Reinjury Prevention Follow-Through for Clients With Cumulative Trauma Disorders

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Key Words: patient education

Objectives. Fifteen subjects with upper extremity, work-related cumulative trauma disorders were involved in a quality improvement study to determine their self-reported degree of follow-through with reinjury prevention regimens. The effect of cuing was also studied.

Method. During occupational therapy, subjects were involved in an educational session that focused on recommendations in ergonomic equipment, therapeutic maintenance techniques, body mechanics, and work simplification techniques. Follow-through with reinjury prevention education was evaluated and rated via telephone interviews approximately 2 weeks (T1) and 4 weeks (T2) after the educational session. Subjects did not know the questions they would be asked at T1, but were cued that their progress would be checked again at T2. Dependent t tests were conducted to compare the mean number of recommendations for which complete follow-through was expected with the mean number of recommendations at T1 and T2 that were implemented completely.

Results. A significantly lower degree was found of absolute completion of recommendations at T1 and T2 than had been anticipated (p < .002). No significant difference between T1 and T2 was found, indicating that cuing at T1 had little effect on subjects’ actual follow-through rate.

Conclusion. The implications of these findings for occupational therapists support the need for further research in reinjury prevention and employer education.

A critical role of occupational therapists in the treatment of clients with cumulative trauma disorders (CTDs) is education in reinjury prevention. To promote a smooth transition back to work for clients recovering from CTDs, the occupational therapist must instill in clients the need to change their work behaviors, but it is the clients’ responsibility to incorporate these methods into their daily activities. This change can minimize future disabilities, emotional stress, time off from work, and financial losses. Clients’ abilities to maintain new work habits once they return to their jobs, however, can be difficult due to job demands (Carlton, 1987; Norris, 1993). Few studies in occupational therapy have discussed the carryover of clients’ implementation of techniques learned in treatment. Quality improvement studies that assess follow-through in the work environment may help to validate the outcomes of occupational therapy to other health professionals, the public, third-party payers, employers, and occupational therapists themselves. This outcome study focused on clients’ self-reported degree of follow-through with preventive regimens, including reasons why they chose, or did not choose, to use prescribed ergonomic equipment, therapeutic main-
tenance techniques, proper body mechanics, and work simplification techniques.

Background of Cumulative Trauma Disorders

Worldwide, nearly 110 million people sustain musculoskeletal, job-related injuries each year (Nordin, 1987). One class of these disorders, CTDs, has grown from 18% of all U.S. workplace injuries in 1981 to 48% in 1989 (Rystrom & Eversmann, 1991). More than 80% of the reported 240,900 new cases of occupational illnesses of U.S. workers in 1988 were CTDs (Vannier & Rose, 1991). A study of workers’ compensation claims in Ohio from 1980 to 1984 revealed that out of 11,032 claims by employees who described having joint, tendon, or muscle inflammation, 6,849 (62.1%) fit the researchers’ description of a CTD (Tanaka et al., 1988). These disorders are reaching epidemic proportions and are now ranked second in research priority by the National Institute for Occupational Safety and Health (Dortch & Trombly, 1990; Rystrom & Eversmann, 1991).

CTDs, also known as overuse injuries, repetitive strain or repetitive motion injuries, or wear and tear disorders, are characterized by pain due to chronic microtrauma in soft tissues or entrapment of a peripheral nerve, and they often appear to be work-related (Aja, 1990; Putz-Anderson, 1988; Vannier & Rose, 1991). Warning signs of CTDs include pain, weakness, numbness, edema, decreased range of motion, deficits in sensation or dexterity, and temperature changes in the tissue (Aja, 1990; Putz-Anderson, 1988). Carpal tunnel syndrome, lateral or medial epicondylitis, de Quervain’s syndrome, and thoracic outlet syndrome are examples of upper extremity CTDs. Potential causes of CTDs include exposure to repetitive motions, manual force, vibration, use of improper tools or gloves, awkward postures, cold temperatures, and fatigue (Dortch & Trombly, 1990; Putz-Anderson, 1988; Rystrom & Eversmann, 1991). Jobs with highly forceful and repetitive motions are suspected causal factors of CTDs in workers (Silverstein,Fine, & Armstrong, 1986). Employees in these jobs are 29 times more likely than other workers to develop hand and wrist tendinitis (Armstrong, Fine, Goldstein, Lifshitz, & Silverstein, 1987). The most common nerve entrapment disorder, carpal tunnel syndrome, has been found to be caused by excessive repetitive motions with the wrist deviated from a neutral position (Dortch & Trombly, 1990; Silverstein, Fine, & Armstrong, 1987).

