

## Reduced Health Resource Use After Acupuncture for Low-Back Pain

Sabine Moritz, DiplBiol, MSc,<sup>1</sup> Ming F. Liu, PhD,<sup>2</sup> Badri Rickhi, MD, FRCP,<sup>1–3</sup> Tracy J. Xu, MSc,<sup>1</sup>  
Patricia Paccagnan, RN,<sup>1</sup> and Hude Quan, PhD<sup>4</sup>

### Abstract

**Objectives:** Acupuncture is commonly used to treat low-back pain (LBP) and clinical trials have demonstrated its efficacy. However, less is known about how the utilization of acupuncture impacts public health service utilization in the real world. This study investigates the association between acupuncture utilization for LBP and health care utilization by assessing whether patients who undergo acupuncture subsequently use fewer health care resources and whether those patients differ in their health care use from the general population with LBP.

**Design:** This study employed the design of a two-group pre/post secondary data analysis.

**Setting and subjects:** There were two study populations. To identify patients who received acupuncture for LBP in 2000, patient charts at Alberta registered acupuncture clinics were reviewed. The comparison group was identified from the Alberta physician claims administrative database. Acupuncture group cases were matched with four comparison cases from the general population with LBP based on gender and age.

**Outcome measures:** Number of physician visits and physician service cost for LBP-related services for 1 year pre- and postacupuncture treatment period were calculated from the physician claims data for both study groups.

**Results:** For the 201 cases and 804 controls, the mean age was 48 years and 54% were female. The number of physician visits for the 1-year period postacupuncture decreased 49% for the acupuncture group ( $p < 0.01$ ) compared to the 1-year period preacupuncture. For the comparison there was a decrease of 2% in physician visits ( $p = 0.59$ ) for the same time periods. Corresponding to the decrease, physician services cost declined 37% for the case group ( $p = 0.01$ ) and 1% for the comparison ( $p = 0.86$ ).

**Conclusions:** Results suggest that patients with LBP were less likely to visit physicians for LBP after acupuncture treatment. This led to reduced health services spending on LBP.

### Introduction

LOW-BACK PAIN (LBP) generates high levels of health resource use and presents a significant burden to society.<sup>1</sup> LBP affects up to 85% of the working population at least once in their life and is the leading cause of disability in those under 45 years of age.<sup>2,3</sup> On average, a patient with LBP will see a health professional twice for each episode of back pain.<sup>4</sup> Conventional medical approaches rarely treat chronic LBP satisfactorily and relieve pain temporarily using nonsteroidal anti-inflammatory drugs, often augmented by muscle relaxants.<sup>5</sup> Because drugs do not eliminate the pain generators, they can only offer temporary relief and there are adverse effects of medications to consider<sup>6–8</sup>; therefore, many patients seek alternative and complementary treatments to help with

their condition.<sup>2,9</sup> Acupuncture is the most commonly used therapy for pain relief<sup>10</sup> and is gaining acceptance within the medical community.<sup>11</sup>

A number of randomized trials have been conducted to evaluate the effectiveness of acupuncture for nonspecific LBP. Recent systematic reviews and meta-analyses of these trials<sup>12–15</sup> concluded that acupuncture is effective in providing short-term relieve from LBP and may also have long-term benefits. While sham acupuncture appears to be as effective as real acupuncture, evidence suggests that acupuncture may be superior to usual clinical care including pain medication, exercise, and physical therapy. The available evidence has impacted clinical practice guidelines and insurance coverage in Germany, the United Kingdom, and the United States. In 2006, evidence from the German

<sup>1</sup>Canadian Institute of Natural and Integrative Medicine, Calgary, Alberta, Canada.

<sup>2</sup>Department of Data Integration, Measurement, and Reporting, Alberta Health Services, Calgary, Alberta, Canada.

<sup>3</sup>Department of Psychiatry, University of Calgary, Calgary, Alberta, Canada.

<sup>4</sup>Department of Community Health Sciences, University of Calgary, Calgary, Alberta, Canada.

