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The cost-effectiveness of a back education program for firefighters: a case study

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Summary of background data*: Low Back Pain (LBP) is one of the most common causes of disability in the working population, and its impact on industry is enormous. The high financial costs of LBP and its apparent relationship with working conditions have led to efforts to prevent this condition. Several reviews have suggested that there is considerable potential for multi-modal preventive interventions to cost-effectively reduce the overall burden of illness.*

Objectives*: The objectives of this study were to assess the feasibility of implementing a multi-faceted back injury prevention program in the community, and to assess the effectiveness of this program.*

Study design*: A case study involving 92 firefighters from a suburb north of Toronto, Ontario, Canada.*

Methods*: A back education program, called the Back Informed Program, was conducted on-site by a trained chiropractor. It offered employees job-specific education, ergonomic advice, exercises and pain management, as well as hands-on practice sessions. Data on absenteeism due to back injury, and cost of lost work days due to back injury were collected between January 1995 and December 1996. Data were compared to a municipality that received no such program during the same time period. Secondary outcomes, including information attained among the workers were qualitatively assessed. Absenteeism and financial data were used to demonstrate the potential efficacy of such a program.*

Résumé des données documentaires *: La lombalgie est une des causes les plus courantes d'incapacité chez les travailleurs et ses impacts sur les milieux de travail sont énormes. Les coûts qu'engendrent la lombalgie et sa relation apparente avec les conditions de travail ont conduit à des efforts de prévention. Plusieurs études suggèrent qu'il existe un potentiel considérable d'intervention préventive intégrée pour diminuer efficacement les frais indirects généraux reliés à la maladie.*

Objectifs *: Les objectifs de cette étude étaient de déterminer la faisabilité d'implanter dans la communauté un programme à volets multiples de prévention des blessures au dos et d'en évaluer l'efficacité.*

Modèle d'étude *: Une étude de cas menée auprès de 92 pompiers d'une banlieue au nord de Toronto (Ontario) Canada.*

Méthodes *: Un programme éducatif pour le dos, intitulé Back Informed Program, a été implanté sur place par un chiropraticien qualifié. Le programme comprenait des informations précises pour chaque poste de travail, des conseils d'ergonomie, des exercices et des moyens de soulager la douleur, ainsi que des interventions chiropratiques directes. Les données sur l'absentéisme lié à des blessures au dos et sur les pertes financières encourues suite à des absences au travail aussi liées à des blessures au dos ont été recueillies entre janvier 1995*

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Results*: The results showed a significant decrease in the number of days lost due to back injuries in the year following implementation of the program. Upon implementation of the Back Informed program, there was a reduction of 72.4% in days lost reported over the two year period of program implementation. The rate of days lost per worker was 0.64 prior to program implementation and dropped to 0.13 two years later. This resulted in substantial cost-savings in both direct and indirect costs to the municipality.*

Conclusions*: This study suggests that a multi-faceted, occupation-specific back education program may help reduce back injuries and reduce injury-related costs.*
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KEY WORDS: back injury, prevention, back school, cost-effectiveness.

Résultats *: Les résultats ont démontré une diminution significative du nombre de journées de travail manquées suite à des blessures au dos durant l'année qui a suivi l'implantation du programme. Pendant les deux années d'implantation du Back Informed Program, les absences déclarées ont diminué de 72,4 %. La moyenne de jours d'absence par travailleur était de 0,64 avant l'implantation du programme. Deux ans plus tard, elle avait chuté à 0,13. La municipalité a ainsi réalisé des économies substantielles en frais directs et indirects.*

Conclusion *: Cette étude suggère qu'un programme éducatif à volets multiples sur les problèmes de dos spécifiques à chaque poste de travail pourrait aider à réduire le nombre de blessures au dos et diminuer les frais qui en découlent.*
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MOTS CLÉS : blessure au dos, prévention, éducation sur le dos, coût-efficacité.

