COST-EFFECTIVENESS OF NATUROPATHIC CARE FOR CHRONIC LOW BACK PAIN

Patricia M. Herman, ND, PhD (candidate); Orest Szczurko, ND, MSc (candidate); Kieran Cooley, ND, MSc (candidate); Edward J. Mills, MSc, PhD

Objective • To determine the cost-effectiveness of naturopathic care (acupuncture, relaxation exercises, exercise and dietary advice, and a back care booklet) compared to standardized physiotherapy education and a back care booklet (control treatment) for low back pain in a sample (N=70) of warehouse workers.

Design • Economic evaluation based upon the results of a pragmatic randomized controlled trial to determine the cost-effectiveness of naturopathic care to society as a whole, to the employer, and to participants.

Results • Naturopathic care (as compared to the control treatment) significantly improved quality-adjusted life-years over the 6-month study period (3-month intervention period and 3-month follow-up period) by 0.0256 (95% CI: 0.0075, 0.0437)—roughly equivalent to 9.4 "perfect health" days. Naturopathic care also significantly reduced societal costs by $1212 per participant. From the perspective of the employer, the intervention cost $154 per absentee day avoided (compared to employer costs of lost productivity of $172 per day) and had a return on investment of 7.9% under the healthcare coverage limits set by this employer and assuming the employer paid the full cost of naturopathic care. Participants experienced savings in adjunctive care of $1096 per participant.

Conclusions • This economic evaluation alongside a pragmatic randomized control trial shows naturopathic care to be more cost-effective than a standardized physiotherapy education regimen in the treatment of chronic low back pain. Further studies of the economic impact of naturopathic medicine are warranted. (*Altern Ther Health Med*. 2008;14(2):32-39.)

Patricia M. Herman, ND, PhD (candidate), is a research principal and graduate student in the Department of Psychology, University of Arizona, Tucson, Arizona. Orest Szczurko, ND, MSc (candidate) is a clinical trial coordinator, and Kieran Cooley, ND, MSc (candidate), is an assistant professor and research fellow in the Department of Clinical Epidemiology, Canadian College of Naturopathic Medicine, Toronto, Ontario, Canada, and both are graduate students in the Department of Pharmaceutical Sciences, Leslie Dan Faculty of Pharmacy, University of Toronto. Edward J. Mills, MSc, PhD, is an assistant professor in the Department of Clinical Epidemiology, Canadian College of Naturopathic Medicine, and the Department of Clinical Epidemiology & Biostatistics, McMaster University, Hamilton, Ontario.

Low back pain poses a major economic burden to society and to employers.[1,2] Back pain is common, and in general, prognosis is good, with 60% to 70% of patients recovering within 6 weeks.[3] However, the largest percentage of the costs of back pain, including the more than $28 billion (1998 USD) in productivity losses (which inflated to 2007 USD is more than $36 billion), is concentrated in the small percentage of patients with chronic low back pain.[1,4]

Conventional treatments for chronic low back pain have been found to be expensive and ineffective.[1,5] Consequently, a significant number of patients have turned to complementary and alternative medicine (CAM). One survey of patients eligible for insurance coverage for CAM found that 55% of low back pain patients had at least 1 visit to a CAM provider in the study year, and 43% used only CAM for their back pain.[6] Whereas chiropractic is the most common type of CAM used for low back pain,[5,6] other CAM therapies also seem effective.[7] In particular, acupuncture has shown promise as part of a package of care for low back pain.[8]

This study is an economic evaluation carried out alongside a pragmatic randomized controlled trial of naturopathic care (including acupuncture) vs a standardized physiotherapy education regimen for low back pain in a population of warehouse workers.

METHODS

In the trial, workers aged 18 to 65 years with a clinical diagnosis of low back pain of at least 6 weeks' duration and who were not on sick leave were recruited from a warehouse site of a large North American corporation. After informed consent, 75 who were eligible (Figure 1) were randomly assigned (via observed coin toss) to receive 3 months of 30-minute semi-weekly onsite naturopathic care visits (acupuncture, exercise and dietary advice, relaxation training, and a back care educational booklet[9,10]) or 3 months of 30-minute bi-weekly onsite control group visits (standardized physiotherapy advice and the back care educational booklet).

