Outcomes of the Introduction of a Standardized Fitness-for-Duty Evaluation of Commercial Truck Drivers on the Incidence of Low Back Injuries and Workers' Compensation Costs

Konstantin V. Berestnev, MD, MPH, Gary L. Moffitt, MD, Dan S. Vancil, PT, and Judith McKenzie, MD, MPH

Objective: To determine the incidence of low back injuries and associated workers' compensation costs before and after the introduction of a standardized fitness-for-duty evaluation of commercial truck drivers who present for their comprehensive Department of Transportation (DOT) physical examination. **Methods:** Trained physical therapists administered questionnaires and performed functional testing of commercial truck drivers scheduled for their DOT examination. The results were communicated to providers performing DOT examinations. Incidence rates of low back injury and associated workers' compensation costs 3 years before and 3 years after the intervention (1999 to 2006) were determined. **Results:** There was a 54% reduction in the low back pain incidence rate and an associated 45% reduction in workers' compensation costs from 1999 to 2006. **Conclusions:** This intervention was associated with a reduced incidence of low back injuries and reduced associated workers' compensation costs in this population.

According to the Federal Motor Carrier Safety Administration Motor Carrier Management Information System, there were 5,700,000 commercial drivers in the United States in 2012,[1] making commercial driving one of the principal occupations there. Despite new technologies such as power steering, air-ride seats, navigation devices, and auxiliary power units, driving a truck is still a physically demanding occupation. In addition to driving for many hours, other tasks drivers perform include loading and unloading freight, cranking dollies, sliding tandems, pulling fifth wheel pins, securing loads, applying tire chains in inclement weather, applying tarps on loads, and performing pre- and post-trip inspections.

In the United States, low back pain is one of the most common causes for visiting a physician and represents a common form of chronic pain and significant cause of disability.[2] Back and neck problems account for a large proportion of health care expenditures.[3] Annual direct health care costs in the United States for spine disorders have been estimated at more than $85 billion in 2005, corresponding to an estimated 65% increase from 1997.[3] Moreover, indirect costs from lost work productivity resulting from low back pain in the United States are estimated to exceed $7 billion annually.[4] According to the Bureau of Labor Statistics, low back pain is the most common reason for days away from work.[5] Although back injury claims account for 15% to 25% of all workers' compensation injuries, they account for 30% to 40% of workers' compensation costs.[6] Direct costs include medical, indemnity (lost wages), and other expenses (eg, legal fees). Indirect costs, more difficult to quantify, include the administrative costs of processing claims, the cost of training replacement workers, and the loss in company productivity.[6] Examples of the indirect costs specific to the trucking industry include administrative, legal, logistical, and other problems for a company whose driver is injured on his route and is unable to deliver his load to the final destination.

Truck drivers experienced 141,100 injuries and illnesses involving time away from work in 1999, with the incidence rate of 306.5 cases of nonfatal occupational injuries and illnesses involving days away from work per 10,000 full-time workers.[5] The incidence rate for nonfatal occupational injuries and illnesses affecting the back and involving days away from work in transportation industry were 80.5 per 10,000 full-time worker in 1999[5] and 36.4 per 10,000 full-time workers in 2006.[7] Indeed, in 2006, the back continued to be the body part most affected by work incidents, accounting for 34% of all cases that year, whereas injuries and illnesses of the back caused 62% of days-away-from-work cases.[7] Not only did truck drivers suffer a substantial number of nonfatal injuries and illnesses, they also had the highest rate of days-away-from-work among major occupational groups (411 per 10,000 workers). The median days away from work was 9 days in 1999[5] and 14 days in 2006.[7] The 2002 Liberty Mutual Workplace Safety Index reported that for each $1 of direct costs, organizations experience between $3 and $5 of indirect costs.[8] Workers' compensation programs in the United States paid $56 billion in medical and cash benefits in 2004, an increase of 2.3% over 2003 payments.[9]

