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A Randomized Controlled Trial of an Educational Intervention to Prevent the Chronic Pain of Whiplash Associated Disorders Following Rear-End Motor Vehicle Collisions

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Study Design. Concealed allocation, multicenter, single-blind, randomized controlled clinical trial.

Objective. To assess the efficacy of an educational video in the tertiary prevention of persistent WAD symptoms following rear-end motor vehicle collisions (MVCs).

Summary of Background Data. Whiplash-associated disorders (WAD) are an important and costly health problem. There is a lack of high quality evidence surrounding efficacy of treatments for WAD. Existing research supports active interventions and early return to regular activities.

Methods. Consecutive patients presenting to four tertiary care emergency departments following rear-end MVCs were eligible. Following informed consent, patients were allocated, using central randomization, to receive an educational video plus usual care or usual care alone. The video provided reassurance, and advice about posture, return to regular activities, exercises, and pain-relief methods. Data were collected by telephone using standardized questionnaires. The primary outcome was presence of Persistent WAD Symptoms at 24 weeks postinjury, based on the frequency and severity of neck, shoulder, or upper back pain. The absolute difference in proportion of patients with persistent WAD symptoms and rate ratios were calculated. Changes in pain scores were compared using the Mann-Whitney *U* test.

Results. The intervention (n = 206) and control (n = 199) groups were similar at baseline (mean age 38.4 years; 64% female). Overall, the proportion of subjects with Persistent WAD Symptoms decreased from 89.1% at baseline to 33.6% at 24 weeks after injury. At 24 weeks, the proportion of subjects with persistent WAD symptoms in the intervention group was 7.9% (95% CI, −2.0, 17.8) lower than the control group. The median improvement in pain score at 24 weeks was 3 for the intervention group and 2 for the control group ($P = 0.016$).

Conclusion. The presence of persistent WAD symptoms following simple rear-end MVCs was high in this sample. The video group demonstrated a trend toward less severe WAD symptoms. We recommend evaluating other educational interventions that could reduce WAD symptoms.

Key words: whiplash associated disorder, motor vehicle collision, randomized controlled trial. **Spine 2005;30: 1799–1807**

Whiplash-associated disorder (WAD) is a collection of signs and symptoms resulting from an acceleration-deceleration mechanism of energy transfer to the neck.[1] It most often involves an occupant of a stationary motor vehicle that is struck from behind by another vehicle;[2] however, WAD injuries may occur during other activities and types of motor vehicle collisions (MVCs).[1] Common symptoms associated with WAD include, but are not limited to, neck pain, headaches, dizziness, visual disturbances, impaired concentration, and sensory changes in the upper extremities.[3] WAD continues to be a burdensome health problem with serious economic consequences. One-third of persons involved in a rear-end MVC report neck pain and other WAD symptoms of important severity.[2] In the United States, the economic impact of WAD is estimated at 4.5 billion dollars per year.[4]

In 1995 the Quebec Task Force on Whiplash Associated Disorders provided a comprehensive review of the literature surrounding this controversial health problem.[1] This report illustrated the lack of consensus regarding treatments for WAD, and in particular the need for well-designed, randomized trials in this field. The Quebec Task Force concluded that the best available evidence suggests that symptoms might be alleviated through early return to regular activities. These conclusions have been supported by two systematic reviews of controlled trials evaluating conservative treatments for WAD. Verhagen *et al*[5] identified 15 trials meeting their selection criteria; however, only three were of acceptable

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methodological quality. On the basis of these three studies involving 301 patients, the authors concluded that active interventions and return to usual activities may be beneficial in the treatment of acute WAD. More recently Sarig-Bahat[6] reported a systematic review evaluating the evidence from trials for exercise therapy in mechanical neck disorders. Based on three randomized controlled trials of varying methodologic quality, involving 326 patients, the author concluded that there was strong evidence "to support the effectiveness of early active mobilizing exercises in acute whiplash patients."

In response to the need for high-quality evidence regarding treatment options for WAD,[1,5] we conducted a randomized controlled trial to assess the efficacy of an educational video in the tertiary prevention of WAD following rear-end MVCs. Our hypothesis was that the group receiving the educational video plus usual care would have fewer patients with persistent WAD symptoms 6 months after injury compared with the usual care group.