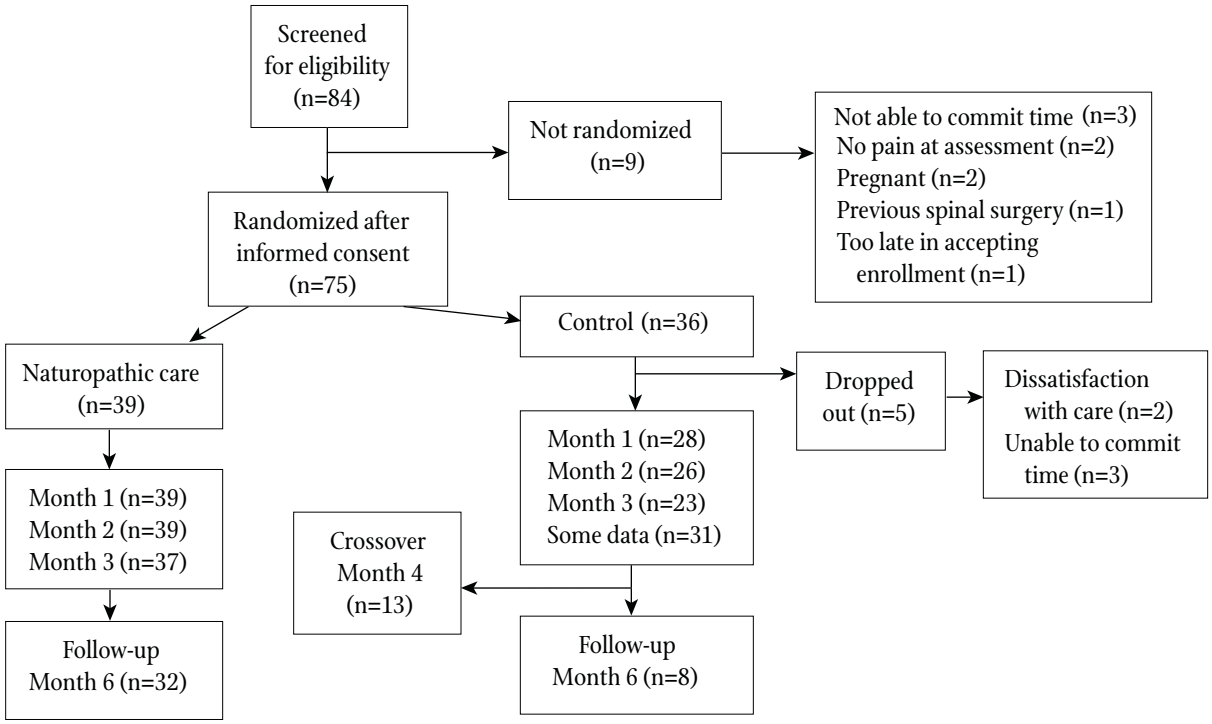

FIGURE 1 Flowchart of Subjects Through the Randomized Controlled Trial

Study participants in both groups were told to continue their usual pain medications as needed, and this usage was monitored. Participants' use of other adjunctive care (chiropractic care, massage, and physiotherapy) was also monitored but not guided in any way by the study. The study was approved by the McMaster University Research Ethics Board, and more detail on the study design is available in Szczurko et al.[11]

The cost-effectiveness of naturopathic care over the control intervention is calculated for 3 perspectives: societal, employer, and participant. Because the cost-effectiveness of this intervention to the employer and to participants depends on coverage limits and the resulting allocation of healthcare costs (both of which can vary widely across employers), the main perspective for this study is societal. The effectiveness of the intervention in terms of the Roland-Morris Disability Questionnaire (RDQ), the Oswestry Disability Index (ODI), and a visual analog scale for pain has been established.[11] Here effectiveness for the societal and participants' perspectives is measured in terms of quality-adjusted life-years (QALYs) gained over 6 months (3-month treatment period plus 3-month follow-up). The algorithm devised by Brazier et al,[12] a single index measure of health-related quality of life (HRQoL)—the SF-6D—is used to calculate QALYs for each participant at baseline, 1 month, 2 months, 3 months, and 6 months from responses to the SF-36 at each of these time points. Total change in QALYs is calculated as the area under the SF-6D score curve over the 6-month study period. Cost-effectiveness to the employer is calculated in terms of cost per day of absenteeism reduced and return on investment. Given the short time horizon, neither costs nor effects are discounted.

Absenteeism was not directly measured in this study. However, because productivity losses are such a large portion of the cost of low back pain,[1] changes in absenteeism are estimated using the change in the RDQ. A search of the literature revealed several recent randomized controlled trials of various interventions for low back pain that measured both days lost from work and the RDQ. A study by Moffett et al[13] proved the best match in terms of average baseline RDQ levels (6.65 for the treatment group and 5.56 for controls), the intervention tested (exercise classes added to routine general practitioner care), and sample size (N=183). This study also provided the most conservative estimate of absentee days reduced per 1-point reduction (improvement) in the RDQ of 2.32 days per 1-point reduction in the RDQ maintained over 1 year.