Acupuncture in Routine Care studies led German Health Authorities to include acupuncture for LBP in their social health insurance plans.<sup>16</sup> Clinical practice guidelines issued by the American Pain Society and the American College of Physicians in 2007 state that physicians should consider acupuncture when patients with chronic LBP do not respond to conventional treatment.<sup>17</sup> The UK National Institute for Clinical Excellence recommended acupuncture as effective treatment for LBP in 2009.<sup>12</sup> In Canada, acupuncture for LBP is not recommended by the Royal College of Physicians and Surgeons and is not covered through the publicly funded health care system. However, private insurance plans provide limited coverage for acupuncture treatment.<sup>18</sup>

This study assessed (1) how private utilization of acupuncture by patients with LBP in Calgary, Canada, impacted utilization of publicly funded health care for LBP, and (2) whether patients who underwent acupuncture for LBP differ in their health service utilization from the general population with LBP.

## Materials and Methods

### *Study population*

There were two study populations: patients who underwent acupuncture for LBP (acupuncture group) and a comparison group. The acupuncture group consisted of residents aged 18 and over who were treated by an Alberta registered acupuncturist in the city of Calgary, Canada. All patients with LBP were recruited at six Alberta registered acupuncturist clinics. Patients received at least two acupuncture treatments for LBP in the year 2000.

The comparison group consisted of Calgary residents aged 18 and over who saw a physician at least twice for LBP in the year 2000. The comparison group cases were identified from the Alberta physician claims administrative database. An adapted version of the International Classification of Diseases (ICD-9-CM) algorithm developed by Cherkin et al.<sup>19</sup> to define LBP was used. This algorithm is validated and commonly used in research on LBP.<sup>20</sup> The definition includes diagnoses that are sources of LBP and excludes nonmechanical low-back problems (such as pregnancy-related conditions, infection, inflammatory diseases, neoplasm, and accidents). In the current authors' adapted definition, procedure codes and ICD-9-CM codes for fractures are excluded because patients at acupuncture clinics generally present with chronic and nonsurgical conditions. Requiring at least two physician visits was to ensure that the comparison group would consist of patients with mainly chronic LBP and was based on a report showing that patients with LBP see a physician twice per episode on average.<sup>4</sup> While some patients in the comparison group may also have received acupuncture, the literature suggests that these numbers would be relatively small (about 1% of general population<sup>21</sup>) and would therefore have a minimal impact on study outcomes.

For both acupuncture and comparison group patients, individuals who died or migrated in or out of Alberta during the study period were excluded through linking patients with LBP with the Alberta health insurance registry file using a personal unique identifier (Personal Health Insurance Number [PHN]). This registry contains demographic information of health care recipients. Canada has a provincially

based publicly funded universal health insurance system. All permanent residents are covered by this provincial health insurance plan except for Registered First Nations, prison inmates, and members of the military and the Royal Canadian Mounted Police, all of whom are the responsibility of the federal government. All eligible Alberta residents are assigned a unique lifetime PHN. The Alberta insurance registry is nearly complete and consistent, and is used as a proxy for the population of Alberta. Each patient in the acupuncture group was matched by age ( $\pm 1$  year) and sex with 4 patients from the comparison group, and the start and completion dates of acupuncture treatment for each patient in the acupuncture group was assigned to the matched patients. The study protocol received ethics approval from the Conjoint Ethics Board of the University of Calgary, Canada.

### *Chart review at the acupuncture clinic*

A research nurse conducted the chart data extraction. With the help of booking records, acupuncturists or their clinic clerks identified all patients who were treated for LBP in 2000. The research nurse reviewed each acupuncture chart to determine whether study inclusion criteria were met and retrieved information on sociodemographics, acupuncture treatment, and medical conditions on the eligible patients with LBP.