■ Materials and Methods

Settings. The study population consisted of consecutive patients presenting to any of four tertiary care emergency departments (EDs) within 24 hours of a rear-end MVC. Patients were enrolled at Kingston General and Hotel Dieu Hospitals (Kingston site), the Ottawa Hospital–Civic Campus (Ottawa site), and the University of Alberta Hospital (Edmonton site) between June 2000 and May 2002. All are large, academic, tertiary care hospitals in Canadian cities that are staffed by full-time emergency physicians with Royal College of Physicians and Surgeons or College of Family Physician Certification in Emergency Medicine. Ontario, where two sites were located, has a no tort rule for law; therefore, injury victims are unlikely to hire a lawyer and carry out legal proceedings for an injury of this nature. In Alberta, no such legislation exists and compensation for pain or suffering can be sought at the discretion of the injured person. The study was approved by the Ethics Review Board at each site.

Educational Video. The video was developed based on recommendations of the Quebec Task Force. The 20-minute video was professionally produced by a provincial educational agency (TV Ontario). The content was scripted based on the best available evidence regarding WAD management. The video provided reassurance as well as basic advice about posture, early return to regular daily activities, range of motion exercises, and the use of pain-relief methods including ice, heat, and analgesics (Figure 1). Before the trial, the video was reviewed by a convenience sample of ED physicians, physiotherapists, and lay people and piloted with patients who presented to the ED following a rear-end MVC between January 1 and April 20, 2000. Results of the pilot study and copies of the video are available from the authors on request.

Inclusions/Exclusions. Patients were eligible for the study if they were involved in a simple rear-end MVC in which their car was struck from behind, were 16 years of age or older, were conversant in English, and provided informed consent according to the requirements of the site's Ethics Review Board. Patients were excluded if they refused to be contacted for research

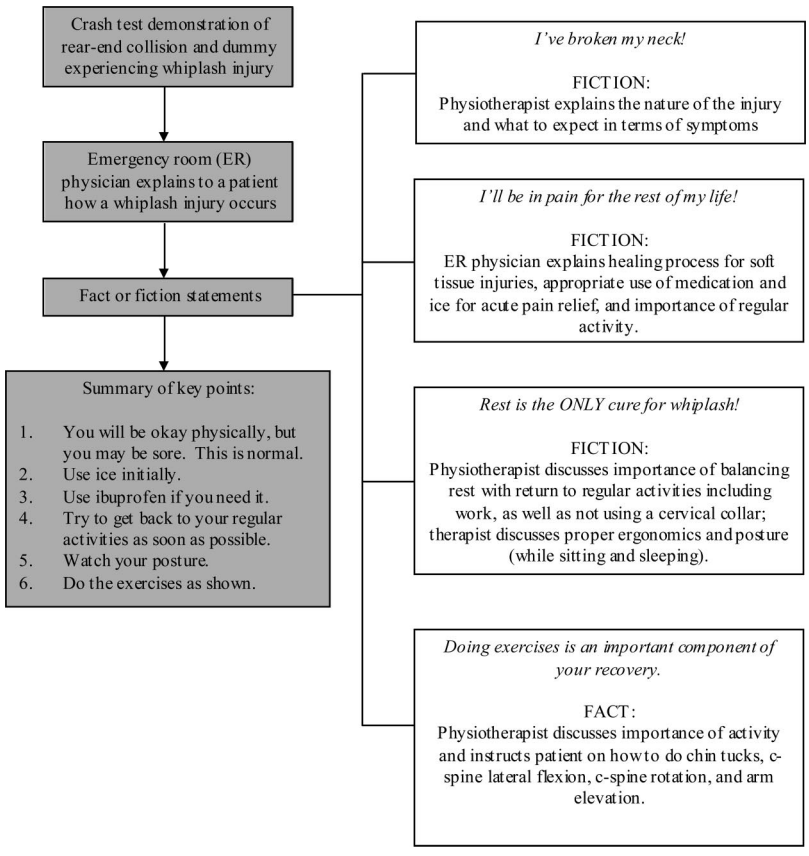

Figure 1. Overview of content of educational video for the tertiary prevention of WAD.

purposes, were making a return visit to the ED for reassessment, were an occupant in a motor vehicle from which another occupant had already been enrolled in the study, or could not be contacted within 7 days of the MVC.

Enrollment and Randomization. Potential study subjects were identified by two methods. Where possible, patients were identified in the ED and were given a letter explaining the study before discharge. To identify patients who may have been missed in the ED, a research assistant regularly reviewed the daily ED logs and sent the letter by courier to eligible patients as soon as possible after the visit (i.e., within 24 hours if the ED visit occurred on Sunday through Thursday and within 72 hours on Friday and Saturday).