Costs are reported in 2005 US dollars. The patients themselves reported their use of back pain–related adjunctive care at baseline, 1 month, 2 months, 3 months, and 6 months via 1-week diaries.[14] Unfortunately, the unit cost of each type of adjunctive care was not recorded, and published sources of these costs (other than medication costs) are sparse. Therefore, the unit costs and resource use are reported separately to enable decision makers facing different costs to adjust the study's results. As shown in Table 1, the best available source for unit price data for naturopathic care, massage, and physiotherapy was the national association for each type of practice. Published sources were available to value chiropractic care,[15] over-the-counter and prescription drugs, and productivity losses.[16]

Published guidelines for the treatment of low back pain generally consist of patient education and reassurance, discouragement

TABLE 1 Unit Prices and Sources for Each Resource Valued

Resource	Unit price (USD)	Source
Naturopathic visit (per hour)	$125.00	Based on a range of $100 to $150 per hour reported via e-mail by American Association of Naturopathic Physicians staff
Chiropractic visit (per visit)	$60.70	Overall average cost of a visit from Segall (2004)[15]
Massage visit (per visit, assuming a 1-hour visit)	$55.00	Based on a range of $50 to $60 per hour reported via e-mail by American Medical Massage Association staff
Physiotherapy visit (per visit, assuming a 30-minute visit)	$61.20	Based on the Canadian Physiotherapy Association's recommended fee for private practice of $37.50 CAD per 15 minutes translated to US dollars using an exchange rate of 1.2254 CAD per USD
Medication costs	Varies	Medi-Span Master Drug Database* and drugstore.com†
Lost productivity (per hour, assumes productivity value to employer equals employer outlay for that employee)	$21.44	Employer cost for employee compensation—production, transportation, and material moving from Bureau of Labor Statistics (2005)[18]

*Costs according to Medi-Span Master Drug Database (MDDB) v2.5; accessed August 2006.
†Costs according to www.drugstore.com; accessed October 2006.

of bed rest and recommendations for a gradual increase in activity, referral for exercise therapy (especially for chronic low back pain), and pain medication.[17] Participants on prescription medications were assumed to manage those with their regular conventional physician. Visits to conventional physicians for prescription management or for non–back pain-related conditions were not assumed to vary between groups and were not tracked. The study naturopathic physicians provided both the naturopathic and control group care. In the real world, low back pain patients would not likely seek out naturopathic physicians to obtain physiotherapy advice at the exclusion of other naturopathic care. Therefore, the time the control group spent with the naturopathic physicians is valued at the cost of a physiotherapy visit. To account for the protocol-related time spent by both groups (informed consent and data collection), only half of the 1-hour screening visit (where histories were taken and initial exams performed) will be counted and a total of 45 minutes (15 minutes per data collection cycle times 3 cycles) will be subtracted from practitioner time for each group.

This analysis follows an intent-to-treat principle for participants who received at least 1 treatment, and missing data are handled using carry-forward imputation. Because the distribution of cost data tends to be highly skewed, bias-corrected and accelerated bootstrap estimates are used to determine confidence intervals for mean differences in costs (1000 replications).[18] The bootstrapped societal cost-QALY pairs are also graphically represented on a cost-effectiveness plane.[19]

Uncertainty in an economic evaluation comes not just from sample variation, but also from the assumptions made that can affect generalizability.[20] In order to test the robustness of study results, a univariate sensitivity analysis is conducted. The use of each resource is varied over its 95% confidence interval range (Table 2), and in the absence of better data, the unit price of each resource shown in Table 1 is varied from 50% to 150% its value. In discussions with practitioners, these ranges are possible, especially if they are allowed to also capture variation in the length and intensity of each visit. The absenteeism estimate has 3 sources of uncertainty: labor costs, RDQ scores, and the change in absentee days for each point change in RDQ. Labor costs will be varied the same way other unit costs are varied, and RDQ scores are varied over their 95% confidence interval. The change in absentee days for each point change in RDQ is varied from a low of 0 days per RDQ point (essentially setting absenteeism to 0) to the higher rate seen in Kovacs et al[21] of 3.59 days per 1-point change in the RDQ. All calculations are made using Microsoft Excel 2003 SP1 (Microsoft Corporation, Redmond, Washington).