Acupuncture treatment information included total number of treatments, additional therapies at the time of giving acupuncture (cupping, electric stimulation, moxibustion, Chinese herbs, acupressure, and Chinese massage) and cost of acupuncture. While information on adjunct therapies was collected, variations in the use of these treatments and the retrospective nature of this study did not allow assessment of how these adjunct therapies may have impacted health care utilization.

### *Health care resource utilization*

Information about number of physician visits and physician services cost within 1 year pre- and postacupuncture treatment was extracted from the physician claims databases of the province of Alberta, Canada. Using personal health numbers, both acupuncture and comparison patients were linked to their records on the physician claims databases. Nearly all physicians in Alberta submitted their claims to the Alberta government-financed universal health insurance agency for their services in the study period from 1999 to 2001. The claims database captures reason for a visit (up to three diagnoses and one procedure), physician specialty, and the amount of dollars that have been paid. For both study groups, information was extracted from the database on provider discipline and specialty, date of providing service, type of service, up to three ICD-9-CM diagnostic codes, one Canadian Classification for Procedures code, number of services, and amount paid.

### *Analysis*

Descriptive statistics were employed to characterize the study populations and describe the number of LBP-related physician visits and the amount of LBP-related health care spending. Number of physician visits and amount of health care spending for the 12 months before and after the

acupuncture treatment period were compared for the following subgroups: age, gender, and acupuncture treatment intensity (up to 10 treatments versus more than 10 treatments) using  $\chi^2$  tests.

## Results

### Study population

A total of 215 patients were identified who were treated for LBP at the six participating acupuncture clinics in the year 2000. Of these 215 cases, 201 patients were successfully linked with the Alberta health insurance registry, and these 201 patients thus formed the acupuncture study group. For the comparison, a total of 28,165 cases were identified. From this cohort, 804 cases were matched by age and gender with the 201 acupuncture patients. For both the acupuncture and the comparison groups, the mean age was 48 years old and females accounted for 54% (Table 1).

### Acupuncture treatment

The mean number of acupuncture visits was 6.8 (ranging from 2 to 45) in the year 2000, with 7% of patients having more than 20 treatments (Table 1). Additional therapies were commonly added to the acupuncture treatment and included Chinese herbs (51%), cupping (49%), *Tui Na* (21%), and moxibustion (1%). Total acupuncture treatment cost per patient varied greatly and ranged from 54 to 2,503 Canadian dollars with median cost of \$241.

### Health care services utilization

Patients in the acupuncture group made a mean number of 1.9 LBP-related physician visits during the 12-month period prior to undergoing acupuncture. The number of LBP-related physician visits decreased significantly ( $p=0.0003$ ) by 0.98 visits to a mean number of 0.95 visits over the 12-month period postacupuncture. A significant reduction in physician visits was seen across age and sex categories (Table 2). The deduction of physician visits was more for those with

10 or more treatments than those with fewer than 10 treatments (0.78 versus 0.91).

For the comparison group, there was no significant difference ( $p=0.59$ ) between the mean number of LBP-related physician visits in the first 12-month period (5.75 visits) and the number of visits in the second 12-month period (5.60 visits).

LBP-related health care spending for the acupuncture group reflects the previously described health care claims. Mean spending per patient for the 12-month period prior to acupuncture was Can\$25.44. Spending for males and females as well as for patients under and over 65 years of age were similar. In the 12-month period following acupuncture treatment, spending decreased by 37% to Can\$15.97 ( $p=0.0125$ ). Decrease in cost was greater for those patients who had sought more than 10 acupuncture visits (-Can \$17.40) (Table 3).

For the general Calgary population with LBP, the mean pretreatment spending per patient and per year was Can\$73.95. Spending for males and females as well as for patients under and over 65 years of age were similar. At Can \$73.37, mean total post-treatment period spending did not differ ( $p=0.87$ ) from pretreatment period spending.

## Discussion

Findings from this health services study indicate that the use of acupuncture by patients with LBP in Alberta, Canada, saved public health care resources through reduced physician visits and related health care spending. Patients with LBP who utilized acupuncture made significantly fewer physician visits, and there was less health care spending in the 12-month period after acupuncture compared to the 12-month period prior to acupuncture. In comparison, there was no difference in physician visits and related health care claims for the matched controls from the general population with LBP for the same two time periods.