Introduction

In Canada, chronic musculoskeletal conditions are a major cause of morbidity, disability, psychological distress, sleep disorders, and health care utilization.[1–4] Conditions related to the musculoskeletal system are the most common cause of chronic disability, with more that 50% being accounted for by low back pain (LBP).[5] Although the prevalence of back pain has not increased in the last 40 years, the increase in work related back pain and disability has occurred at a rate faster than any other form of disability.[4]

Considering that back pain primarily affects the working population, its impact on society and industry is enormous.[2,6,7] The direct costs of low back pain in 1990 exceeded $24 billion in the US[6] and LBP accounted for approximately 33% of all Workers' compensation claims costs.[3] In 1994, the cost of musculoskeletal disorders in Canada was $25.6 billion, with direct and indirect costs estimated to be $7.5 and $18.1 billion, respectively.[8] Back and spine disorders accounted for about $8.1 billion of the reported total.

There is growing awareness among administrators, practitioners and researchers that working conditions often play an important role in the development of back pain.[9,10] Workers often report that their LBP is related to their work, with some occupations reporting higher than average prevalence rates.[6,9]

In view of the high financial costs that accompany low back pain and disability, and its apparent relationship with working conditions, efforts continue to be made to prevent occurrence of work-related back pain. Several reviews of occupational low back pain (OLBP) have con-

cluded that there is potential for cost-effective, preventive interventions to reduce the overall burden of illness associated with low back pain by modifying some of the risk factors.[7] Unfortunately, the efficacy of these and other preventive recommendations has yet to be assessed using appropriate rigorous methodologies.[4]

The lack of rigorous study is understandable since work related LBP is a complex condition, involving contributions from personal and work related factors.[3] Ergonomic and postural techniques of bending, twisting, and heavy lifting, and duration of positions such as lengthy periods of standing or walking and motor vehicle driving, as well as personal fitness and strength levels and job satisfaction have been linked to OLBP.[7,10] Many of these factors have the potential to be modifiable.

One way of modifying these factors is to educate the worker with back education, or "back school"-type programs. The content of such programs varies widely from a simple educational session to programs that involve intensive education and exercise classes delivered over several weeks in duration.[11] A recent systematic review of back school literature, suggested that back schools may be effective for those suffering from recurrent and chronic LBP in occupational settings, although the cost-effectiveness is not clear at this time.[12] Evidence from this review suggests that intensive programs lasting 3 to 5 weeks yield the most promising results. Unfortunately such programs may be costly and unmanageable for most organizations and workers.

This paper provides a case study describing the implementation of a back education program in the community by a practicing chiropractor. The feasibility of successfully implementing this program in the community, its cost effectiveness, attainment of knowledge and potential benefits will also be discussed.

Methods

The back education program utilized in this study, the Back Informed Program was developed in 1995 by chiropractors (PK, JH) at the Canadian Memorial Chiropractic College. The development of this program was motivated by requests from local industry for a back education program that could be offered to their staff. The current case represents the implementation of this program to firefighters in a local municipality, north of Toronto, Ontario, Canada. The outcome of the intervention was assessed by the reported 'days lost due to low back injury' in the years prior to and following program implementation. Feedback on the program, and its outcome was obtained by survey from the participants, and from the supervisors and Human Resources manager of the study municipality.

The Back Informed Program

The Back Informed Program includes all elements of typical employee-education programs on low back safety and was modeled after the original back school by Zachrison-Forsell.[13] The firefighters were educated on the epidemiology of low back pain, anatomy and biomechanics, principles of back safety, correct lifting and handling techniques, correct posture, nutritional advice, stress management, exercises, and pain management. Other components of the program included hands-on practice/feedback sessions simulating the work environment through use of obstacle-course simulations and workplace ergonomic evaluation. Slides, videos, and spine models were used to deliver the program. The videos and still-pictures were used to identify various work-related activities, which were mostly taken 'on-site' to maximize the realism. These pictures were used to discuss improper biomechanical faults and to arrive at more appropriate techniques/postures.

The program objectives were to empower the individual worker to understand and modify factors predisposing to mechanical low back pain, to alter their contributing back injury behaviours and attitudes, as well as those of the administration. In dealing with behavioural issues, a strong emphasis was placed on physical activity and modifying stressful body habits. Finally, attitudinal issues were addressed by emphasizing that most low back pain is controllable and that the individual plays a key role in preventing and managing back pain.