RESULTS

The 75 workers were randomized to naturopathic care (n=39) or to a standardized physiotherapy education regimen (control group care; n=36). Overall, 68 patients (91%) had useable data for the 12-week treatment period, and 32 (82%) of the naturopathic care group and 8 (22%) of the control group had week 26 follow-up data (Figure 1). The primary reason why the response rate for the control group at week 26 is so low is because both groups were offered the opportunity to receive crossover care for 4 weeks after the treatment period ended (between week 12 and week 16) as an incentive for retention during the treatment period. Thirteen of the control group participants elected to receive crossover naturopathic treatment and were no longer able to represent control group outcomes at follow-up. No participants in the naturopathic care group elected to receive crossover control group care. At baseline, minor differences in characteristics are seen between the full treatment and control groups (Table 3). Baseline characteristics for the control group participants with available 6-month data are also shown in Table 3 to aid in the interpretation of that portion of the sensitivity analysis, which is discussed below.

Resource use for the study treatments (net of protocol-related hours), adjunctive care visits and medication, and estimated absenteeism days (all net of baseline) are reported in Table 2.

TABLE 2 Average Use of Resources Net of Baseline Use and Health-related Quality of Life (SF-6D)

Resource	Naturopathic care (n=39)	Control (n=31)	Difference
Study treatment 30-minute visits (net of protocol-specific hours)	23.5	5.5	
Adjunctive care over 6 months Mean (Bootstrap BCa 95% CI)*			
Chiropractic visits	-6.7 (-14.6, -2.3)	3.2 (0.9, 7.6)	-9.9 (-18.5, -4.8)
Massage visits	-2.9 (-5.7, -1.4)	2.6 (-0.4, 8.8)	-5.5 (-12.3, -2.1)
Physiotherapist visits	-3.6 (-10.3, 0.0)	1.6 (-3.7, 10.0)	-5.2 (-15.4, 1.5)
Pain medication costs†	-$52 (-$84, -$32)	-$72 (-$277, -$3.5)	$20 (-$53, $219)
Estimated absenteeism days	-4.8 (-6.2, -3.6)	1.9 (0.9, 3.1)	-6.7 (-8.6, -5.0)
Health-related quality of life (SF-6D, score out of 100) Mean (SD)			
Baseline	69.7 (10.5)	70.7 (10.2)	
1 month	74.2 (8.2)	72.9 (11.4)	
2 months	76.4 (9.2)	71.8 (10.2)	
3 months	76.9 (11.7)	70.8 (9.5)	
6 months	75.9 (11.0)	71.4 (9.6)	

*BCa 95% CI indicates bias corrected and accelerated 95% confidence interval.
†Average medication costs rather than pill counts are reported here because of the wide variety of over-the-counter and prescription medications used.

TABLE 3 Baseline Characteristics of Patients With at Least One Data Collection Point After Treatment Began and for the Control Group Participants With Data Available at 6-month Follow-up*

Outcome measure	Naturopathic care (n=39)	Control (n=31)	Control group participants with 6-month follow-up data (n=8)
Age in years, mean (SD)	45.3 (7.46)	48.2 (8.13)	43.1 (8.84)
Female, number (%)	22 (56)	13 (42)	3 (38)
Work type/shift, number (%)			
Day	19 (49)	10 (32)	4 (50)
Afternoon	5 (13)	7 (23)	1 (13)
Night	5 (13)	9 (29)	2 (25)
Package delivery	8 (21)	2 (6)	1 (13)
Truck driver	2 (5)	1 (3)	0 (0)
Sales representative	0 (0)	2 (6)	0 (0)
Roland-Morris Disability Questionnaire Score	8.1 (6.09)	5.4 (3.51)	3.6 (3.20)
Oswestry Disability Index Score	11.9 (8.12)	11.4 (7.70)	8.25 (7.70)
Baseline quality-adjusted life-year	0.70 (0.105)	0.71 (0.102)	0.74 (0.111)
Adjunctive care, visits/week Mean (SD); median (range):			
Chiropractic	0.43 (1.03), 0.0 (0.0 - 4.0)	0.06 (0.16); 0.0 (0.0 - 0.5)	0.03 (0.09); 0.0 (0.0 - 0.3)
Massage	0.15 (0.32); 0.0 (0.0 - 1.0)	0.17 (0.41); 0.0 (0.0 - 1.5)	0.13 (0.35); 0.0 (0.0 - 1.0)
Physiotherapy	0.28 (0.94); 0.0 (0.0 - 5.0)	0.32 (0.78); 0.0 (0.0 - 3.0)	0.25 (0.46); 0.0 (0.0 - 1.0)
Pain medication cost/week	$2.72 (4.48); $0.63 ($0.00 - $19.76)	$18.04 (64.63); $0.00 ($0.00 - $274.12)	$34.49 (96.82); $0.00 ($0.00 - $274.12)

*Mean (SD) unless otherwise indicated.