Patients with LBP in the acupuncture group were also less likely to seek publicly funded health care services before undergoing acupuncture compared to the general population with LBP. In the year prior to undergoing acupuncture, the acupuncture treatment group visited physicians far less often than the general population with LBP (2 versus 6 times on average). The fewer number of visits resulted in fewer claims for publicly funded services for the acupuncture group compared to the general population with LBP (\$25 versus \$74). This could be related to several factors. Aday et al. developed a model for studying the utilization of health services.<sup>22</sup> This model has been used in studies of determinants of conventional medicine and complementary and alternative medicine utilization behaviors.<sup>22</sup> The model explicates that utilization of health services is determined by (1) population characteristics (including predisposing, enabling, need factors, and beliefs); (2) features of the health delivery system; and (3) patient's satisfaction. In this study, adjustments were made for age and sex and the patient population was restricted to those with LBP. The Canadian universal health insurance plan provides free health care to all residents but does not cover acupuncture. Therefore, insurance coverage would not have played a role in the observed difference in physician visits. Patient's satisfaction and beliefs are possible explanations. Patients with LBP in

TABLE 1. CHARACTERISTICS OF ACUPUNCTURE PATIENTS WITH LBP (N=201)

Characteristics	Acupuncture patients
Age (mean)	48 years old
Female	109 patients (54%)
Acupuncturist visit	
Mean	6.8 visits
Median (range)	5 (2–45 visits)
<10 visits	165 patients (82%)
10–20 visits	23 patients (11%)
>20 visits	13 patients (7%)
Therapy utilization	
Herbs	102 (51%)
Cupping	99 (49%)
<i>Tui Na</i>	43 (21%)
Moxibustion	5 (1%)
Cost for acupuncture treatment	
Mean	\$369
Median (range)	\$241 (54–2504)

LBP, low-back pain.

TABLE 2. NUMBER OF PHYSICIAN VISITS FOR LOW-BACK PAIN (LBP) OF ACUPUNCTURE PATIENTS WITH LBP (N=201) WITHIN 1 YEAR PRE- AND POSTACUPUNCTURE

Physician visit	Acupuncture			Comparison		
	(N=201)			(N=804)		
	Pre	Post	p-Value	Pre	Post	p-Value
Total	1.93	0.95	0.01	5.75	5.60	0.59
Male	1.82	0.64	0.01	5.94	5.36	0.16
Female	2.01	1.18	0.01	5.59	5.79	0.54
Age						
< 65	1.95	1.09	0.01	5.79	5.56	0.42
≥ 65	1.82	0.18	0.03	5.51	5.80	0.64
Acupuncture visits						
< 10	1.62	0.84	0.02			
≥ 10	3.33	1.42	0.05			

the acupuncture group might have been dissatisfied with routine conventional treatment and thus turned to complementary therapies, including acupuncture. The benefits obtained from acupuncture might reduce the need of these patients to see their physician.

The available data and the study design do not allow calculation of possible cost savings related to reduced health care utilization for the Canadian provincial health care system. However, it should be noted that acupuncture costs were considerable and would have been borne by patients themselves or by a private health care plan. It is unknown what proportion of patients had private health insurance coverage and how many had to pay out of pocket. To further assess the potential impact of introducing acupuncture as an insured health care service, one would need to study how patients who use acupuncture for LBP compare to patients who do not utilize acupuncture with regard to underlying conditions for LBP and comorbidities. Furthermore, a comprehensive health economics assessment would be required to determine how acupuncture use affects insured health care cost long term.