Beginning 24 hours after sending the information letter, the research assistant attempted to contact the patient by telephone. During this initial telephone contact, patients providing verbal consent to participate were enrolled. The research assistant conducted the baseline interview and assigned the patient to one of the two study arms. Treatment was allocated by opening the next in a series of sequentially numbered, sealed, opaque brown envelopes prepared by a researcher at Queen's University who did not participate in patient enrollment or treatment allocation. The randomized list was computer-generated in blocks of 20 and stratified by site.

Study Intervention. Both study groups were provided with usual initial clinical evaluation and care for the management of whiplash injuries in the ED by the primary treating physician, which may or may not have included a cervical radiograph.[7] Patients were allowed to follow usual regimens of follow-up care (i.e., care sought by patients from other practitioners following the initial ED visit).

Patients randomized to the intervention arm were sent the 20-minute educational video described above. The video was sent by courier to the study subject's home on the day of randomization. The patient was also contacted shortly after receiving the video and asked to respond to a brief questionnaire to evaluate the subject's use and assessment of the video. Patients randomized to the control arm were instructed to follow-up with their usual physician and were not provided with any additional educational material.

Blinding. The study subjects were blinded to the study hypothesis. The consent letter indicated that they may be sent additional educational material, depending on the study group to which they were assigned. Subjects receiving usual care were never aware that the intervention being evaluated was an educational video. When subjects were assigned to the intervention group, they were asked not to reveal that they had received a video to the research assistant conducting the follow-up telephone interviews. To minimize the potential impact of the trial and its intervention on practice patterns, the attending physicians providing initial care in the ED were minimally exposed to the ongoing trial and did not have knowledge of each patient's potential participation. The research assistants conducting the follow-up telephone interviews were blinded to their allocation, were not involved in enrollment or randomization, and did not perform the initial or video assessment interviews.

Data Collection. Baseline data were collected on all patients during the initial interview. Patient response to treatment was assessed at 2, 6, 12, 24, and 52 weeks following the initial ED visit. This was achieved by telephone using a standardized questionnaire (available from authors). The questionnaire was developed and tested in our previous work.[2] Variables assessed at baseline allowed us to describe the study population; measure the primary and secondary outcome variables at baseline; and gather information on important prognostic factors (e.g., demographics, crash characteristics, symptoms). Variables collected during the follow-up interviews allowed us to measure our outcome variables at various points of follow-up.

Outcome Measures. A scoring system for pain experienced by patients with WAD (Figure 2) was developed as part of earlier research and was found to correlate strongly with objective signs and clinical symptoms documented in the ED.[2,8] Subjects were asked to rate the frequency [never, occasionally (less than once a week), regularly (once a week or more), or daily] and severity [no symptoms, minor (a nuisance), moderate (affects their regular activities or work), or severe (significant handicap to their regular work or activities)] of pain in the neck, shoulder, and upper back. A pain score, on an ordinal scale (range, 0–5) was generated for each of these anatomic locations. Patients were assigned the highest score obtained for the three pain outcomes. "Persistent WAD Symptoms" was operationally defined as having a score of ≥ 3 in at least one of these locations. A priori and as per established precedents,[9] the cut-off for dichotomizing the pain scale was set at ≥ 3; these levels of pain were at least moderate in severity and more frequent than occasional, and hence this was used as a clinically relevant cut-off value. The primary endpoint was the presence or absence of persistent WAD symptoms at 24 weeks from the time of injury; we chose 24 weeks because it has been shown to correlate with long-term symptoms.[1,2,9] The secondary outcome was change in the ordinal pain score between baseline and 24 weeks.

Sample Size. Our hypothesis was that the group receiving the video plus usual care would have 15% fewer patients with persistent WAD symptoms at 6 months after the injury compared with the usual care group. We decided on a 15% change a priori; this difference was considered to be clinically important and was conservative relative to values reported in earlier studies.[10–13] The sample size estimation indicated that at least 151 patients were required for each study group. This was based on a 35% prevalence of persistent WAD symptoms at 6 months following a rear-end MVC.[2] This sample size, in balanced study arms, would allow 80% power at an alpha level of 0.05 to detect an absolute difference of 15% in the proportion of patients reporting persistent WAD symptoms.

	Severity of Pain			
Frequency of Pain	None	Mild	Moderate	Severe
Never	0	0	0	0
Occasionally	0	1	2	3
Regularly	0	2	3	4
Daily	0	2	4	5

Figure 2. Scoring system for primary outcome (shaded area represents persistent WAD symptoms).