Identified as the most frequent form of on-the-job injuries, CTDs are a major contributor to increased absenteeism, workers’ compensation payments, medical costs, labor turnover, and employer costs (Dortch & Trombly, 1990; Putz-Anderson, 1988). In 1984, the state of Oregon settled 607 claims regarding job-related carpal tunnel syndrome, with an average cost per case estimated at $2,204 and indirect costs of $2,467 (Louis, 1987). For an employ-
ers (1987) interviewed 30 persons receiving home health care, they found only an 18% disuse rate of assistive devices. These findings suggest that carryover is inconsistent and that populations may differ in their implementation of techniques learned in therapy.

Studies examining the carryover of preventive behavior to the workplace have yielded varying outcomes. McCauley (1990) looked at the effects of body mechanics instruction on 30 young workers divided into two groups. The first group received instruction on the prevention of back injury before the first day of work and two on-site lessons; the second group did not receive injury prevention instruction. When observed on the job, those in the first group used more effective body mechanics. McCauley theorized that the lack of long-term work experience among these workers contributed to the quick carryover of these techniques to the work environment, because the subjects had not developed work habits that used poor body mechanics. In another study of 30 food service workers, subjects who received body mechanics training in lifting and lowering tasks performed better in the laboratory setting than those receiving no instruction, but their new habits did not carry over to the workplace (Carlton, 1987). Carlton theorized that workers’ habit patterns, high job pace, and return to the same work environment all contributed to the lack of follow-through.

The effectiveness of two educational approaches in reducing known risk motions was studied in 18 industrial workers who were at risk for developing CTDs (Dortch & Trombly, 1990). The approaches involved using a handout for one group of workers, and a handout and hands-on demonstration for the other group. One week after instruction, both groups of workers were determined to have reduced at-risk movements while on the job.

Although Dortch and Trombly used observation of workers to collect their data, studies on client follow-through are frequently conducted with self-report. The validity of self-reports from clients as actual measures of carryover has been questioned in the literature. One study suggested that self-reports from clients are unreliable unless other measures of compliance are taken at the same time (Waggoner & LeLievre, 1981). Another study of 61 adults with hand injuries found a positive correlation between self-reports of compliance and clients’ proficiency in performing their exercises at the clinic (Cordori et al., 1992).

Giving clients the opportunity to take responsibility for their own care encourages independence. The concept of compliance implies that the therapist’s goals are not the client’s goals. The therapist’s challenge is to find the latent motivation in clients and show them how to help themselves (Brown, 1991).

Whether one is assessing compliance or motivation, documentation of self-reported follow-through is an appropriate measure. This study examined the motivation of clients with CTDs to follow individualized, preventive regimens. Clients contributed to the preventive programs by discussing their concerns and goals about returning to work or continuing to work. The study focused on clients’ self-reported use of ergonomic equipment, therapeutic maintenance techniques, proper body mechanics, and work simplification approaches, as well as the reasons for nonuse of recommended methods at two follow-up points: 2 weeks (T1) and 4 weeks (T2) after the educational session. We hypothesized that the initial contact would motivate clients who had not implemented some injury prevention techniques to change their work behaviors before the time of the second follow-up contact, because the researcher disclosed at the first follow-up contact that the client would be called again.

Method

This study used a quasiexperimental design to examine the carryover of individualized reinjury prevention regimens to the workplace by subjects with CTDs, after occupational therapy treatment at a hand therapy clinic. During therapy, each subject was involved in an educational session about preventing reinjury. Subjects practiced techniques and 14 of 16 subjects received a handout including written recommendations (2 received verbal recommendations). Self-report, via telephone interview with the subjects, was used to validate their follow-through with the regimens. This method was viewed as a cost-effective, practical way to gather follow-through data.

Subjects

The initial group in this study through T1 consisted of 12 women and 4 men, a convenience sample of persons diagnosed with a work-related upper extremity CTD from five hand clinics in the state of Washington. They ranged in age from 21 years to 52 years, with an average of 36 years. Thirteen subjects were white, one was Hispanic, one was black, and one was white/Native American. Ten of the subjects were married; six were single. Highest education level attained ranged from 10th grade through master’s degree. Eleven subjects ranked themselves as the primary wage earner in their family.