Findings from trials including cost-benefit assessments vary but suggest that acupuncture for LBP could be cost effective. A study by Eisenberg et al. investigated the effectiveness and cost of usual care plus patient choice of acupuncture, chiropractic, or massage therapy compared with

usual care alone in patients with acute LBP in a clinical trial setting.<sup>9</sup> The trial found that offering access to a choice of complementary and alternative medicine therapies for acute LBP leads to increased total costs, and although there were no clinically significant improvements, there was greater patient satisfaction. In contrast, Witt et al. evaluated cost-benefits of acupuncture on LBP through a randomized clinical trial involving over 3000 patients and found that acupuncture plus routine care lead to clinically significant improvements in back function and was cost effective.<sup>22</sup> Cost effectiveness due to the improvement was over 10,000 Euros per quality-adjusted life year (QALY) compared to the comparison group. Ratcliffe et al. also assessed cost-benefits of acupuncture for LBP in a randomized trial with long-term follow-up and found acupuncture to be cost-effective with 4,241 pounds per QALY gained.<sup>23</sup>

This study has several limitations. First, the acupuncture treatment status in the comparison group is unknown, and it is likely that this group included a small number of patients who had acupuncture. To overcome this limitation, 4 patients were randomly selected for each acupuncture patient. It should also be noted that the possible inclusion of patients who received acupuncture in the comparison group is unlikely to have had a significant effect on the study findings and could only (if at all) have led to an underestimation of the impact of acupuncture on health care utilization. Second,

TABLE 3. HEALTH CARE CLAIMS (DOLLAR) FOR LOW-BACK PAIN (LBP) OF ACUPUNCTURE PATIENTS AND THE GENERAL CALGARY POPULATION TREATED FOR LBP

Claims (Mean)	Acupuncture group			Comparison group		
	(N=201)			(N=804)		
	Pre	Post	P value	Pre	Post	P value
<b>Total</b>	25.44	15.97	0.01	73.95	73.37	0.86
Male	25.12	13.14	0.06	76.30	69.76	0.22
Female	25.67	18.13	0.11	72.16	76.13	0.36
Age:						
< 65	25.60	17.85	0.06	74.60	73.10	0.69
> =65	24.60	6.41	0.03	70.85	74.65	0.64
Acupuncture visits						
< 10	21.53	13.80	0.11			
≥ 10	43.32	25.92	0.59			

this study was conducted in one Canadian region. Because health services utilization varies across health care systems, the findings of the current study may not be generalizable to other settings. Third, it cannot be ruled out that the symptoms of patients in the acupuncture group were less serious compared to the symptoms of patients in the comparison group and that this difference in disease severity played a role in the observed discrepancy in physician visits and health care spending. However, it is likely that only patients with severe symptoms sought acupuncture. Also, more severe cases requiring surgery were excluded from the comparison group. Finally, acupuncture was not standardized and treatment intensity, acupoint selection, and utilization of adjunct treatments varied across practitioners and patients. Because of these treatment variations, the impact of treatment intensity and the use of adjunct therapies could not be considered in this study.

### Conclusions

Utilization of publically funded health care services decreases after patients with LBP undergo acupuncture. These patients also seek fewer publicly funded health care services before undergoing acupuncture compared to the general population with LBP. This leads to reduced health services spending on LBP.

### Acknowledgments

We thank five acupuncture clinics for their collaboration and support throughout the study. Dr. David Chu made helpful comments at the study design stage and for critical review of the manuscript. We thank Ms. Tracy Jing Xu, MSc for data management and Ms. Kodi Carlson, BSc for assistance with the manuscript preparation. This study was generously supported by the Lotte and John Hecht Memorial Foundation and the Norlien Foundation. Hude Quan is supported by an Alberta Innovates–Health Solutions Health Scholar Award.

### Disclosure Statement

No competing financial interests exist.