The transportation industry is a sector that has been under increased scrutiny in recent years, with the aim toward improving safety for the drivers and others who share the road. Studies have focused on seatbelt use, fatigue, cognition, psychosocial factors, drugs, alcohol usage, and work scheduling.[10–15] Much less emphasis has been placed on a potentially preventive measure: the use of a functional capacity evaluation (FCE) during post-hire evaluation of truck drivers for their fitness-for-duty and the outcomes related to this intervention. Aggregate health risk appraisal data from Chevron-Texaco's truck driver workforce suggested that approximately 50% of the truck drivers who completed a health risk appraisal were found to be at increased risk for a back injury.[16] High-risk scores in that appraisal were based on a weighted index that included some of the following factors in decreasing order of importance: a history of back pain, a job requiring regular lifting or long periods of sitting or standing, and being overweight.[16]

From the Arkansas Occupational Health Clinic (Dr Berestnev and Dr Moffitt), Springdale; Division of Occupational of Medicine (Dr McKenzie), Department of Emergency Medicine, University of Pennsylvania, School of Medicine Occupational Medicine Residency Program, GR Silverstein, Philadelphia; and RoadReady, Inc (Mr Vancil), Lowell, Ark.

At the time of the research Konstantin V. Berestnev, MD, MPH, FACOEM, was an Occupational Medicine resident at the University of Pennsylvania School of Medicine and is currently practicing at the Arkansas Occupational Health Clinic in Springdale, Arkansas; Gary L. Moffitt, MD, is the owner of the Arkansas Occupational Health Clinic and a Medical Director of RoadReady, Inc**;** Dan Vancil, PT, is the President of RoadReady, Inc; Judith G. McKenzie, MD, MPH, FACOEM, is an Associate Professor and Residency Program Director in the Division of Occupational Medicine, Department of Emergency Medicine at the University of Pennsylvania School of Medicine.

This research was partially supported by the National Institute of Occupational Health and Safety (NIOSH), Occupational Safety and Health Training Grant—Occupational Medicine, T01-00H-008628.

There are no other conflicts of interest or sources of funding.

This research was approved by the institutional review board of Perelman School of Medicine at the University of Pennsylvania.

Address correspondence to Konstantin V. Berestnev, MD, MPH, FACOEM, Arkansas Occupational Health Clinic, 4001 Wagon Wheel Road, Springdale, AR 72762 (kberestnev@aohconline.com).

DOI: 10.1097/JOM.0000000000000122

Recognizing that musculoskeletal injury is common among commercial truck drivers, some employers and insurers are employing an FCE as a tool to assist in decision making regarding appropriate job placement of these commercial truck drivers as well as regarding return to work duty after an injury. The assumption is that if the testing results are employed to appropriately fit the worker to the job, there will be a reduction in injury and subsequent workers' compensation costs. This research focuses on the institution of such program and on determining the outcomes of said intervention.

In an effort to reduce the rate of low back injuries and associated workers' compensation costs, a trucking company incorporated a standardized fitness-for-duty evaluation of drivers in 2003, the main element of which included the addition of an FCE to the already established and traditional Department of Transportation (DOT) physical examination. The purpose of this study was to evaluate the effect of the use of data from this standardized fitness-for-duty post-hire evaluation to augment the traditional DOT examination to guide worker placement, on low back injury incidence and on workers' compensation costs.

MATERIALS AND METHODS

Study Population

The study population comprises all truck drivers employed at one large nationwide trucking company anytime from January 1, 1999, to December 31, 2006.

Description of the Standardized Fitness-for-Duty Evaluation Program

This large nationwide trucking company utilizes a new comprehensive RoadReady Evaluation. The testing was conducted by trained physical therapists at the company's eight nationwide testing sites throughout the study period. The RoadReady Evaluation is a standardized fitness-for-duty examination, more comprehensive than that required by DOT regulations and used in conjunction with the DOT evaluation. The physical therapist reports the findings from the RoadReady Evaluation to the DOT medical examiner, who makes the final determination regarding driver certification, integrating the RoadReady Evaluation and medical findings. This RoadReady Evaluation is not used to diagnose specific lower back conditions nor is it a tool to deny applicants a position. Those who do not meet the standards have the opportunity for placement elsewhere within the company.