All subjects were required to have participated in an educational session regarding reinjury prevention during therapy at the clinic. They had either returned, or were in the process of returning, to a previous position, to light duty, or to a new job. Potential subjects were excluded from the study if they were involved in litigation against their employers and if there was any known concurrent substance abuse, either of which could have adversely affected follow-through.

Diagnoses included carpal tunnel syndrome, with or without carpal tunnel release; medial and lateral epicondylitis; shoulder impingement; forearm, shoulder, and
upper extremity (nonspecific) tendinitis, overuse syndrome; thoracic outlet syndrome; and de Quervain’s syndrome. Three subjects had received multiple diagnoses. Eight subjects had CTDs in the right extremity, two had CTDs in the left extremity, and six had bilateral involvement.

Six subjects had not received time off from work and were continuing to work full-time, six returned to their previous full-time positions after a range of 1 month to 7 months’ absence from work, and three returned to light full-time duty after 2 weeks to 8 months’ absence from work. One subject was in the process of returning to a new job after 3 months without working.

Instrument

Criterion-referenced Reinjury Prevention Checklists for CTS, tendinitis, and de Quervain’s syndrome were developed and personalized for each subject. Checklists were based on protocols from one of the participating clinics. Each subject’s checklist was modified for feasibility during the educational session by input from the primary therapist and the subject. Checklists were used to evaluate the subjects’ follow-through in using ergonomic equipment, therapeutic maintenance techniques, body mechanics, and work simplification techniques at work and at home. Ergonomic equipment recommendations included items such as splint wear and use, workstation equipment, and tools. Therapeutic maintenance recommendations included hot and cold modalities, strengthening exercises, stretching, and similar items. Body mechanics recommendations focused on positioning (e.g., holding one’s wrist in neutral while working). Work simplification recommendations encompassed items such as taking rest breaks, decreasing repetitive motions, and using both hands rather than one when working. The checklists were given to the subjects in a handout after the educational session.

Subjects’ follow-through was rated according to one of three categories: complete follow-through with recommendation (3), partial follow-through with recommendation (2), or no follow-through (1). If subjects gave examples of how they implemented recommendations and their methods were consistent with or better than the recommended ones, they received a rating of 3. A rating of 3 was also given when the therapists had given the subject permission to stop following a recommendation (e.g., when the symptoms decreased, icing was not needed). If the subjects indicate that they were trying to implement a recommendation but were not always successful, they received a rating of 2. If subjects admitted to not implementing a recommendation, they received a rating of 1. Subjects who received a rating of 2 or 1 were also asked why a recommendation had not been adopted fully.

Procedures

After the study was explained to the subjects, consent forms were signed and witnessed by the subjects’ therapists. In addition, demographic characteristics, such as gender, race, age, marital status, level of education, whether they were the primary wage earner in the household, and return to work status, were gathered via a written questionnaire from 14 of the subjects. For 2 subjects, demographic data were gathered by chart review after verbal consent was obtained at the T1 follow-up contacts.

Subjects were actively involved in planning the regimen in the checklists used during their educational session. They practiced using ergonomic equipment and techniques to prevent reinjury. Fifteen of the subjects were given their recommendations in the clinic; one received them over the phone from her therapist. This subject had practiced reinjury prevention techniques in the clinic.

All subjects were called at T1, approximately 2 weeks (range = 15 to 16 days) after their educational session on the prevention of reinjury, except for one subject, who called the researcher because she was unable to provide a telephone number. The researcher identified herself and reminded subjects that the call was part of the quality improvement study in which they had consented to participate and that the confidentiality of their responses would be upheld. Subjects were asked to retrieve their Reinjury Prevention Checklists; if they could not, the checklists were read to them.

After the researcher read each recommendation, the subjects were asked how each had been implemented. If the recommendation was in effect, an example was requested; if not, a reason was requested. After going through the checklists, subjects were asked whether they had any questions or recurring symptoms. If so, they were redirected to their therapists. The subjects were thanked for answering the questions and told to expect another call in approximately 2 weeks. The above procedure was repeated at T2. Because one subject could not be contacted at T2, she was dropped from the study.