Statistical Analysis. To ensure that randomization achieved balance on baseline prognostic factors, distributions of the variables were examined and the study groups were compared using χ^2 statistics for categorical variables and parametric and nonparametric *t* tests for continuous and ordinal variables. The primary analysis was based on intention-to-treat; we included patients who completed the study and analyzed them according to the group to which they had been randomly assigned regardless of video viewing compliance. In a sensitivity analysis, we included patients who had been lost to follow-up and classified these as treatment failures (i.e., persistent WAD symptoms present at follow-up). The proportion of patients reporting Persistent WAD symptoms at each of the follow-up points was calculated. The absolute difference in proportion of patients with persistent WAD symptoms between study groups was then determined for each follow-up point, and the associated 95% confidence intervals were derived using the normal approximation to the binomial distribution.[14] In addition we calculated the rate ratio and associated 95% confidence intervals at each time point. Analyses of the primary outcome were carried out for the entire study population overall and then stratified by site. The change in pain score (ordinal scale) from time of injury to 24 weeks was assessed in both study arms and compared via the nonparametric Mann-Whitney *U* test.

Results

Study Population

We identified 684 consecutive patients as potential study subjects between June 2000 and May 2002. Overall, 279 (41%) patients were not randomized; we were unable to contact 149 patients within 7 days of the collision; 6 individuals were excluded because of language barriers; 20 were not interested; and 104 declined for unspecified reasons. We recruited 59% of the patients with 199 randomly allocated to the control (usual care) group and 206 to the intervention arm (usual care plus video). One hundred and sixty-four (82.4%) patients in the control group and 184 (89.3%) patients in the intervention group were followed at 24 weeks, the primary end-point. At 24 weeks, 21 subjects indicated they no longer wanted to participate, we were unable to contact 17 subjects, and 19 of the recruited patients had moved, or their telephone was no longer in service (Figure 3).

Baseline Characteristics

There were few significant differences in the distribution of study variables between the two groups (Tables 1 and 2). The mean time elapsed between the ED visit and

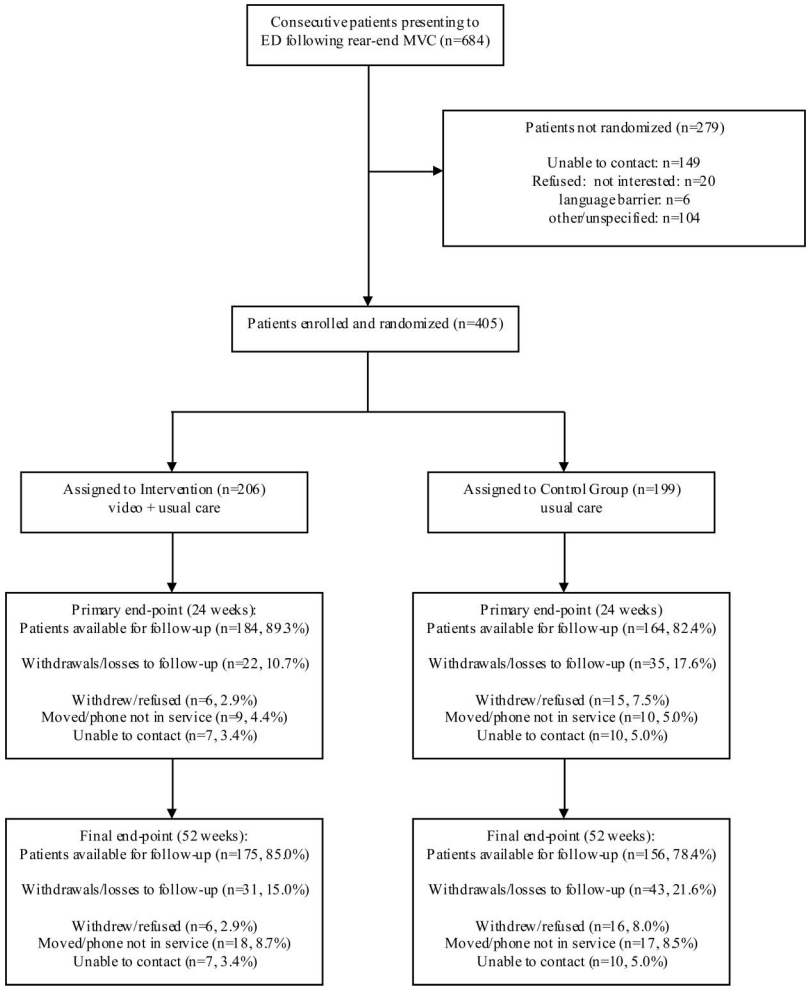

Figure 3. Flow of study participants through the trial.