The uniqueness of the program was that it is adapted to be task-specific. The program included an initial job site evaluation and periodic follow-up site assessments. These assessments were utilized to give feedback to workers, as well as making suggestions to the administrators and employer of any potential engineering and organizational changes. The program was presented in two parts, a one-hour introductory educational class, followed by a 45-minute review/practice class conducted approximately six to eight weeks later. This review class was repeated at six-month intervals. Feedback to presented material and spe-

cific injury outcomes were continuously obtained, and when necessary changes made to the program to ensure optimal results. The instructor was a chiropractor with a special interest in back education and ergonomics.

Program implementation

The Back Informed Program was administered to all 92 firefighters in a suburban municipality just north of the city of Toronto, Ontario, Canada. After agreements to conduct the program were reached with municipal administrators, union representatives and the Fire Chief, the first class was given in January 1995. The initial sessions were delivered in 6 weeks, with the review classes, following immediately after completing the initial session. Groups of eight to ten firefighters were scheduled per class, allowing for personalized instruction and participation. All firefighters in the municipality had participated in the program by December 1995.

Comparison municipality

In an effort to contrast the results noted with the case study municipality, a review of local fire departments was undertaken to identify a comparable cohort. However, only one fire department in the neighboring municipality was willing to participate in the study. Although there were some obvious differences between the size, age and average calls between the two departments (See Table 1), it was deemed better than not having a cohort group at all. The comparison provided useful benchmark information regarding injury rates between fire departments in different areas.

Table 1
A comparison of the number, age and activity of the firefighters between the study and comparison municipalities

	Study Municipality	Comparison Municipality
Number firefighters	92	175
Age range (years)	25–63	35–40
Mean number of calls/ year	3029	7914
Mean calls/firefighter/ year	32.9	45.2

Results

Table 2 presents the number of days lost due to low back-related injuries before and after program implementation in the study and comparison municipalities. In 1994, prior to program implementation, the firefighters in the case study municipality experienced 59 days lost due to low back-related injuries, from 2 lost time cases. Following the implementation of the Back Informed Program in 1995, there were 0 days lost reported. In 1996, the total days lost was 12, with 2 lost time cases. The rate of days lost per worker was calculated as 0.64 in the year prior to program implementation and dropped to 0.13 two years later. In contrast, data from the comparison municipality revealed a relatively stable number of reported lost workdays during the three-year comparison period.

The satisfaction with the Back Informed Program was noted amongst the administration of the municipality, as well as the firefighters themselves. Surveys obtained from all participants following the classes revealed a number of important points: workers found the 'worksite-specific' examples helpful and informative. They appreciated learning about how to prevent injuries, and enjoyed the course instructor's hands-on approach (e.g., wearing all the firefighting equipment, climbing the ladders and going on "calls" with the workers). Importantly, the workers also reported that by implementing such a program, they felt that the management and the administration were demonstrating genuine concern about their health and well-being, and were appreciative of the changes resulting from the program, i.e., they were being listened to. The Human Resources Department manager in the study municipality reported that there was higher morale as the result of implementation of the program.

Discussion

This case study demonstrated the potential impact of a back education program in preventing low back injuries in a group of firefighters in an Ontario municipality. The ratio of number of lost workdays to worker was about the same between the study and comparison municipalities by the end of the two year education program, compared to the almost six fold increase in days lost per worker at the study site prior to the implementation of the program. This amounted to a reduction of 72.4% in days lost reported over the two year period of program implementation in the study municipality. This is a considerable

Table 2
Comparison of days lost in 1994 to 1996 between the two municipalities studied

		Study Municipality (n = 92)		Comparison Municipality (n = 175)	
Year	**Lost Time**	**Total Lost Days**	**Days Lost/Worker**	**Total Lost Days**	**Days Lost/Worker**
1994*	2	59	0.64	25	0.14
1995	0	0	0.00	29	0.17
1996	2	12	0.13	23	0.13

**Year prior to the implementation of the Back Informed Program.*

reduction in injuries which impacts not only upon the actual number of reported back injuries but also on preventing subsequent chronic pain and disability. Evidence suggests that 3 to 7% of patients develop chronic pain after acute injury and that they typically account for 75% of the costs.[4] Therefore, effective primary preventive measures will not only decrease the incidence of back pain but also prevent subsequent complications.

