

CHIROPRACTIC CARE OF MUSCULOSKELETAL DISORDERS IN A UNIQUE POPULATION WITHIN CANADIAN COMMUNITY HEALTH CENTERS

Michael J. Garner, MSc,^a Peter Aker, MSc, DC,^b Jeff Balon, DC, MD,^c Michael Birmingham, PhD,^d David Moher, PhD,^e Dirk Keenan, DC,^f and Pran Manga, PhD^g

ABSTRACT

Objective: This study was part of a larger demonstration project integrating chiropractic care into publicly funded Canadian community health centers. This pre/post study investigated the effectiveness of chiropractic care in reducing pain and disability as well as improving general health status in a unique population of urban, low-income, and multiethnic patients with musculoskeletal (MSK) complaints.

Methods: All patients who presented to one of two community health center-based chiropractic clinics with MSK complaints between August 2004 and December 2005 were recruited to participate in this study. Outcomes were assessed by a general health measure (Short Form-12), a pain scale (VAS), and site-specific disability indexes (Roland-Morris Questionnaire and Neck Disability Index), which were administered before and after a 12-week treatment period.

Results: Three hundred twenty-four patients with MSK conditions were recruited into the study, and 259 (80.0%) of them were followed to the study's conclusion. Clinically important and statistically significant positive changes were observed for all outcomes (Short Form-12: physical composite score mean change = 4.9, 95% confidence interval [CI] = 3.8-6.0; VAS: current pain mean change = 2.3, 95% CI = 1.9-2.6; Neck Disability Index: mean change = 6.8, 95% CI = 5.4-8.1; Roland-Morris Questionnaire: mean change = 4.3, 95% CI = 3.6-5.1). No adverse events were reported.

Conclusions: Patients of low socioeconomic status face barriers to accessing chiropractic services. This study suggests that chiropractic care reduces pain and disability as well as improves general health status in patients with MSK conditions. Further studies using a more robust methodology are needed to investigate the efficacy and cost-effectiveness of introducing chiropractic care into publicly funded health care facilities. (*J Manipulative Physiol Ther* 2007;30:165-170)

Key Indexing Terms: *Chiropractic; Community Health Centers; Social Class; Musculoskeletal Diseases*

Community health centers (CHCs) provide programs and services to those populations with difficulty accessing primary health care, particularly as a result of socioeconomic or language barriers.^{1,2} These

populations are generally only able to access basic medical care, if available, even when other treatments may be more appropriate. Community health centers are nonprofit, publicly funded, and community-governed organizations

^a Research Associate, Carlington Community and Health Services, Ottawa, Ontario, Canada; McLaughlin Center for Population Health Risk Assessment, Institute of Population Health, University of Ottawa, Ottawa, Ontario, Canada.

^b Private Practice, Tweed, Ontario, Canada.

^c Chiropractor, Canadian Memorial Chiropractic College, Toronto, Ontario, Canada; Corporate Medical Director, AIM Health Group, Markham, Ontario, Canada.

^d Executive Director, Carlington Community and Health Services, Ottawa, Ontario, Canada.

^e Director, Chalmers Research Group, Children's Hospital of Eastern Ontario Research Institute, Ottawa, Ontario, Canada; Associate Professor, Departments of Pediatrics and Epidemiology & Community Medicine, Faculty of Medicine, University of Ottawa, Ottawa, Ontario, Canada.

^f Private Practice, Ottawa, Ontario, Canada.

^g Professor, School of Management, University of Ottawa, Ottawa, Ontario, Canada.

This project was funded as part of the Primary Health Care Transition Fund by the Ontario Ministry of Health and Long-Term Care (Grant No. G03-02676).

Submit requests for reprints to: Michael J. Garner, MSc, Carlington Community and Health Services, Ottawa, ON, Canada K1Z 5Z8 (e-mail: michaelgarner@gmail.com).

Paper submitted July 24, 2006; in revised form October 4, 2006; accepted November 25, 2006.