Naturopathic care participants tended to reduce adjunctive care use and have reduced absenteeism. Conversely, control group participants tended to increase adjunctive care (except for medications) and have slightly increased absenteeism. No participant reported adjunctive use of acupuncture. Table 2 also reports HRQoL as measured by the SF-6D. The naturopathic care group experienced a statistically significant (*P*=.006) increase in QALYs over the 6-month study period, but the control group did not (Table 3). The difference between groups in QALY gains was statistically significant (*P*=.036). The estimated mean health gain is 0.0256 QALYs, which is equivalent to 9.4 "perfect health" days or to taking average participants' health (measured by the SF-6D as approximately 70% health at baseline, Table 2) to "perfect health" for 31 days over the 6-month period.

The mean incremental cost to society of naturopathic care is estimated to be -$1212 (a net savings of $1212) per participant (Table 4). Figure 2 shows the cost-utility plane for the societal perspective. The graph represents 1000 bootstrap replications of the relationship between incremental societal costs and incremental QALY gains. All cost-effect pairs (100%) are in the bottom right quadrant, suggesting that naturopathic care is dominant over the control treatment (a standardized physiotherapy education regimen)—that is, the use of naturopathic care instead of the control treatment is associated with both an improvement in HRQoL and lower costs. Under these assumptions and in this population, naturopathic care is a cost-effective alternative to standardized physiotherapy education.

As discussed previously, the portion of these savings that accrues to the employer (through reductions in medical costs, if self-insured, and productivity losses avoided) and the portion that accrues to participants (through out-of-pocket costs avoided) depend upon the coverage limits specified. Table 4 reports the breakdown of adjunctive care costs between the employer and the participant based on employer coverage of 80% of costs up to $400 annually for chiropractic care and massage and up to $1000 for physiotherapy. Medications were covered by this employer at various rates from 0% to 80% with no maximum. Under these assumptions, the majority of the savings due to reductions in adjunctive care accrue to participants as reductions in their out-of-pocket costs.

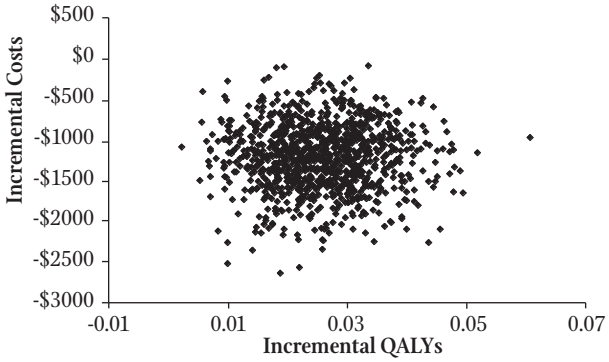

FIGURE 2 Cost Effectiveness Plane for Societal Costs and Quality-adjusted Life-year (QALY) Gains for Naturopathic Care Compared to the Control Treatment (a standardized physiotherapy regimen) Over 6 Months

The other cost that must be allocated before cost-effectiveness to the employer and to the participant can be determined is the cost of treatment. In this study participants in both groups received their treatment at no cost. The employer covered all

TABLE 4 Costs (Net of Baseline) and Quality-adjusted Life-years*

Costs	Naturopathic care (n=39)	Control (n=31)	Difference (Bootstrap BCa 95% CI)†
Study treatment costs	$1469	$337	$1132
Adjunctive care costs:			
Chiropractic visit costs	-$406 ($1146)	$196 ($561)	-$603 (-$1122, -$292)
Massage visit costs	-$161 ($350)	$142 ($654)	-$303 (-$677, -$116)
Physiotherapist visit costs	-$221 ($956)	$97 ($1146)	-$318 (-$943, $92)
Pain medication costs	-$52 ($82)	-$72 ($355)	$20 (-$53, $219)
Total adjunctive care costs	-$840 ($1828)	$363 ($1272)	-$1203 (-$2097, -$592)
Estimated productivity loss	-$817 ($758)	$324 ($541)	-$1141 (-$1470, -$866)
Total Societal Costs	-$188 ($1977)	$1024 ($1456)	-$1212 (-$2169, -$533)
Adjunctive costs paid by the participant	-$857 ($1783)	$239 ($1022)	-$1096 (-$1959, -$575)
Adjunctive costs paid by the employer	$17 ($169)	$124 ($430)	-$107 (-$264, $55)
Quality-adjusted life-years	0.0293 (0.0409)	0.0036 (0.0332)	0.0256 (0.0075, 0.0437)‡

*Mean (SD) unless otherwise indicated.
†BCa 95% CI indicates bias corrected and accelerated 95% confidence interval.
‡95% standard error–based confidence interval.

study costs. Free onsite naturopathic treatment may not necessarily be continued, however, and it should be noted that some of the attractiveness to participants of naturopathic care on this study (possibly affecting retention and outcomes) may have been due to its accessibility and lack of cost.