Table 1. Baseline Characteristics of Study Participants: Demographics and Symptoms

	Treatment Group n = 206	Control Group n = 199
Demographics		
Site, n (%)		
Kingston	113 (50.9)	109 (49.1)
Ottawa	42 (50.6)	41 (49.4)
Edmonton	51 (51.0)	49 (49.0)
Mean age, years (range)	38.4 (16–85)	38.4 (17–81)
Male, n (%)	78 (37.9)	67 (33.7)
Worked for income, n (%)	145 (70.4)	139 (69.8)
Missed work, n (%)*	92 (63.4)	103 (74.1)
Mean job physical activity score (SD)†	7.36 (11.30)	5.53 (2.82)
Mean hours missed (SD)	16.3 (12.6)	17.0 (12.6)
Symptoms		
Reporting no pain, n (%)	3 (1.5)	2 (1.0)
Still experiencing pain in at least one location at initial interview, n (%)	196 (96.6)	187 (94.5)
"WAD" pain at initial interview, n (%)	185 (89.8)	176 (88.4)
"WAD" scores at baseline, n (%)		
0	12 (5.8)	19 (9.6)
1	5 (2.4)	3 (1.5)
2	4 (1.9)	1 (0.5)
3	42 (20.4)	40 (20.1)
4	89 (43.2)	94 (47.2)
5	54 (26.2)	42 (21.1)
Pain onset within 12 hr of MVC, n (%)		
Neck	154 (90.1)	145 (87.9)
Shoulder	99 (73.9)	95 (70.9)
Upper back	81 (72.3)	92 (78.6)
Low back	75 (71.4)	80 (76.9)
Numbness	24 (54.5)	25 (58.1)
Headaches	98 (83.8)	97 (76.4)
Past history of pain lasting more than 1 wk, n (%)		
Neck	51 (24.8)	37 (18.6)
Shoulder	43 (20.9)	35 (17.6)
Upper back	21 (10.2)	18 (9.0)
All 3	14 (6.8)	9 (4.5)
One of 3	60 (29.1)	75 (27.7)
Ongoing problems with pain just prior to MVC, n (%)		
Neck	16 (7.8)	16 (8.0)
Shoulder	14 (6.8)	11 (5.5)
Upper back	9 (4.4)	10 (5.0)
All 3 locations	5 (2.4)	6 (3.0)
One of 3 locations	21 (10.2)	25 (12.6)
Reduced neck range of motion, n (%)	58 (28.1)	47 (23.6)

*$P = 0.05$.
†$P = 0.08$.

Table 2. Baseline Characteristics of Study Participants: Circumstances of the Collision

	Treatment Group n = 206		Control Group n = 199	
Circumstance of the Collision	n	(%)	n	(%)
Vehicle damage				
Substantial/write-off	128	62.1	113	56.8
Unknown	36	17.5	41	20.6
Relative size of other vehicle				
Smaller	52	25.2	46	23.1
Bigger	103	50.0	96	48.2
Same size	47	22.8	52	26.1
Seating position at time of collision				
Driver's seat	159	(77.2)	165	(82.9)
Front seat passenger	41	(19.9)	28	(14.1)
Back seat passenger	6	(2.9)	6	(3.0)
Participant's vehicle stopped when hit	171	(83.0)	168	(84.4)
Where collision occurred				
Parking lot	1	(0.5)	1	(0.5)
Intersection in city	92	(44.7)	101	(50.8)
Intersection outside city	5	(2.4)	1	(0.5)
On city road	86	(41.7)	73	(36.7)
On country road	2	(1.0)	5	(2.5)
On the highway	11	(5.3)	14	(7.0)
Other	9	(4.4)	4	(2.0)
Neck extension				
No	124	(60.2)	126	(63.3)
Yes	32	(15.5)	35	(17.6)
Unknown	49	(23.8)	36	(18.1)

assignment to study groups was 3 days for the control group and 2.7 days for the intervention group. One hundred and forty-five (35.8%) of the participants were male, and the mean age of the cohort was 38.4 years. Two hundred and eighty-four (70.1%) participants reported working outside of the home before the collision. At the time of the initial interview, 92 (63.4%) of the participants randomized to the intervention and 103 (74.1%) controls ($P = 0.051$) had missed an average of 16 hours of work.