0161-4754/\$32.00

Copyright © 2007 by National University of Health Sciences.

doi:10.1016/j.jmpt.2007.01.009

Table 1. Baseline characteristics of the patients (*N* = 259)

Variable	n (%)
Age (y)	
18-29	32 (12.4)
30-39	53 (20.5)
40-49	60 (23.2)
50-59	68 (26.3)
60-69	23 (8.9)
≥70	16 (6.2)
Unknown	7 (2.7)
Sex	
Male	70 (27.0)
Female	189 (73.0)
Household income	
<\$10,000	81 (31.3)
\$10,000-\$19,999	80 (30.9)
\$20,000-\$39,999	40 (15.4)
\$40,000-\$59,999	13 (5.1)
≥\$60,000	19 (7.3)
Unknown	26 (10.0)
Condition type	
Acute	45 (13.8)
Chronic	214 (86.2)
BMI (kg/m ²)	
<20	19 (7.3)
20-24.9	77 (29.7)
25-29.9	64 (24.7)
30-34.9	38 (14.7)
≥35	26 (10.0)
Unknown	35 (13.5)
Site	
One	109 (42.1)
Two	150 (57.9)
No. of treatments in 12 wk	
1-6	122 (47.1)
6-12	111 (42.9)
>12	37 (14.3)
Comorbidities	
0	164 (63.3)
1	31 (12.0)
2	25 (9.7)
3	10 (3.9)
4	10 (3.9)
≥5	19 (7.3)
Primary treatment site	
Neck	30 (11.6)
Thoracic	29 (11.2)
Lumbar	145 (56.0)
Pelvis	15 (5.8)
Lower extremities	17 (6.6)
Upper extremities	12 (4.6)
Systemic	4 (1.5)
Missing	7 (2.7)

that provide primary health care, health promotion, and community development services. They employ multidisciplinary teams, typically consisting of a range of traditional health care providers, including physicians, nurse practitioners, dietitians, health promoters, social workers, counselors, and others. Furthermore, CHCs employ these professionals and pay them by salary and benefits rather than

through the usual fee-for-service system. Services at CHCs are provided at no cost to clients.

Chiropractic care was recently delisted from provincially funded health care in Ontario.³ This made chiropractic services even less accessible for CHC clients because they now have to pay for a whole service rather than having the Ontario government pay for a portion of the service. Approximately 10% to 12% of Canadians use chiropractic services, although 6 provinces do not cover chiropractic care under provincial health insurance plans.³

Chiropractors typically use spinal manipulative therapies (SMTs) to treat acute and chronic conditions, mostly musculoskeletal (MSK) in nature.⁴ In addition to manual therapies, chiropractors commonly use other forms of treatment, including exercise, education, advice, and electrotherapies.⁴ Although chiropractic manipulation is not yet generally accepted as standard medical care, the evidence for its use in the treatment of low-back pain (LBP) and neck pain had been shown to be at least as effective as more commonly used treatment approaches such as standard medical care, including medication, without the potential harms of medication.⁵⁻⁷

Currently, there is no study on chiropractic care in low-income, urban, and multiethnic populations. As part of a demonstration project (funded by the Ontario Ministry of Health and Long-Term Care) studying the integration of chiropractors into multidisciplinary primary care settings, this study investigated the effectiveness of chiropractic care in Ottawa CHC clients with MSK complaints.

METHODS

Study Setting and Design

This single-group (both sites were combined for statistical analyses) pre/post intervention study received ethics approval from the Ottawa Department of Health Ethics Review Board. Chiropractic clinics were established in two urban Canadian CHCs. Both sites serve similar populations in terms of size and sociodemographic characteristics. These neighborhoods are of low socioeconomic status with large multiethnic populations who face many barriers to accessing adequate health care. All individuals who presented to the clinics between August 1, 2004, and December 31, 2005, were screened for eligibility. Eligibility criteria included inability to privately pay for chiropractic care, residence in the catchment area of either site, and presence of an MSK disorder. All eligible patients were approached by the chiropractic assistant to participate in the study.

Treatment

Because this was a pragmatic study, the choice of treatment (type and frequency of visits) was determined by the treating chiropractor. The chiropractors were only limited from using modalities (because we did not have any) and nutritional supplementation. Patients were treated and

Table 2. Visual analog scale scores

Variable	n	Initial [mean (SD)]	Final [mean (SD)]	Change (95% CI)	t
Current pain	249	6.2 (2.4)	3.9 (2.7)	2.3 ^a (1.9-2.6)	13.78*
Typical pain	249	6.3 (2.2)	4.3 (2.4)	2.0 ^a (1.7-2.3)	12.01*

^a Clinically important difference.