Assuming that the employer pays all costs of treatment, naturopathic care is cost-effective for participants, with savings in out-of-pocket adjunctive care costs of $1096 and an increase in QALYs of 0.0256. Employer costs of $1025 ($1132 less $107, assuming the employer would also have paid for the control treatment) are compared to a net reduction in absenteeism days of 6.7 (95% CI: -4.8, -8.6) for an incremental cost-effectiveness ratio for the employer of $154 per absentee day avoided. If employer costs per absentee day are $172 ($21.44 per hour times 8 hours) as assumed in this analysis, then under the assumptions of this study, offering naturopathic care is a cost-effective alternative to standardized physiotherapy education to employers. Comparing an investment of $1469 for naturopathic care per participant to a return of $1585 ($337 + $107 + $1141) gives a return on investment over the 6 months of 7.9%.

Sensitivity analyses indicate that the incremental societal cost savings shown in this study are robust to widely differing cost and resource use assumptions. Varying each resource use category across its 95% confidence interval range and varying unit prices from 50% to 150% in all cases generated incremental societal cost savings. The largest changes in societal costs came from varying the cost of the naturopathic care visits (incremental societal costs ranged from -$1948 to -$479), varying labor costs (incremental societal costs ranged from -$1784 to -$643), and varying the number of adjunctive care physiotherapy visits (incremental societal costs ranged from -$1838 to -$803). However, if absenteeism costs (productivity losses) are not counted or realized, incremental societal cost savings drop to near 0 (Table 5). Nevertheless, naturopathic care would still be considered to be the cost-effective alternative even at 0 incremental societal costs as long as its net increase in health benefits (QALYs) remains.

Because of the large number of unavailable data for the control group, mainly at the 6-month follow-up, total societal costs and QALY gains were calculated including only those participants who did not take the crossover naturopathic treatment option and who reported 6-month data. Comparing results for the naturopathic care group in Table 5 to those shown in Table 4, as expected due to the small number of this group lost to follow-up, there is not much change in their total societal costs (an average of -$192 for those reporting 6-month data compared to -$188 for the full sample) or QALYs (an average of 0.0263 for those reporting 6-month data compared to 0.0293 for the full sample). It seems that those in the naturopathic group who did not provide 6-month data were doing somewhat better health-wise (QALYs, when they are included, are higher) and were almost identical on costs to those who provided data. The control group participants who took crossover naturopathic treatment and/or who did not provide 6-month data were doing worse health-wise (average QALYs decrease from 0.0110 to 0.0036 when they are included) and had higher costs (average societal costs increase from $666 to $1024 when they are included) than those who did not cross over but did provide 6-month data. Therefore, those lost to 6-month follow-up in the naturopathic group were doing better than average and those lost to 6-month follow-up in the control group were doing worse than average in terms of both HRQoL and costs. Control group participants who did not take crossover care and did provide 6-month data also were in better health at baseline than control participants who opted for crossover naturopathic care (Table 3).

DISCUSSION

Naturopathic care for the treatment of chronic low back pain in this population of warehouse workers is a cost-effective alternative to a standardized physiotherapy education regimen from a societal perspective. Naturopathic care resulted in significantly lower societal costs and significantly better HRQoL than the control treatment over the 3-month treatment period and 3-month follow-up. Naturopathic care was also cost-effective to the employer and participants under the coverage assumptions used in this study.