At baseline, 5 patients denied the presence of any pain related to the collision. At the time of the initial interview, 383 (94.5%) subjects were still experiencing symptoms in at least one of six locations (neck, shoulder, upper back, low back, head, or upper extremities). The neck was the most common pain site noted (91.6%). When the frequency/severity response for neck, shoulder, and/or upper back pain was assessed, 177 (88.9%) patients in the control group and 185 (89.8%) patients in the intervention group reported persistent WAD symptoms.

Although the type of initial and follow-up care varied for individual patients and among sites, there was no significant difference between study groups with respect to advice received in the ED (e.g., to use heat, ice, collar, exercise, rest), whether patients were prescribed or advised to take medications, or whether patients consulted another physician other than the physician seen in the ED (data not shown).

Treatment Efficacy

The proportion of subjects reporting persistent WAD symptoms decreased from 89.1% at baseline (185 of 206 intervention group; 176 of 199 control group) to 33.6% (55 of 184 intervention group; 62 of 164 control group) 24 weeks after collision (Table 3; Figure 4). At 24 weeks, the proportion of study subjects in the intervention group experiencing persistent WAD symptoms was 7.9% (95% CI, −2, 17.8) lower than that of the control group. The risk of persistent WAD symptoms for pa-

Table 3. Comparison of the Percentage of Patients with Persistent WAD Symptoms (score ≥3) Over the Study Period

Time from MVC	Percentage with Persistent WAD Symptoms (No. of Subjects with Persistent WAD Symptoms/No. of Subjects Available for Follow-up)		Rate Ratio [95% CI]	Absolute Difference in Proportions [95% CI]
	Intervention	Control		
Initial	89.8 (185/206)	88.4 (176/199)	1.02 [0.95,1.09]	1.4 [−4.7,7.5]
2 week	68.0 (133/195)	72.4 (131/188)	0.94 [0.83,1.07]	4.4 [−13.6,4.8]
6 week	51.9 (98/189)	55.4 (97/175)	0.94 [0.77,1.13]	3.5 [−13.7,6.7]
12 week	38.4 (71/185)	45.0 (76/169)	0.85 [0.67,1.09]	6.6 [−3.7,16.9]
24 week	29.9 (55/184)	37.8 (62/164)	0.79 [0.59,1.06]	7.9 [−2.0,17.8]
52 week	30.1 (53/176)	34.0 (53/156)	0.89 [0.65,1.21]	3.9 [−6.2,14.0]

tients in the intervention group was 0.79 times that of the control subjects (95% CI, 0.08, 1.10; Table 3).

In a sensitivity analysis, we included patients who had been lost to follow-up and classified these as treatment failures (i.e., persistent WAD symptoms present at follow-up); 37.4% of the intervention group had persistent WAD symptoms at 24 weeks versus 48.7% of the control group. The absolute difference in proportions was 11.3% (95% CI, 1.7, 20.9). Furthermore, we found no differences in treatment effect for the primary outcome across study sites (available from authors), consequently only pooled results are reported.

Differences in maximum severity/frequency score (based on an ordinal scale of 0–5) reported by patients at entry and after 24 weeks in the study were calculated. At baseline, both groups reported a median pain score of 4 (i.e., moderate pain on a daily basis or severe pain on a regular basis) out of a maximum pain score of 5. The median improvement in score over the study period was 2 for the control group and 3 for the intervention group ($P = 0.016$; Table 4).

Compliance with Video

Several days after sending the video, patients in the intervention group were contacted to evaluate their use and impressions of the video. At that point, 71% (n = 147 of 206) of patients randomized to the intervention group reported following all or a portion of the recommendations in the video, whereas 76% (n = 139 of 184) of patients available for follow-up at 24 weeks had followed all or part of the recommendations. There was no significant difference in the proportion of patients with persistent WAD symptoms at 24 weeks for patients who had followed recommendations (30.2%) compared with those who had not (29.9%; $P = 0.95$).