Elements of the RoadReady Evaluation

The RoadReady Evaluation consists of an initial review querying the applicant's musculoskeletal medical history. Questions asked focus on the spine. For example: "Have you ever had or do you now have any trouble with your neck or back? Have you ever missed work because of a neck or back injury? Have you ever had surgery on your neck or back? Are you currently on any work restrictions?" All positive responses are noted and taken into consideration during the performance of the functional examination component.

Conducted by trained physical therapists, the FCE consists of an assessment of (1) back posture and alignment; (2) joint flexibility to include range of motion of the upper extremity, lower extremity, and spine; (3) upper and lower extremity muscle strength; (4) joint and ligament integrity; (5) balance and coordination; and (6) functional activities for the extremities and trunk. Tests are also conducted to identify conditions or deficits of the nervous system, rotator cuff, cervical and lumbar nerve roots, carpal tunnel, and the sacroiliac region. The upper back is not tested specifically.

Lower Back Analysis

The lower back is evaluated in many of these above-mentioned tests. During the visual inspection and examination of posture, the therapist checks for scoliosis, abnormal kyphosis, lordosis, surgical scars, muscle atrophy, hypertrophy, and other findings. Both neck and lower back flexibility are tested for forward and backward bending, side bending, and rotation limitations. Functional tests, such as standing squat, heel, and toe walking, and assuming the proper lifting position can help indicate weakness or limitations that may indicate lower back problems, such as nerve root impingement. Similarly, manual muscle testing is conducted on the lower extremities as this may point to neurological deficits associated with lower back conditions. Additional testing includes a sit-and-reach test, measurement for leg length discrepancy, palpation of the back for tenderness and muscle guarding, a prone lying spring test of the spine, and performance of back extension from a prone lying position for 5 repetitions with a 10-second endurance hold in extension on the last repetition. If significant limitations are noted in any of the above screening tests, additional tests are conducted to further evaluate the condition. On the basis of the findings of all tests, the therapist sends a recommendation to the DOT examiner who then makes the final determination on the certification status of the driver. Following clearance by the DOT examiner, the driver applicant is tested again, this time for his ability to successfully perform job-specific tasks as required by the transportation company. Drivers are subjected to the 3-minute step test, job-specific tasks, and the dynamic lift tests, conducted by the physical therapists. All the medical findings and the physical therapists' evaluation results are integrated by the DOT medical examiner electronically in RoadReady electronic data entry and document storage system. Logic within the system does not allow a medical examiner to certify a driver unless all required components of the medical examination form are completed. Medical examiners can search and obtain previous medical examination information from the database to assist in the completion of the current medical examination.

Data Collection and Analysis

The data for the period from 1999 to 2006 were obtained from the trucking company's human resources department data management system. The following were ascertained: the number of and incidence of upper back injuries per 1000 drivers, the number of and incidence of lower back injury per 1000 drivers, and the worker's compensation costs associated with these injuries. Because the upper back was not specifically targeted in the RoadReady Evaluation, injury incidence and associated workers' compensation claims for upper back injury were used for comparison. Microsoft Office Excel software was used in the analysis of this data.

RESULTS

During the Study Period

The number of drivers employed by the company in the preintervention period averaged 11,310. The average was 12,362 in the postintervention period (see Table 1). Approximately 95% of the drivers were male and 5% were female. Their ages ranged from 20 to 88 with an average age in the 40- to 49-year old group. After the RoadReady Evaluation, approximately 3% of the drivers were found not to meet the standards and were given the opportunity for placement elsewhere within the company.

