that in the chiropractic group, nearly 61% of the individuals have been on one or less than a week of sick leave, 37% of the individuals have been on one to four weeks of sick leave, and only 2% of the individuals have reported one month of sick leave. For the physiotherapy group, 58% of the individuals have been on one or less than a week of sick leave, 33% of the individuals have been on one to four weeks of sick leave, and only 9% of the individuals have reported one month of sick leave. The changes in sick-leave after treatment for the chiropractic group were 40 percent, and for the physiotherapy group, this rate was 43 percent. These ratios changed after six months to 48 percent for the chiropractic group and 46 percent for the physiotherapy group.

During the treatment period, several treatment sessions for the chiropractic group were 4.9, and for the physical therapy, it was 6.4 visits. After treatment, within a five-month interval chiropractic group has had 14 percent extra visits, and the physical therapy group has had 17 percent extra visits. Noting that, during this period, there has been an additional 5.2 percent of visits to physical therapy by the chiropractic group and 6.7 percent of visits to chiropractic by the physiotherapy group. Accordingly, the overall number of visits within six months for the physical therapy group was 20 percent higher than the chiropractic group.

2.2. Costs of Treatments

Primarily, all costs were obtained for 1995 and adjusted for 2018. Given the mean costs of treatment in 1995 dollars, this paper spotted the cost of the visits, the imaging cost of plain films (anteroposterior and lateral) for each treatment group along with the copayments for drugs and visits and additional costs including radiology, laboratory tests, and medications. The imaging strategy has shown to have the benefits of reducing days of suffering by 0.04 days compared with the undiagnosed and untreated pain. However, it has imposed the risk of irradiation (16.81 mrad) with additional imaging charges. Accordingly, to avoid one day of suffering, it was estimated that radiation impose risk of 3,188 mrad with 2,072\$ cost [21].

With a three-percent rate of inflation, costs were updated to 2018 dollars value. Further, the updated dollar values of visits were cross-checked with the more recent payments to ensure it does not surpass the cap payments for the utilization of treatments [22]. Thus, the proposed costs were recorded in Table 2.

Table 2. Detailed Costs of Treatment Strategies for Years 1995 and 2018.

Treatment Strategies ¹	1995 \$		2018 \$	
	Ch	Pt	Ch	Pt
Treatment	28.01	49.99	56.94	101.62
Imaging	67.26	-	136.73	-
Visit	114	134	231.74	272.39
Drug (Copay)	10	10	20.33	20.33

¹ Ch represents Chiropractic, Pt represents physical Therapy.

2.3. Statistical Analysis

According to the literature, 66 percent of patients who went to chiropractic groups had experienced complete wellness right after treatment. From this, it was assumed that 34 percent of patients should consume additional healthcare after treatment up to six months. In terms of recurrence at six months, 21 percent have shown to feel pain. Among the physiotherapy group, the literature showed that 56 percent of the patients experienced complete wellness right after treatment. Thus, it was assumed that 30 percent should have additional health care utilization after a treatment period up to 6 months [3]. Given these assumptions, the decision tree was drawn below (See Fig 1). The cost and disability-adjusted life-years (DALY) was also estimated at each node. For estimating DALY, the sick-leave days was used as the measure of disability average life years. For the issue of DALY, the following formula was used:

$$\text{DALY gained} = (D_i - D) * (1 - e^{-rl})/r \quad (1)$$

where D is a disability, L is the duration of pain, and r is a discount rate. Following the Global Burden of Disease (GBD), this study considered 3% as the inflation rate. For the duration of pain, one month and six months were used for the DALY estimation.

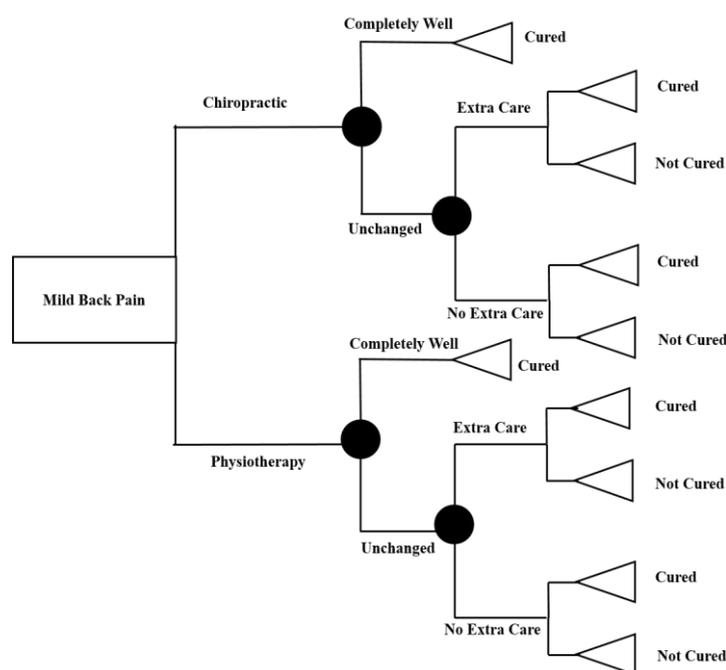


Figure 1. Decision Tree.