Results

The data used for descriptive analysis of the recommendations from T1 and T2 were derived from the 15 subjects completing the study. All the recommendations for the subjects were categorized into either ergonomic equipment, therapeutic maintenance, body mechanics, or work simplification. Next, the rating scores of all subjects for each category were tallied. Finally, the occurrence of each rating was plotted in percentages for T1 and T2. From the 117 recommendations given by therapists to subjects, 21% were related to ergonomic equipment, 42% to therapeutic maintenance, 12% to body mechanics, and 25% to work simplification. Two categories, namely...
ergonomic equipment and therapeutic maintenance, constituted the majority of recommendations given by therapists. Subjects were also most consistent in follow-through with recommendations from these two categories.

At T1, 4% of the combined subjects’ 25 ergonomic equipment recommendations were rated as no follow-through, 16% as partial follow-through, and 80% as complete follow-through (see Figure 1). At T2, 8% were rated as no follow-through and 92% were rated as complete follow-through.

At T1, 2% of the combined subjects’ 49 therapeutic maintenance recommendations were rated as no follow-through, 10% as partial follow-through, and 88% as complete follow-through. At T2, 8% were rated as no follow-through, 8% as partial follow-through, and 84% as complete follow-through (see Figure 2).

At T1, 14% of the combined subjects’ 14 body mechanics recommendations were rated as no follow-through, 50% as partial follow-through, and 36% as complete follow-through (see Figure 3). At T2, 21% were rated as no follow-through, 43% as partial follow-through, and 36% as complete follow-through.

At T1, 4% of the combined subjects’ 29 work simplification recommendations were rated as no follow-through, 41% as partial follow-through, and 55% as complete follow-through (see Figure 4). At T2, 7% were rated as no follow-through, 45% as partial follow-through, and 48% as complete follow-through.

To investigate whether significant differences existed between the number of recommendations made at baseline for which complete follow-through was expected, dependent t tests were conducted to compare the baseline means with the mean number of recommendations at T1 and T2 that were implemented completely. No significant difference was found between means at T1 and T2, however, and T1 and T2 means were significantly lower than baseline means (t = 3.85, p < .002; t = 3.74, p < .002, respectively). The results indicated a significantly lower degree of absolute completion of recommendations at T1 and T2 than was expected for full therapeutic benefit (see Table 1).

Reasons given for partial follow-through or no follow-through are shown in Table 2. At T1 the primary reason for lack of follow-through was attributed to job demands (18.8%) followed by subjects’ forgetfulness (6%). At T2 the primary reasons for lack of follow-through remained the same, although the percentages changed slightly (job demands, 21.3%; forgetfulness, 4%). Only one subject cited pain as a reason for lack of follow-through.

Discussion

The intention of this study was to ascertain the reported degree of client follow-through with recommendations made by occupational therapists to prevent reinjury after a CTD. This group of subjects showed a high rate of follow-through with ergonomic equipment recommendations in the home and work environments. When they
were queried 2 weeks after receiving the recommendation, subjects said that they found ergonomic equipment to be helpful in reducing symptoms and increasing their productivity when they were working. In the few cases when subjects chose not to use equipment, the most frequent reason reported was that it was not giving them relief from their symptoms. Comments regarding limitations imposed by the equipment included statements that the equipment prevented them from working fast enough or inhibited positions they needed to use when they were working. Regarding the increased percentage in follow-through of recommendations at T2, some sub-
Figure 4. Degree of follow-through with work simplification recommendations (n = 29).

Projects used their equipment more frequently, whereas others obtained the recommended equipment during the interval between T1 and T2. One subject stated that she decided to use her splint after the call from the researcher; thus in her case, the cueing at T1 affected her follow-through.

For the therapeutic maintenance recommendations, there was also a high overall rate of follow-through at both T1 and T2. The slight decrease in complete follow-through at T2 by some of the subjects was reportedly caused by increased symptoms as a result of working. These subjects said they needed to rest when they were at home, rather than follow their home exercise programs, because they were getting too much exercise at work. A few subjects said they had forgotten to follow some recommendations.

Body mechanics recommendations, such as holding an arm in the proper position while working, were more likely to be rated only as partial follow-through, meaning that more subjects were attempting these recommendations but were not always successful. At T2, more subjects reported that they were unable to work and maintain the recommended positions due to job requirements. Subjects with ergonomic work stations reported that they were able to implement body mechanics recommendations when using the stations.