Financially, the Human Resources Department of the study municipality reported the direct cost-savings of the program, due to reduction in absenteeism due to low back injury, resulted to be approximately $60,000 over the first six-month period. If the indirect costs were considered (e.g. costs associated with hiring temporary employee, benefits paid and lost of quality control), the savings are estimated to be significantly greater. The cost for the program implementation was approximately $5000.00 for the two years, therefore the program appears to be very cost-effective.

The results of this study lend support to similar studies in the literature. A review of the literature revealed both anecdotal and non-experimental evidence of reduced costs and absenteeism with other specific back education/back pain prevention programs.[14–20] Furthermore, recent guidelines for managing adult low back pain, including the American Health Care Policy and Research (AHCPR) have suggested the use of educational program to help manage low back pains. However, others such as Lahad et al., in a non-systematic review of back education strategies for preventing low back pain, concluded that there is only minimal support for use of educational strategies for low back pain prevention in adult workers.[21] Similar results have been found in other studies.[9,22] The contradictory evidence may result from the heterogeneity of the interventions and their temporal application. Therefore, based on the overall assessment of the literature, and the review by the Cochrane group, there is moderate evidence that back schools are effective in the management of recurrent or chronic low back pain.[12]

Low back pain disability is recognized to be complex with many contributing factors. The importance of a multifactorial approach to prevention of low back pain has been noted.[22,23] This program addressed the multifaceted aspect of the etiology of back pain, especially in the work place. The impact of the program was more than just education of employees; it also influenced management/organization in implementing important changes that in turn created positive image between the workers and the employer. Furthermore, the workers felt that the management had demonstrated genuine concern and interest for their well being by implementing such a program. This follows Gebhardt's[9] suggestion that employers, who play a more active role in promoting better working conditions, motivate employees to adopt preventative injury behaviours.

Several limitations should be considered when evaluating the results of this case study. Psychosocial factors surrounding the group investigated (firefighters), including high morale and job satisfaction, could contribute to positive results and limit the generalizability of these results to the general population. Secondly, the use of days lost as an outcome measure to assess the program may be considered a surrogate measure of severity of injury.[22] The use of this outcome has the advantage of being closely related to the cost of the injury (in lost wages); however, it may be related to a variety of other factors other

than anatomical damage caused by the injury. The availability of limited duty, demands of the job, and the worker's motivation to return to work, all impact on the number of days out of work. This is especially important in a musculoskeletal disorder like low back pain where considerable evidence suggests that social factors play a significant role in reporting work-related injuries.

Thirdly, even low back pain, which is the most common musculoskeletal injury, is a fairly rare event among firefighters. Although this occupation is physically demanding, it is possible that the low back injury rates among the firefighters are relatively low, possibly related to their physical status. The results of this study may not be applicable to the general public.

Fourth, the current study presents the results from a single case study involving a specific occupation over a specific time point. Realizing that each year about 2% of the US workforce will have a compensable low back injury (although may be 3–4 times higher in selected subgroups); a larger sample and a longer assessment period are needed to allow confident interpretation of the results.[23]

A final limitation of this case study presentation involves measurement issues including the long latency period and multi-factorial etiology of back pain. These issues significantly challenge intervention research.[23] The long latency period of back pain requires that an intervention may need to be in place for years to demonstrate a true impact. Subjects may move in and out of situations with different degrees of risk, making it difficult to ascribe symptoms, when they become reportable, to a particular occupational exposure. This becomes confounded by the fact that many people perform tasks that put them at risk outside of work.

Conclusions

In conclusion, despite uncertain efficacy of back education programs, it remains an accepted and relatively inexpensive prevention weapon against low back injury.[15] The back education program presented in this paper, The Back Informed Program, attempted to curtail the costly problem associated with low back pain by emphasizing self-care, self-control, and self-responsibility. The results presented in this case study suggest that a multifaceted approach to a preventive intervention may be successful in reducing the number of injuries and costs associated with low back pain. The program warrants further study with a larger sample size, true control group, and longer follow-up period.

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