The number of employed drivers increased from 10,569 in 1999 to 12,825 in 2006, a 21% increase. The incidence rates of low back injury per 1000 employees gradually declined (see Table 1, Fig. 1) from 23.7 in 1999 to 11.0 in 2006, a 54% decline. The incidence rates of upper back injury per 1000 employees decreased from 2.2 in 1999 to 1.5 in 2006, a 32% decline (see Table 1, Fig. 1).

The workers' compensation costs of the upper back injuries increased from $ 11,217 in 1999 to $43,896 in 2003 and decreased to $8250 in 2006 (see Table 2, Fig. 2). The average annual workers' compensation costs of the upper back injuries during the period 1999

TABLE 1. Incidence Rates of Upper and Low Back Injuries per 1000 Employees From 1999 to 2006

Year	No. of Drivers	No. of Upper Back Injuries	Incidence of Upper Back Injuries	No. of Low Back Injuries	Incidence of Low Back Injuries
1999	10,569	23	2.2	251	23.7
2000	11,103	25	2.3	227	20.4
2001	11,431	19	1.7	190	16.6
2002	12,138	24	2.0	200	16.5
2003	11,808	29	2.5	156	13.2
2004	12,318	17	1.4	172	14.0
2005	12,497	14	1.1	174	13.9
2006	12,825	19	1.5	141	11.0
1999–2002		**23.5**	**2.0**	**225.5**	**19.3**
2003–2006		24	**1.6**	**148.5**	**13.0**

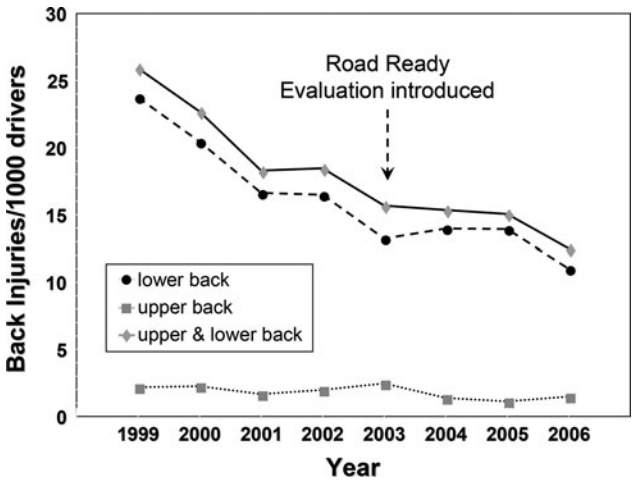

FIGURE 1. Incidence rates of upper back pain, low back pain, and both combined in truck drivers from 1999 to 2006

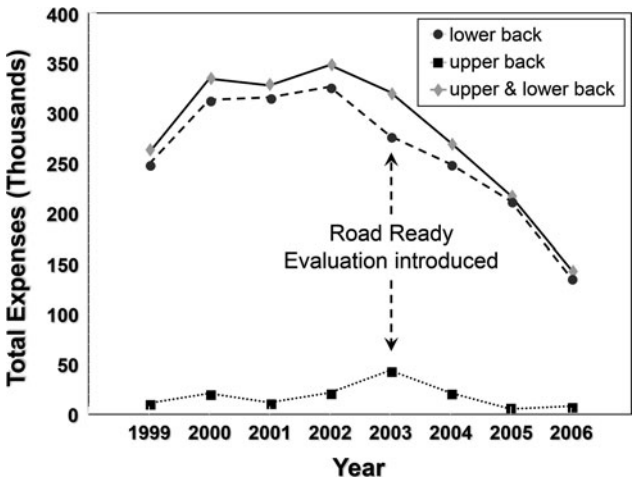

FIGURE 2. Workers' compensation costs associated with back injuries from 1999 to 2006

TABLE 2. Workers' Compensation Costs Associated With Back Injuries in Truck Drivers From 1999 to 2006

Year	Upper Back	Lower Back
1999	$11,217.26	$248,924.26
2000	$20,982.86	$313,283.87
2001	$11,871.61	$315,745.57
2002	$21,642.97	$326,310.88
2003	$43,896.07	$277,104.23
2004	$21,488.14	$249,173.63
2005	$5,416.75	$212,313.58
2006	$8,250.44	$136,159.10
1999–2002	**$16,428.68**	**$301,066.15**
2003–2006	**$19,762.85**	**$218,687.64**

to 2002 was $16,429 and during the period 2003 to 2006 was $19,763 (see Table 2).