Work simplification recommendations showed the same trend as body mechanics recommendations. The same reason, that job demands prevented them from implementing these recommendations, was most prevalent among subjects who received ratings of partial follow-through or no follow-through.

It is important for therapists to know which reinjury prevention recommendations clients will have a more difficult time implementing so that these recommendations can be given increased attention during therapy. In this study, subjects had most difficulty implementing recommendations regarding body mechanics and work simplification, reportedly because of job demands. Recommendations involving ergonomic equipment and therapeutic maintenance techniques that subjects could carry out at home were more successful than those recommended for the work environment because subjects had more control over the activities.

The three subjects who seemed to have exceptional employer support in reinjury prevention measures, such as encouraged rest breaks and ergonomic work stations and equipment, had the best follow-through and reported no increase in their symptoms during the duration of

Table 1

| Differences Between Means of Optimal Baseline Scores and T1 and T2 Follow-Through Scores |
|---|---|---|---|
| Scores | M | SD | Range | t Value |
| T1 | 5.9 | 1.7 | 3-9 | .65 |
| T2 | 5.5 | 1.9 | 2-9 | |
| Baseline recommendations | 7.8 | 1.4 | 6-11 | 3.85* |
| T1 | 5.9 | 1.7 | 3-9 | |
| Baseline recommendations | 7.8 | 1.4 | 6-11 | 3.74* |
| T2 | 5.5 | 1.9 | 2-9 | |

Note: N = 15, T1 = Time 1, T2 = Time 2.
*Significant at the p < .002 level.
Table 2
Reasons Given for Partial Follow-Through or No Follow-Through at T1 and T2

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<th>Pain T2 (n = 1)</th>
<th>Job Demands T1 (n = 3)</th>
<th>Job Demands T2 (n = 3)</th>
<th>Self-Discharge T1 (n = 7)</th>
<th>Self-Discharge T2 (n = 3)</th>
<th>Forgotten T1 (n = 5)</th>
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PFT = partial follow-through, NFT = no follow-through, T1 = Time 1, T2 = Time 2.

this study. For example, one subject reported that her employer made ice packs available during rest breaks, which helped to reduce pain.

Support and commitment from the employer in reducing job demands and encouraging follow-through appeared to be a key factor in this study. As noted in Carlton's study (1987) of workers who received body mechanics instruction, maladaptive habits may be deeply ingrained in some workers. Because job demands seem to be contributing to the increasing incidence of CTDs, employer involvement and education regarding CTDs is critical. The study by Dortch and Tromblé (1990) showed that education of workers who do not have CTDs can reduce the number of at-risk movements 1 week after training. Their findings supported preventive approaches to CTDs to break the all-too-common scenario of increased symptoms and the need for surgical intervention after a client has returned to work. The prevention of CTDs could also decrease the number of claims to third-party payers.

Occupational therapists can help educate workers and employers about prevention. As stated by Dortch and Tromblé (1990):

As a consultant to industry, the occupational therapist skilled in task analysis and adaptation, the biomechanics of hand use, and client education can contribute greatly to both the employer and the employee. As in other types of programs for health maintenance or disability prevention, education is the means by which occupational therapists treat workers (p. 777).

Interview results may have been influenced because subjects chose to be involved in this study, potentially increasing their likelihood of having better follow-through. Another consideration is that some recommendations may not have been feasible or were not jointly determined during the educational session. In addition, the responses of two of the subjects may have been affected because they knew the first author as an occupational therapy aide at a hand rehabilitation clinic.

Further study is needed to document the effects of preventive reinjury education on changing work behaviors and to determine whether such education can aid in decreasing reinjury in clients with upper extremity CTDs. Long-term studies and studies on the effectiveness of job analysis and job-specific recommendations could also shed light on the efficacy of specific modalities. The results of these types of studies may help to focus treatment and determine the most cost-effective and beneficial way to educate clients and, perhaps, slow the rising incidence of CTDs.

Conclusion
In this study, job demands of the subjects reportedly had the most effect on their ability to follow reinjury prevention regimens, especially recommendations about proper body mechanics and work simplification. A reminder cue at T1 had no significant effect on increasing follow-through of the recommendations 2 weeks later at T2. In fact, the increased job demands of 80% of the subjects decreased their abilities to follow-through with recommendations at T2. This study supports the need for further investigation of factors that prevent worker follow-through with reinjury prevention regimens and identification of effective methods of educating employers about prevention of CTDs. ▲

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