This is the first economic evaluation of naturopathic medicine and one of the first of a package of care including complementary and alternative medicine therapies.[22] Naturopathic

TABLE 5 Sensitivity Analysis*

Sensitivity analysis scenarios	Naturopathic care (n=39)	Control (n=31)	Difference (Bootstrap BCa 95% CI)†
Absenteeism excluded	$629 ($1828)	$700 ($1272)	-$71 (-$965, $540)
Absenteeism at higher rate	-$635 ($2170)	$1202 ($1625)	-$1836 (-$2886, -$1058)
Analysis using only those participants that reported 6-month data‡			
Total societal costs	-$192 ($2135)	$666 ($1652)	-$858 (-$2564, $123)
Quality-adjusted life-years (QALYs)	0.0263 (0.0434)	0.0110 (0.0348)	0.0153 (-0.0182, 0.0488)§

*Mean (SD) unless otherwise indicated.
†BCa 95% CI indicates bias corrected and accelerated 95% confidence interval.
‡Naturopathic care (n=32), control (n=8).
§95% standard error–based confidence interval.

medicine is practiced as a system of medicine, not as individual therapies.[23] Therefore, it is appropriate that multiple therapies (here acupuncture, exercise and dietary advice, relaxation training, and a back care education booklet) applied by trained naturopathic physicians be included in an evaluation of naturopathic medicine. However, this study falls short of an evaluation of the system of naturopathic medicine in that the physicians were restricted to these modalities in their treatment of patients.[24]

Although this study followed published guidelines for economic evaluations,[25-27] it is not without limitations, and as with any economic evaluation, the generalizability of the results depends on the assumptions made. For example, there are a number of factors that could improve the cost-effectiveness of naturopathic care for low back pain offered in other settings. This study did not measure "presenteeism" (productivity at work) impacts, which could significantly increase the savings in productivity due to the intervention. In one study, workers who reported chronic back or neck disorders as their primary condition also reported an average reduction of 21.7% over the last month in their at-work productivity.[28] Similarly, if reductions in lost leisure time follow the same pattern as work-related productivity losses, the inclusion of the value of quality leisure time regained would also increase cost-effectiveness. The duration of the intervention also could be shortened to reduce intervention costs. A recently completed growth curve analysis of the trial data indicates that although a 3-month intervention period was used in this study, the full health benefits of the intervention could be achieved after 2 months, and the health benefits of naturopathic care are maintained at a constant level for the duration of the 3-month follow-up (Herman and Sechrest, in preparation). If impacts continue past 6 months, cost-effectiveness analyses taking this longer period of benefits into account would show an even greater increase in health benefits in terms of QALYs.

There are also a number of factors that could reduce the cost-effectiveness of naturopathic care. Because this study used an onsite clinic to provide care during work hours, there were no travel, time-off-work, or child-care costs for visits. Inclusion of these costs would likely decrease cost-effectiveness. The same 2 naturopathic physicians offered both the naturopathic care and control group treatment. It is possible that they unconsciously negatively biased the results of the control group. Lack of blinding also may have negatively biased the results of the control group, especially since this was a sample of workers who volunteered for a study of naturopathic care, albeit with the forewarning that they may not be randomized to the naturopathic care group. Participants seemed to show a strong preference for naturopathic care—all immediate post-randomization dropouts were from the control group, and 42% of those remaining at 3 months took advantage of the offer of crossover naturopathic care. Retention in the naturopathic care group was excellent (82% at 6-month follow-up), and the participants who left the study, possibly due to time constraints, tended to be those with the better health outcomes. In the control group the non-completers and those taking advantage of the crossover tended to be those with worse health outcomes. A pre-randomization measure of patient preferences may have provided some insight into these results.

Other limitations include the small sample size, the unavoidable reduction in follow-up data for the control group due to the popularity of the naturopathic care crossover offer, the lack of a direct measure of absenteeism, and the limits on generalizability that come from recruiting all participants from 1 worksite.

CONCLUSIONS

This economic evaluation alongside a pragmatic randomized control trial shows naturopathic care to be more cost-effective than a standardized physiotherapy education regimen in the treatment of chronic low back pain from the societal, employer, and participant perspectives. Further studies of the economic impact of naturopathic medicine are warranted, especially those that address the limitations of this study.

Acknowledgments

This publication was made possible by Grant Number F32 AT003363 from the National Center for Complementary and Alternative Medicine (NCCAM). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NCCAM or the National Institutes of Health. Patricia Herman would like to acknowledge Drs Lee Sechrest of the University of Arizona and Ben Craig of the University of Wisconsin, Madison, for their invaluable guidance and support on this project.