Cointerventions

Overall, 32% of the study population reported using pain medication at 24 weeks after injury with no significant difference between study groups ($P = 0.64$). A small proportion of the study population reported receiving treatment from a chiropractor (n = 39, 11.2%). The difference was significantly different with almost twice as many patients in the control group (n = 25, 14.5%) receiving chiropractic treatment compared with the intervention group (n = 14, 7.5%; $P = 0.02$). Approximately one-third of the study sample sought the care of a physiotherapist (31%) with no significant difference between groups ($P = 0.85$). The proportion reporting use of physiotherapy services varied significantly across sites with 28% and 25% of patients in Kingston and Ottawa, respectively, compared with 48% in Edmonton ($P = 0.02$). Very few patients reported receiving acupuncture (6.1%), and there was no significant difference between study groups ($P = 0.22$).

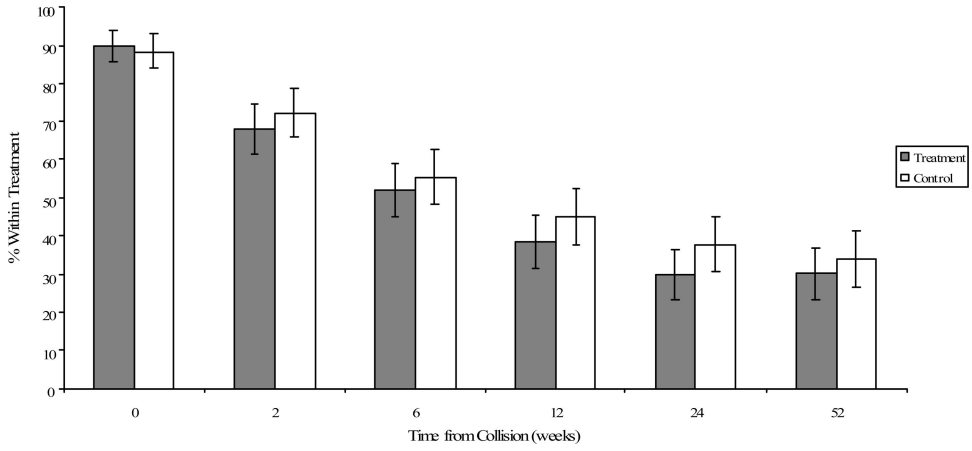

Figure 4. Participants with persistent WAD symptoms (score ≥3) over follow-up period.

Table 4. Changes in Pain Score From Baseline Over the Study Period

Time from MVC	Median Difference in Pain Score (Maximum Score = 5)		*P* (from Mann-Whitney *U* test)
	Intervention	Control	
2 week	0	0	0.07
6 week	1	1	0.26
12 week	2	1	0.03
24 week	3	2	0.02
52 week	3	2	0.07

Compensation

Overall, 68.9% of the study sample received reimbursement for damage sustained to their vehicle with no significant difference between study groups ($P = 0.27$). Approximately one-quarter of the study population was compensated for time lost from work ($P = 0.61$). Approximately one-third of patients received compensation for the costs of additional treatments ($P = 0.18$).

■ Discussion

This large multicentered trial is the first to examine an educational video intervention for preventing persistent WAD symptoms following assessment and treatment in an emergency setting. The results of this trial are encouraging but not conclusive. Although there was a consistent trend suggesting greater improvement among the group that received the educational video, the difference in the primary outcome measure at 24 weeks after injury did not achieve statistical significance at the $P = 0.05$ level. The magnitude of the observed difference did not approximate the a priori definition of minimal clinically important difference; we observed an absolute difference of approximately 8% compared with our minimal clinically important difference of 15%. In a sensitivity analysis that included losses to follow-up, the difference reached statistical ($P = 0.02$) but not clinical (11%) significance. The main secondary outcome (change in pain score) was significantly greater for patients in the intervention group compared with those in the control group. This evidence of a treatment effect suggests that at least some component of the intervention was effective. Contrary to some opinions,[15] the evidence of an acute effect lends further credence to the belief that this clinical syndrome actually exists.

There are a number of possible explanations for the lack of clinically and statistically significant findings. Many of these relate to the intervention itself, when it was implemented, and the video medium used to transfer information. First, the information in the video may not have been sufficiently different from the advice that was received through the usual care in the ED; therefore, the treatment effect would be diluted. The information presented in the video was very general and was not tailored to the specific needs of individual patients. Second, although evidence has shown that the video medium is effective in knowledge transfer, it may be inappropriate to teach therapeutic exercises after injury. Research studies that have shown a positive impact of active exercise following WAD have had multiple sessions with hands-on instruction from a trained professional.[16] Our design did not allow for clinical follow-up of patients in the intervention group to monitor their understanding and application of the information.