* $P < .008$.

Table 3. Disability index scores

Variable	n	Initial [mean (SD)]	Final [mean (SD)]	Change (95% CI)	t
RMQ	180	10.6 (5.9)	6.3 (5.3)	4.3 ^a (3.6-5.1)	10.98*
NDI	107	22.5 (8.3)	15.7 (8.4)	6.8 ^a (5.4-8.1)	10.00*

^a Clinically important difference.

* $P < .008$.

Table 4. Short Form-12 scores

Variable	n	Initial [mean (SD)]	Final [mean (SD)]	Change (95% CI)	t
PCS	253	36.3 (10.1)	41.2 (10.2)	4.9 ^a (3.8-6.0)	9.00*
MCS	255	39.7 (11.3)	42.9 (10.3)	3.2 ^a (2.0-4.3)	5.42*

^a Clinically important difference.

* $P < .008$.

followed for a maximum of 12 weeks as part of the study, although some may have continued with their treatment after discharge from the study.

Outcome Measures

Pain levels were assessed using a visual analog scale (VAS).⁸ Patients were told to rank their pain on a scale of 0 to 10 in which 0 referred to *no pain* and 10 referred to *worst imaginable pain*. To document disability levels, we used condition-specific disability indexes. The Roland-Morris Questionnaire (RMQ) was administered to patients with LBP; it is scored on a scale of 0 to 24.⁹ Patients with neck pain were given the Neck Disability Index (NDI); it is scored on a scale of 0 to 54.¹⁰ Shoulder-specific, knee-specific, and wrist-specific (carpal tunnel) indexes were also available, but so few patients were given these indexes that analysis was not possible. To assess general health status, we used the Short Form-12 version 2 (SF-12v2).¹¹ Scores were summarized into the physical composite score (PCS) and the mental composite score (MCS), both of which are scored between 1 and 100. We also assessed patient satisfaction with chiropractic care using a tool specifically designed for use in this study.

All outcome measures were administered at two time points—before initial treatment and at discharge from the clinic or after 12 weeks of care, whichever came first. Experienced interpreters and translations of the questionnaires were employed as necessary because the study

participants were multiethnic and English was not the first language for many of them. Clinically important differences between pretest and posttest scores included a change of 30% in the RMQ,¹² 5 points for the NDI,¹⁰ a change of 2.0 in the VAS,^{13,14} and a change of 2.5 for the MCS or PCS.¹⁵

Data Analyses

All participants with follow-up data were included in the analyses, and a comparison was made between these participants and those who were lost to follow-up. The scoring of the SF-12v2 was performed by Quality Metric (Lincoln, RI). Change in scores from pretreatment to posttreatment was evaluated for the SF-12v2, VAS, RMQ, and NDI with the use of paired *t* tests. Post hoc analyses were performed with stratification by sex, self-reported body mass index (BMI), clinic site, and household income (\geq \$20,000 vs $<$ \$20,000). SPSS version 13 (SPSS Inc, Chicago, Ill) was used for all data analyses. Bonferroni's correction was used to account for multiple testing, and the significance value was set at .008. The NDI was scored in two ways: one was with the use of imputation of the mean value for missing variables, and the second was by deleting the two questions on pain while driving and that while reading. These two items were not generally applicable to our population owing to the inaccessibility of cars and the lower prevalence of literacy. Stratification of the outcome variables by acute or chronic condition did not change the results; thus, results for the entire sample are reported.

RESULTS

Description of the Study Sample and Follow-Up

Three hundred sixty-six individuals presented to the chiropractic clinics over the 17 months of study. Three hundred twenty-four met our eligibility criteria, and all consented to be enrolled in this study and receive treatment. Two hundred fifty-nine (80.0%) were followed to discharge and completed all appropriate questionnaires. Sixty-five (20.0%) participants were lost to follow-up: 48 (74%) for failing to attend the clinic, 5 (8%) for mental and physical health issues, 4 (6%) for family and legal issues, 5 (8%) because they were referred out of the clinic to more appropriate providers, and 3 (4%) because of multiple issues.