### References

- Rapoport J, Jacobs P, Bell N, et al. Refining the measurement of the economic burden of chronic diseases in Canada. *Chronic Dis Can* 2004;25:13–21.
- Lewis K, Salahadin A. Acupuncture for lower back pain: A review. *Clin J Pain* 2010;26:60–69.
- Gagnier JJ, Van Tulder MW, Berman B, et al. Herbal medicine for low back pain: A Cochrane review. *Spine* 2007;32:82–92.
- Rekola KE, Levoska S, Takala J, et al. Patients with neck and shoulder complaints and multisite musculoskeletal symptoms: A prospective study. *J Rheumatol* 1997;24:2424–2428.
- Zaringhalam J, Manaheji H, Rastqar A, et al. Reduction of chronic non-specific low back pain: A randomised controlled clinical trial on acupuncture and baclofen. *Chin Med* 2010;5:1–7.
- Van TM, Koes BW, Bouter LM. Conservative treatment of acute and chronic nonspecific low back pain: A systematic review of randomized controlled trials of the most common interventions. *Spine* 1997;22:2128–2156.
- Crowe M, Whitehead L, Gagan MJ, et al. Self-management and chronic low back pain: A qualitative study. *J Adv Nurs* 2010;66:1478–1486.
- Weiner SS, Nordin M. Prevention and management of chronic back pain. *Best Pract Res Clin Rheumatol* 2010;24:267–279.
- Eisenberg DM, Post DE, Davis RB, et al. Addition of choice of complementary therapies to usual care for acute low back pain: A randomized controlled trial. *Spine* 2007;32:151–158.
- Cherkin DC, Sherman KJ, Deyo RA, et al. A review of the evidence for the effectiveness, safety, and cost of acupuncture, massage therapy, and spinal manipulation for back pain. *Ann Intern Med* 2003;3:898–906.
- Berman BM, Langevin HH, Witt CM, et al. Acupuncture for low back pain. *NEJM* 2010;363:454–461.
- Trigkilidas D. Acupuncture therapy for chronic lower back pain: A systematic review. *Ann R Coll Surg Engl* 2010;92:595–598.
- Rubinstein SM, Middelcoup MV, Kuijpers T, et al. A systematic review on the effectiveness of complementary and alternative medicine for chronic non-specific low-back pain. *Eur Spine J* 2010;19:1213–1228.
- Furlan AD, Van Tulder M, Cherkin D, et al. Acupuncture and dry-needling for low back pain: An updated systematic review within the framework of the Cochrane collaboration. *Spine* 2005;30:944–963.
- Manheimer E, White A, Berman B, et al. Meta-analysis: Acupuncture for low back pain. *Ann Intern Med* 2005;142:651–663.
- Cummings M. Modellvorhaben Akupunktur: A summary of the ART, ARC and GERAC trials. *Acupunct Med* 2009;27:26–30.
- Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: A joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Intern Med* 2007;147:478–491.
- Park J. Use of Alternative Health Care: Health Reports. *Stat Canada* 2005;16:39–41.
- Cherkin DC, Deyo RA, Volinn E, et al. Use of the International Classification of Diseases (ICD-9-CM) to identify hospitalizations for mechanical low back problems in administrative databases. *Spine* 1992;17:817–825.
- Taylor VM, Anderson GM, McNeney B, et al. Hospitalizations for back and neck problems: A comparison between the Province of Ontario and Washington State. *Health Serv Res* 1998;33:929–945.
- Eisenberg DM, Davis RB, Ettner SL, et al. Trends in alternative medicine use in the United States, 1990–1997: Results of a follow-up national survey. *JAMA* 1998; 280:1569–1575.
- Witt CM, Jena S, Selim D, et al. Pragmatic randomized trial evaluating the clinical and economic effectiveness of acupuncture for chronic low back pain. *Am J Epidemiol* 2006;164:487–496.
- Ratcliffe J, Thomas KJ, MacPherson H, et al. A randomised controlled trial of acupuncture care for persistent low back pain: Cost effectiveness analysis. *BMJ* 2006;333:626.

Address correspondence to:  
Sabine Moritz, DiplBiol, MSc  
Canadian Institute of Natural and Integrative Medicine  
2020 18 Street N.W.  
Calgary, Alberta T2M 3T1  
Canada

E-mail: s.moritz@cinim.org