REFERENCES

1. Maetzel A, Li L. The economic burden of low back pain: a review of studies published between 1996 and 2001. *Best Pract Res Clin Rheumatol.* 2002;16(1):23-30.
2. Goetzel RZ, Hawkins K, Ozminkowski RJ, Wang S. The health and productivity cost burden of the "top 10" physical and mental health conditions affecting six large U.S. employers in 1999. *J Occup Environ Med.* 2003;45(1):5-14.
3. Andersson GB. Epidemiological features of chronic low-back pain. *Lancet.* 1999;354(9178):581-585.
4. Rizzo JA, Abbott TA 3rd, Berger ML. The labor productivity effects of chronic backache in the United States. *Med Care.* 1998;36(10):1471-1488.
5. Waddell G. Low back pain: a twentieth century health care enigma. *Spine.* 1996;21(24):2820-2825.
6. Linde K, Ramirez G, Mulrow CD, Pauls A, Weidenhammer W, Melchart D. St. John's wort for depression—an overview and meta-analysis of randomised clinical trials. *BMJ.* 1996;313(7052):253-258.
7. van Tulder MW, Furlan AD, Gagnier JJ. Complementary and alternative therapies for low back pain. *Best Pract Res Clin Rheumatol.* 2005;19(4):639-654.
8. Furlan AD, van Tulder MW, Cherkin DC, et al. Acupuncture and dry-needling for low back pain. *Cochrane Database Syst Rev.* 2005 Jan 25;(1):CD001351.
9. Frost H, Lamb SE, Doll HA, Carver PT, Stewart-Brown S. Randomised controlled trial of physiotherapy compared with advice for low back pain. *BMJ.* 2004;329(7468):708.
10. Professors of General Practice O, Physiotherapy, Ergonomics, and Psychology. *The Back Book.* 2nd ed. London: Stationary Office; 2002.
11. Szczurko O, Cooley K, Busse JW, et al. Naturopathic care for chronic low back pain: a randomized trial. *PLoS ONE.* 2007;2(9):e919.
12. Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ.* 2002;21(2):271-292.
13. Moffett JK, Torgerson D, Bell-Syer S, et al. Randomised controlled trial of exercise for low back pain: clinical outcomes, costs, and preferences. *BMJ.* 1999;319(7205):279-283.
14. Goossens ME, Rutten-van Mölken MP, Vlaeyen JW, van der Linden SM. The cost diary: a method to measure direct and indirect costs in cost-effectiveness research. *J Clin Epidemiol.* 2000;53(7):688-695.
15. Segall L. How do your fees compare? *Chiropractic Econ.* 2004;50(13):23-32.
16. US Department of Labor. Bureau of Labor Statistics. Employer costs for employee compensation--September 2005. Washington, DC: US Department of Labor; 2005.
17. Koes BW, van Tulder MW, Ostelo R, Burton AK, Waddell G. Clinical guidelines for the management of low back pain in primary care. *Spine.* 2001;26(22):2504-2513; discussion 2513-2514.
18. Thompson SG, Barber JA. How should cost data in pragmatic randomised trials be analysed? *BMJ.* 2000;320(7243):1197-1200.
19. Drummond MF, O'Brien BJ, Stoddart GL, Torrance GW. *Methods for the Economic Evaluation of Health Care Programmes.* 2nd ed. Oxford, UK: Oxford University Press; 1997.
20. Briggs A. Economics notes: handling uncertainty in economic evaluation. *BMJ.* 1999;319(7202):120.
21. Kovacs FM, Llobera J, Abraira V, et al. Effectiveness and cost-effectiveness analysis of

neuroreflexotherapy for subacute and chronic low back pain in routine general practice: a cluster randomized, controlled trial. *Spine.* 2002;27(11):1149-1159.
22. Herman PM, Craig BM, Caspi O. Is complementary and alternative medicine (CAM) cost-effective? A systematic review. *BMC Complement Altern Med.* 2005 Jun 2;5:11.
23. National Institutes for Health. National Center for Complementary and Alternative Medicine. What is complementary and alternative medicine (CAM)? Available at: http://nccam.nih.gov/health/whatiscam/. Accessed December 18, 2007.
24. Herman PM, Sherman KJ, Erro JH, Cherkin DC, Milliman B, Adams LA. A method for describing and evaluating naturopathic whole practice. *Altern Ther Health Med.* 2006;12(4):20-28.
25. Drummond MF, Davies, L. Economic analysis alongside clinical trials. Revisiting methodological issues. *Int J Technol Assess Health Care.* 1991;7(4):561-573.
26. Korthals-de Bos I, van Tulder M, van Dieten H, Bouter L. Economic evaluations and randomized trials in spinal disorders: principles and methods. *Spine.* 2004;29(4):442-448.
27. Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic submissions to the BMJ. The BMJ Economic Evaluation Working Party. *BMJ.* 1996;313(7052):275-283.
28. Collins JJ, Baase CM, Sharda CE, et al. The assessment of chronic health conditions on work performance, absence, and total economic impact for employers. *J Occup Environ Med.* 2005;47(6):547-557.