Third, the intervention may not have been implemented early enough in the course of the condition. The literature suggests that return to regular activities should occur as soon as possible after the injury event[1] and that this can be facilitated by "early delivery of evidence-based information."[17] We decided not to provide the intervention during the ED visit because of potential contamination of the control group. However, if the video had been provided at the time of the ED visit and was given the visible support of the attending physician, we may have seen a stronger effect. In addition, there were delays in transporting the video to the patients because we had to obtain consent before they could be randomized. We were not always able to contact them within the timeframe we had hoped. In a sensitivity analysis, we found no difference in outcome between groups that received the video within 72 hours versus more than 72 hours (data not shown); however, we did not have the statistical power to examine the observed effect within shorter timeframes.

Other possible explanations for lack of significant findings relate to patient compliance, the source of symptoms, and the outcome we used. First, we do not know the extent to which patients complied with the information provided in the video during the course of their recovery or whether they followed the instructions correctly, particularly in regards to the performance of the exercises. Furthermore, we do not know whether they complied with some pieces of information and not with others. If the intervention was efficacious, lack of compliance or incorrect procedures would likely bias the observed effect towards the null. Second, the pain associated with WAD may originate from different anatomic sources; the source of chronic neck pain may be the cervical zygapophysial joints in 50 to 65% of cases and discogenic or myofascial structures in the remaining cases.[3] The treatment approach we used (i.e., early mobilization) may not be appropriate for neck pain arising from joint structures. If a portion of our sample was resistant to improvement because the pain originated from the zygapophysial joints, this could also mute any potential benefit. Finally, our primary outcome measure may not have been sensitive to important changes in the condition of the patients. For practical purposes and based on past practice, we reduced a complex array of symptoms to a dichotomous outcome based on a six-point scale.

Strengths and Limitations

This study had several important strengths including rigorous methodological quality; appropriate, random assignment to treatment groups; adequate concealment of allocation to treatment groups; and blinding of the outcome assessor and the data analyst to the treatment group of the study subjects. In addition we recruited and followed a large number of consecutive patients over an extended period of time. The intervention was developed based on the best available evidence and was pilot tested with positive results. Selection bias should have been minimized with the prospective, randomized design; however, the moderate loss to follow-up (14.1% at 24 weeks and 18.3% at 52 weeks) could have introduced bias with a difference in effect among those who continued with the study. We examined the impact of losses to follow-up through a sensitivity analysis, and this suggested that their influence was primarily a loss of statistical power.

Because of the multifaceted nature of the intervention, we do not know the relative contributions of the different components of the intervention towards any treatment efficacy. The video addressed a number of factors related to the healing of soft tissue injuries (i.e., appropriate use and timing of pain relieving methods; importance of proper posture and maintaining range of motion; early return to regular activities). Although we were unable to discriminate which components of the video may have been more effective, the general advice and instruction provided would have been safe for all patients. Finally, we were unable to disentangle the effects of the information and the video format. A second treatment group that received the same information delivered in a different format would have facilitated this comparison but was not feasible. Other potential limitations of the study were our inability to blind the subjects in the intervention group and our use of self-reported information.

Future Directions

Although we did not find statistical significance for our primary outcome, the direction of effect was encouraging. Other research has shown that early activity and/or therapeutic exercises are effective in improving the signs and symptoms following whiplash injuries.[11,16] We felt that there were many advantages to the video format. These included the ability to provide a standardized intervention that had face validity and was reproducible. We would advocate examining other types of informatics systems that could transfer standard information to target users in a timely and cost-efficient manner. Providing such information to WAD patients may assist them in self-identifying whether they might benefit from further clinical follow-up. We would recommend further methodologically rigorous randomized trials. There are many facets to this research question that remain unanswered such as the efficacy of early activity alone or in combination with exercises, various types of exercises, self-taught versus instruction by a trained professional, and timing relative to the injury event.

■ Key Points

- A multicenter, single-blind, randomized controlled trial was conducted to assess the effectiveness of an educational video in the tertiary prevention of persistent WAD symptoms following rear-end motor vehicle collisions.
- Consecutive patients presenting to the emergency department following a rear-end motor vehicle collision were assigned using central randomization to receive an educational video plus usual care (n = 206) or usual care alone (n = 199).
- At 24 weeks post-MVC, the proportion of subjects with persistent WAD symptoms in the intervention group was 7.9% (95% CI, −2, 17.8) lower than the control group.
- The median improvement in pain score at 24 weeks was significantly greater for the intervention group ($P = 0.016$).

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