The baseline characteristics of the sample are described in Table 1. Of the participants, 73% were female, 34% were married, and 62.2% had a household income (in Canadian dollars) lower than \$20,000 per year, with an average household size of 2.8 persons (the poverty line in 2004 for 1 person was \$20,337¹⁶). Almost 60% of the participants were referred to the chiropractor by one of the health care practitioners at the CHC, and the rest presented themselves for care. Most of them reported neither smoking (78.8%) nor drinking (65.3%). Eighty-three percent of the participants presented to the chiropractor with a chronic complaint (>3 months' duration).

On average, the patients received 7.6 treatments (SD = 4.3) during the 12-week treatment period. The number of treatments did not vary by clinic site, sex, or age but was slightly different by condition type (acute = 6.0, chronic = 7.9). No adverse events were reported or observed.

Visual Analog Scale for Pain

We observed clinically important and statistically significant changes in reported current (mean score = 2.3, 95% confidence interval [CI] = 1.9-2.6) and typical (mean score = 2.0, 95% CI = 1.7-2.3) pain in all patients (Table 2). Post hoc analyses showed that change remained positive when we stratified by acute and chronic conditions, high and low BMI, and sex.

Disability Indexes

The total change score for those patients with LBP (RMQ) was a point reduction of 4.3 in disability (95% CI = 3.6-5.1). This change is clinically important and statistically significant (Table 3). For those patients with neck pain, there was a clinically important and statistically significant reduction in neck-related disability (6.8, 95% CI = 5.4-8.1). The results for the NDI did not change when using the two methods for imputing missing data. In the post hoc analyses, when we stratified by chronicity, sex, or BMI, the changes remained positive for the RMQ and NDI.

General Health Outcomes (SF-12v2)

Positive and clinically important changes were observed for the PCS (total change = 4.9, 95% CI = 3.8-6.0) and MCS

(total change = 3.2, 95% CI = 2.0-4.3) (Table 4). Post hoc analyses revealed little change in outcome when we stratified by acute and chronic conditions, sex, or BMI. However, the participants with a household income lower than \$20,000 per year reported lower PCSs before and after treatment as compared with those who had an income higher than \$20,000 per year.

Patient Satisfaction

Patients indicated satisfaction with the care provided by the chiropractor, with 78.8% of them being "very satisfied" and 18.9% being "satisfied."

Withdrawals, Dropouts, and Missing Data

In comparing patients with complete data with those who were lost to follow-up, the participants were found to be the same on all demographic variables except sex; male participants accounted for 40% of the lost sample and 27% of the analyzed sample. For participants who withdrew or dropped out but for whom we had initial questionnaire data (VAS, RMQ, NDI, and SF-12v2), we imputed a value of no change and reran the statistical analysis. No meaningful change in effect was observed.

DISCUSSION

Most of the participants in our study sample were below the poverty line (<\$20,000 per year) and had minimal education (lower than grade 12). They were also of mixed ethnicity and from an urban environment, and most had chronic rather than acute conditions. This sample is uniquely different from the usual population (ie, largely of middle to upper class, white, and presenting with acute MSK conditions) cared for by chiropractors.¹⁷ Descriptions of chiropractic treatment in populations of low socioeconomic status are rare.

Populations in lower socioeconomic strata have higher incidence and prevalence rates of LBP and MSK conditions in general (in addition to other health problems), yet they have the least access to chiropractic care.¹⁷ In addition to barriers in accessing adequate and appropriate traditional medical services, nontraditional or complementary and alternative health care services such as chiropractic are also inaccessible for most CHC clients because of the costs associated with treatment outside of Canada's publicly funded health care system. Adding chiropractic to the multidisciplinary health care teams in CHCs improved access to appropriate health services for the CHC clients' clinical problems and, as we report in this article, improved their outcomes of care. We observed good interprofessional rapport and teamwork between the medical doctors and the chiropractors at both sites. The limited access to alternatives to standard medical care results in most MSK disorders in

CHCs being treated with anti-inflammatory medication, which has significant associated risks.^{18,19} Chiropractic care offers a viable alternative to medication, with potentially less risk.²⁰ No adverse event was observed during the study period.