The workers' compensation costs of the low back injuries increased from $248,924 in 1999 to $277,104 in 2003 and decreased during the period from 2003 to 2006 to $136,159 level in 2006, a 45% reduction from year 1999 (see Table 2). The average annual worker's compensation costs of the low back injuries during the period 1999 to 2002 was $301,066 and during the period 2003 to 2006 was $238,450 (see Table 2). There was a 54% reduction in low back injury incidence rate with an associated 45% reduction in workers' compensation costs on average between the preintervention period and the postintervention period. The workers' compensation costs of low back injuries per injured driver increased over the preintervention period then decreased thereafter over the postintervention period (see Table 3).

DISCUSSION

This research sought to determine the effect of the use of the RoadReady Evaluation during the post-hire evaluation process on the incidence of back injuries and associated workers' compensation costs. These data show that the incidence rate of low back injury decreased by 54% from 1999 to 2006, and the workers' compensation costs were reduced from $248,924 in 1999 to $136,159 in 2006. Nevertheless, Figure 1 shows that the incidence of low back injuries declined from 1999 to 2006 despite the intervention. In addition, according the Bureau of Labor Statistics, the incidence rate of nonfatal occupational injuries affecting the low back in the transportation industry was 80.5 per 10,000 workers in 1999 and declined to 36.4 cases per 10,000 workers in 2006.[5,7] This is a 55% reduction in the incidence rate similar to that found in this study. The reduction rates

TABLE 3. Workers' Compensation Costs Associated With Low Back Injuries per Injured Driver From 1999 to 2006

Year	Workers' Compensation Costs of Lower Back Injuries per Injured Driver
1999	$991.73
2000	$1380.11
2001	$1661.82
2002	$1631.55
2003	$1776.31
2004	$1448.68
2005	$1220.19
2006	$965.67

seen in the RoadReady population may be due to temporal trends and not to the intervention.

The workers' compensation costs for low back injuries decreased from $277,104 in 2003 to $136,159 in 2006. The workers' compensation costs associated with low back injuries per injured driver increased steadily from 1999 to 2003 and declined after 2003, postintervention (see Table 3). Although there are no data available for the total workers' comp costs associated with the back injuries in the transportation industry in 1999 or 2006, Arkansas Workers' Compensation Commission biennial reports show an increase in medical-only expenditures from $18,554,727 in 2003 to $22,178,582 in 2006.[17,18] The Bureau of Labor Statistics[5,7] reports that one of the variables affecting the cost, median days away from work for truck drivers, increased from 9 days in 1999 to 14 days in 2006.

RoadReady intervention seems to be associated with a reduction in workers' compensation costs due to low back injuries. The 54% reduction in incidence rate of low back injuries seen is similar to that of the transportation industry from 1999 to 2006. Nevertheless, the reduction in workers' compensation costs associated with low back injury since the introduction of the program in 2003 may have been due to the intervention, where individuals assessed as having a higher risk of low back injury may have been placed elsewhere. The number of upper back injuries and associated workers' compensation costs remained flat during the study period.