3. Results

The findings showed that for the six months of treatment, the mean cost of chiropractic was 410.89. It also showed that the mean cost of physiotherapy was 459.45 for the same treatment duration. In this estimation, the cost-sharing of patients, e.g. copayments for visits, were ignored. Therefore, the items that were incorporated in this estimation included both direct and indirect costs that were covered by the insurance. It was also assumed that the employer was covering all the costs of insurance and carried the costs of sick-leave. Furthermore, other indirect costs, including costs to the relative and family, transportation, loss of a job, and change of job, were excluded from the estimation. The summary of the results then illustrated in Table 3.

Table 3. Cost-Effectiveness Table.

Treatment Strategies ¹	Ch	Pt	Diff
Treatment	\$410.89	\$459.45	\$48.56
DALY	0.01562	0.01132	(0.0043)

¹ Ch represents Chiropractic, Pt represents physical Therapy.

Per these findings, chiropractic is the cost-effective choice with a saving of \$48.56 and an increase in DALY of 0.004. Sensitivity analysis of this study was conducted based on 20% increase and decrease in the variables including a fraction of people that feel well after treatment, use of additional treatment of chiropractic/physical therapy, changes in the number of their sick leave day's after treatment and at six months, and the number of visits. The tornado graph is depicted in Figure 2.

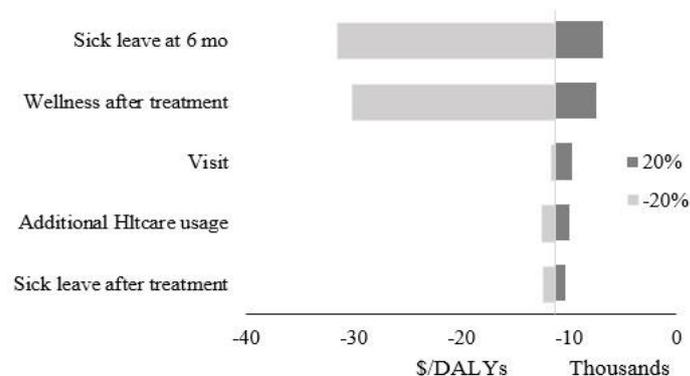


Figure 2. Tornado Graph.

The sensitivity analysis for this study showed that the incremental cost-effectiveness ratio was robust to the varying assumptions. The Tornado Graph depicted the outcomes of change in the assumption within a 20% range. The most considerable change came from changes in the ratio of sick-leave after six months from the beginning of treatment, followed by the percentage of people who have reported wellness after treatment. The sensitivity analysis also showed that when wellness after treatment for chiropractic falls by 50 to 60 percent, physiotherapy would be the cost-effective option.

4. Discussion

The use of chiropractic care for treating low-back-pain has been subject to much criticism. Many argued that adverse events after this treatment could be severe [23]. Still, it is not determined whether the risks of using chiropractic care outweigh it's benefits in the short period of time. Comparably, physiotherapy has shown to have some shortcomings in treating LBP. For example, a survey of physiotherapists showed that they believe their training has not instilled them with the requisite skills and confidence to successfully address and treat the multidimensional pain presentations seen in LBP. Nonetheless, chiropractic care and physical therapy are shown to be the superior non-pharmacologic strategies for treating LBP [24].

This study analyzed these two strategies and showed that in the short term, chiropractic care is a more cost-effective alternative compared to physical therapy for the treatment of acute low back pain. Chiropractic resulted in a lower cost and higher DALY than the physiotherapy over a one-month treatment period and five months follow-up. Although this study was the first one that focuses on the non-pharmacological treatment of acute low back pain in the short term in the US, it comes with some shortcomings. For example, according to Herman et al. (2008), productivity at work should be considered in the evaluation of cost-effectiveness, which was overlooked in this study. Additionally, this study assumed that socio-geographical issues, quality of care, and other associated factors to the place of living are equal. In terms of cost, there might be some extra societal costs that were not included in this study.

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