The results of this study are similar to those found in randomized controlled trials of SMTs reported in the peer-reviewed literature for LBP²¹ and neck pain.⁷ With our use of a less robust methodology as compared with a clinical trial, one might expect that the direction of bias for our study would be toward a positive treatment effect, and this was indeed the case. However, the magnitude of the effect was not anticipated. Post hoc analyses revealed that treatment outcomes remained clinically important when we stratified by sex, BMI, income, and condition type (acute vs chronic). Closer examination revealed novel data that may be interesting for others to explore further: overweight and low-income clients presented with more pain and worse physical health as compared with their normal-weight and higher-income counterparts.

An inherent limitation of our study, as for any uncontrolled study, is that we have no comparison or control group against which to compare our results. Therefore, we cannot definitively state that the effect observed was caused only by the chiropractic treatment. Other nonspecific effects of treatment (social desirability and attention bias) may completely or partly explain the positive findings. Only with the use of a more robust methodology could the results be more definitive.

The focus of this study was not on examining a specific technique but on investigating the effectiveness of chiropractic treatment as it is delivered in the field (ie, a pragmatic approach). From previous work, we understand the typical chiropractic treatment to entail any combination of SMT, information, specific soft tissue work, massage, mobilization, manual traction, exercise, and individualized advice.²² Our chiropractors used all of these treatments for the CHC clients. The mean number of treatments per patient falls within acceptable parameters for the treatment of acute and chronic conditions.²³

There were several clinical issues that created difficulties in treating and performing research on the CHC client population. The clients were often illiterate in English and in their mother tongue. The chiropractors also noted some difficulties in obtaining a thorough patient history because of language difficulties and/or traumatic circumstances surrounding the event that led to the patients' MSK condition (eg, torture and abuse). Comprehension of the VAS for pain proved to be difficult for many patients, and the translators employed to translate the English questionnaire into the clients' mother tongue noted comprehension difficulty with some of the aspects of the SF-12v2 and the disability indexes. Furthermore, the method in which the disability indexes assess levels of disability used questions that are less applicable to a low-income population.

Specifically, questions on pain when driving and that when reading were not applicable to many clients. These difficulties add to the treatment time. The efficiency of the clinic was hence diminished, which limited the volume of patients who could be seen. Most patients lost to follow-up in this study failed to attend the clinic. Compliance with medications and health-related education/advice, missed attendance, and appointment scheduling difficulties are all common problems in primary health care clinics in CHCs.

Another important clinical issue in CHCs is the prevalence of serious comorbidities. Most CHC clients had coexisting serious medical or mental health problems. In our two clinics, we had clients who were victims of torture or abuse (past or present) and who had dual diagnoses. In the medical clinics at the CHCs, MSK disorders are not usually seen as important issues for medical doctors to deal with because they are not life-threatening. Other pressing health issues, such as diabetes, psychiatric conditions, and respiratory disorders, take higher priority in time-limited patient encounters. However, MSK disorders lead to high levels of disability, lack of employment options, time off work, or protracted time on disability insurance. The presence of a chiropractor as part of the primary health care team provides a treatment option for family physicians to refer to for care of those MSK conditions that are perhaps not as high of a medical priority but critically important to the clients' functioning in society.

CONCLUSIONS

In Ontario, chiropractic lies outside of the publicly funded health care system and is primarily accessed by patients with private health insurance coverage or higher household incomes. Including chiropractors in publicly funded primary health care CHC teams helps reduce the burden of chronic MSK pain and disability in those patients of low socioeconomic status who would normally face barriers to accessing chiropractic care. These positive findings should stimulate further, more robust, research into integrating chiropractic care into health centers that serve clients with barriers to health care access.

Practical Applications

- Canadian populations of low socioeconomic status face barriers to accessing chiropractic care.
- Chiropractic care appears to be an effective treatment for patients of low socioeconomic standing.