There are limitations to this research. It is observational in nature, so this limits the conclusions that might be drawn regarding cause and effect. Observation for a longer period would further demonstrate the effect of this intervention. There may have been other unidentified reasons for the reduction in workers' compensation costs. Having data on commercial truck drivers who did not participate in the RoadReady intervention for comparison group would have been helpful. The upper back, not targeted in this intervention, served as a comparison group where the number of injuries and associated workers' compensation costs remained flat. Further studies determining the difference in incidence rates of back injuries and associated workers' compensation costs in truck drivers employed by transportation companies with and without fitness-for-duty testing would be useful. Despite the limitations, the RoadReady post-hire evaluation introduction was associated with a 45% reduction in workers' compensation costs associated with low back injuries in this population.

REFERENCES

1. U.S. Department of Transportation, Federal Motor Carrier Safety Administration, Motor Carrier Management Information System (MCMIS), Commercial Motor Vehicle Facts—March 2013.
2. Childs JD, Wu SS, Teyhen DS, Robinson ME, George SZ. Prevention of low back pain in the military cluster randomized trial: effects of brief psychosocial education on total and low back pain-related health care costs. *Spine J.* 2013;pii:S1529–S9430.
3. Martin BI, Deyo RA, Mirza SK, et al. Expenditures and health status among adults with back and neck problems. *JAMA*. 2008;299:656–664.
4. Ricci JA, Stewart WF, Chee E, at al. Back pain exacerbations and lost productive time costs in United States workers. *Spine*. 2006;31:3052–3060.
5. Bureau of Labor Statistics, U.S. Department of Labor. Lost-work time Injuries and Illnesses: Characteristics and resulting time away from work. Available at http://stats.bls.gov/iif/home.htm. Published 1999.
6. MacDonald MJ, Sorock GS, Volinn E, Hashemi L, Clancy EA, Webster B. A descriptive study of recurrent low back pain claims. *JOEM*. 1997;39:35–43.
7. Bureau of Labor Statistics. *Occupational Injuries and Illnesses: Counts, Rates, and Characteristics*. Washington, DC: US Bureau of Labor Statistics; 2006.
8. Liberty Mutual Research Institute for Safety. *Liberty Mutual Workplace Safety Index*. Hopkinton, MA: Liberty Mutual Research Institute for Safety; 2002.
9. Sengupta I, Reno V. Recent trends in workers' compensation. *Soc Secur Bull*. 2007;67:17–26.
10. US Department of Transportation, National Highway Traffic Safety Administration. Rural Pickup Truck Drivers and Safety Belt Use: Focus Group Report. Washington, DC: US Department of Transportation; 2004.
11. US Department of Transportation, National Highway Traffic Safety Administration. *Assessment of a Drowsy Driver Warning System for Heavy-Vehicle Drivers: Final Report*. Washington, DC: US Department of Transportation; 2009.
12. US Department of Transportation, National Highway Traffic Safety Administration. *Process and Outcomes Evaluation of Older Driver Screening Programs: The Assessment of Driving-Related Skills (ADReS) Older-Driver Screening Tool*. Washington, DC: US Department of Transportation; 2009.
13. US Department of Transportation, National Highway Traffic Safety Administration. *The Economic Impact of Motor Vehicle Crashes*. Washington, DC: US Department of Transportation; 2002.
14. US Department of Transportation. *National Highway Traffic Safety Administration, Drug-Impaired Driving: Understanding the Problem and Ways to Reduce It: A Report to Congress*. Washington, DC: US Department of Transportation; 2009.
15. US Department of Transportation. *National Highway Traffic Safety Administration, Countermeasures That Work*. 5th ed. Washington, DC: US Department of Transportation; 2010.
16. Kashima SR. A petroleum company's experience in implementing a comprehensive medical fitness for duty program for professional truck drivers. *JOEM*. 2003;45:185–196.
17. Arkansas Workers' Compensation Commission biennial report for the fiscal years 2003–2004. Available at http://www.awcc.state.ar.us/reports/biennial/fullbiennialreportfor2004.pdf.
18. Arkansas Workers' Compensation Commission biennial report for the fiscal years 2005-2006. Available at http://www.awcc.state.ar.us/reports/biennial/fullbiennialreportfor2006.pdf.