REFERENCES

1. [aohc.org](http://www.aohc.org) [homepage on the internet]. Toronto: Association of Ontario Health Centres; 2006 [cited 2006 Feb. 17]. Available from: www.aohc.org.
2. Forrest CB, Whelan EM. Primary care safety-net delivery sites in the United States: a comparison of community health centers, hospital outpatient departments, and physicians' offices. *JAMA* 2000;284:2077-83.
3. Manga P. A perverse and discriminatory policy: the de-listing of chiropractic care in Ontario, Canada. *Chiropr J Aust* 2004;34:113-9.
4. Christensen MG, Kollasch MW, Ward R, Webb KR, Day AA, zumBrunnen J. Job analysis of chiropractic 2005. Greeley: National Board of Chiropractic Examiners, 2005. p. 121-38.
5. Australian Acute Musculoskeletal Pain Guidelines Group. Evidence-based management of acute musculoskeletal pain. Australia: Australian Academic Press Pty Ltd; 2003.
6. Bronfort G, Haas M, Evans RL, Bouter LM. Efficacy of spinal manipulation and mobilization for low back pain and neck pain: a systematic review and best evidence synthesis. *Spine J* 2004;4:335-56.
7. Gross AR, Hoving JL, Haines TA, Goldsmith CH, Kay T, Aker P, et al. A Cochrane review of manipulation and mobilization for mechanical neck disorders. *Spine* 2004;29:1541-8.
8. Lee JS, Hobden E, Stiell IG, Wells GA. Clinically important change in the visual analog scale after adequate pain control. *Acad Emerg Med* 2003;10:1128-30.
9. Roland M, Morris R. A study of the natural history of back pain: Part I. Development of a reliable and sensitive measure of disability in low-back pain. *Spine* 1983;8:141-4.
10. Vernon H, Mior S. The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther* 1991;14:409-15.
11. Ware J, Kosinski M, Turner-Bowker D, Gandek B. How to score version 2 of the SF-12 Health Survey. Boston: Health Assessment Lab; 2004.
12. Jordan K, Dunn KM, Lewis M, Croft P. A minimal clinically important difference was derived for the Roland-Morris Disability Questionnaire for low back pain. *J Clin Epidemiol* 2006;59:45-52.
13. Childs JD, Piva SR, Fritz JM. Responsiveness of the numeric pain rating scale in patients with low back pain. *Spine* 2005;30:1331-4.
14. Peloso PM, Gross AR, Haines TA, Trinh K, Goldsmith CH, Aker P. Medicinal and injection therapies for mechanical neck disorders: a Cochrane systematic review. *J Rheumatol* 2006;33:957-67.
15. Bennett SJ, Oldridge NB, Eckert GJ, Embree JL, Browning S, Hou N, et al. Comparison of quality of life measures in heart failure. *Nurs Res* 2003;52:207-16.
16. Canadian Council on Social Development [homepage on the internet]. Ottawa: CCSD [cited 2006 June 14]. Poverty lines. Available from: http://www.ccsd.ca/factsheets/fs_lico04_bt.htm.
17. Manga P, Angus D. Enhanced chiropractic coverage under OHIP as a means of reducing health care costs, attaining better health outcomes and achieving equitable access to select health services, Working Paper 98-02. Ottawa, School of Management, University of Ottawa, 1998.
18. Aalykke C, Lauritsen K. Epidemiology of NSAID-related gastroduodenal mucosal injury. *Best Pract Res Clin Gastroenterol* 2001;15:705-22.
19. Raskin JB. Gastrointestinal effects of nonsteroidal anti-inflammatory therapy. *Am J Med* 1999;106:3S-12S.
20. Senstad O, Leboeuf-Yde C, Borchgrevink CF. Side-effects of chiropractic spinal manipulation: types, frequency, discomfort and course. *Scand J Prim Health Care* 1996;14:50-3.
21. Assendelft WJ, Morton SC, Yu EI, Suttrop MJ, Shekelle PG. Spinal manipulative therapy for low back pain. *Cochrane Database Syst Rev* 2004;CD000447.
22. Leboeuf-Yde C, Hennius B, Rudberg E, Leufvenmark P, Thunman M. Chiropractic in Sweden: a short description of patients and treatment. *J Manipulative Physiol Ther* 1997;20:507-10.
23. Henderson D, Chapman-Smith D, Mior S, Vernon H. Clinical guidelines for chiropractic practice in Canada. *J Can Chiropr Assoc* 1994;38:S3-S204.