The U.S. Department of Labor, Bureau of Labor Statistics (1993) reported that disorders associated with conditions due to repeated pressure, vibration, or motion have increased from 23,000 in 1981 to 223,600 in 1991. Figures from 1992 demonstrate a 26% increase since 1991 in cumulative trauma disorders (CTDs) (U.S. Department of Labor, Bureau of Labor Statistics, 1994). The high incidence of repeated trauma injuries prompted the Occupational Safety and Health Administration (OSHA) to propose regulations to standardize ergonomics programs within industry (Bureau of National Affairs, 1995). The proposed OSHA guidelines include the following components: (a) health and risk factor surveillance, (b) job analysis, (c) medical management, (d) training and education, and (e) program evaluation. The proposed guidelines suggest active surveillance methods, including a risk assessment of work sites and periodic physical examination of all employees for early identification of symptoms and identification of high-risk jobs. Because individual examinations of a large population can prove unwieldy, OSHA developed a symptom survey (Bureau of National Affairs, 1995) to serve as an additional, optional method of determining whether musculoskeletal disorders are occurring in the workplace.

Method

When we reviewed 361 workers' compensation claims of the U.S. Army's Hawaii civilian workforce submitted over a 2-year period, we found that chronic injuries, such as low back pain (26.9%), upper-extremity CTDs (6.9%), and neck problems (3.7%), comprised 36.2% of all compensation cases. We suspected an underreporting of CTD symptoms. To determine prevalence more accurately, we surveyed the Tripler Army Medical Center civilian worker population with a modified version of the OSHA symptom survey. We included questions to emphasize symptoms of the upper extremity and information on job demographics, work pace, and feeling of physical and mental exhaustion. This cross-sectional epidemiology survey was designed to elicit a self-evaluation of pain or discomfort and localized symptoms to the neck and shoulder, elbow, and hand and wrist. The Federal Employees Union approved the survey, with our assurance that the information would be confidential.

To reach a confidence interval of 95% with an estimated prevalence rate of 5% and a bound on error of ±0.02, we calculated a required sample size of 323 (Epi Info, 1994). Using the employee roster of 1,112 full-time civilian employees, we did random sampling, selecting every third employee for a total of 450 employees, or 40.5% of the population. (The additional 127 employees ensured that we would meet our required sample size of 323).
Using the hospital distribution system, we mailed the survey with a letter explaining its purpose and sent a reminder note to nonrespondents 2 weeks later. The OSHA criteria for a clearly positive survey response are (a) reported pain symptoms of at least moderate intensity (i.e., a score of 2 or higher on the 4-point intensity scale), (b) reported symptoms persisting for at least 7 days from onset, or (c) reported symptoms that interfered with the employee’s ability to perform his or her job.

Results

Of 450 workers, 357 (79.3%) returned surveys. The respondents ranged in age from 19 to 69 years ($M = 44.4$ years) and represented the hospital’s overall age and gender demographics. One hundred eighty-one (50.7%) responded yes to the question, “Have you had any pain or discomfort of the shoulders, arms, neck, or hands during the past year that you believe to be related to your work?” One hundred and thirteen (31.7%) of all respondents met the previously stated OSHA criteria and were counted as giving a positive response. If we assume a response bias and that the 93 nonrespondents had no symptoms of CTD, then the 113 “positive respondents” who met OSHA criteria amounted to 25% of the 450 employees sampled.

Of the positive respondents, women were significantly overrepresented (72%) compared with their proportion (64%) of all respondents. Chi-square analysis for trend of the positive responses to work-related pain and discomfort by 10-year age groups was not significant. We used the mid-range of each age group as the exposure score. Similar analysis of respondents stratified according to length of time on current job also showed no significant trend. Twenty-three percent had worked less than 1 year, and 32.2% had worked 1 to 5 years. Twenty-three percent had worked 5 to 10 years, and almost 22% had worked more than 10 years. Varying the exposure score for more than 10 years did not affect significance.

Tables 1 and 2 show the frequency of reported symptoms associated with workers reporting physical or mental exhaustion. Analysis for trend demonstrated significant association for both factors. Of 356 respondents (1 of the 357 did not answer these questions), 112 (31.5%) reported that they had no control over their work pace, with 54 (48.2%) reporting symptoms that met OSHA criteria. Of the 224 who thought that they had control over their work pace, 55 (24.6%) reported symptoms meeting OSHA criteria. The difference in comparison of proportions was significant ($p < .001$), with a 95% confidence interval of 1.72 to 4.75.

We placed respondents with similar job requirements into eight job groups, which were formed by combining job titles with similar work requirements: (a) nurses, (b) clerical workers, (c) computer specialists, (d) laboratory and medical technicians, (e) physical laborers, (f) dental workers, (g) radiation technicians, and (h) not classified (i.e., job groups represented by only 1 or 2 respondents). There were no significant differences among the job groups. We compared the frequency with which respondents reported experiencing symptoms of physical and mental exhaustion never-seldom and often-always and found no significant differences among job groups.

Many respondents reported symptoms of long duration. Of the 113 positive respondents (i.e., those meeting the OSHA criteria), 56% reported having had symptoms for more than 1 month, and 24% reported a duration of more than 6 months. Twenty percent reported constant episodes, 27% reported daily episodes, 18% reported episodes of at least once a week, and 13% reported monthly episodes.

Symptoms were in multiple areas, with numbness and ache occurring most frequently in the hand, wrist, and forearm and stiffness and ache occurring most frequently in the neck and shoulders. Symptoms were nearly evenly distributed among hand, wrist and forearm (74 complaints), and shoulder and neck (80 complaints); a few symptoms were described around the elbow and upper arm (9 complaints).

Forty-four percent of the positive respondents, some giving multiple answers, reported symptoms in multiple sites. Thirty-five percent reported repetitive use of the extremities, 12.5% reported awkward posture, and 11% reported work area layout as the cause of their discomfort. A small percentage blamed forceful grasp (6.3%) or tool design (2.7%) as the cause of their symptoms, and 22% did not know what caused their symptoms. Thirty-three percent reported that the problem interfered with their ability

<table>
<thead>
<tr>
<th>Mental Exhaustion</th>
<th>Exposure Score</th>
<th>OSHA Criteria All n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>1</td>
<td>8 (7.2)</td>
</tr>
<tr>
<td>Seldom</td>
<td>2</td>
<td>35 (31.5)</td>
</tr>
<tr>
<td>Often</td>
<td>3</td>
<td>56 (50.5)</td>
</tr>
<tr>
<td>Always</td>
<td>4</td>
<td>12 (10.8)</td>
</tr>
</tbody>
</table>

Note. n = 111 for respondents meeting Occupational Safety and Health Administration (OSHA) criteria; $n = 357$ for all respondents. $\chi^2$ for linear trend $= 35.3, p < .00001$; correlation is highly significant.

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to work. Although the majority of the positive respondents rated their symptoms as moderate (67%) or severe (9%), 88 of 110 (80.0%; 3 respondents did not answer this question) reported no light or restricted duty days due to musculoskeletal problems.

By dividing respondents who reported symptoms into two groups, we found that 44.2% of those who met OSHA criteria sought medical care compared with 29.2% of those who did not meet OSHA criteria. The difference was moderately significant ($p = .047$ by analysis of proportions).

Discussion

Work intensity, repetition, and faulty ergonomics are common workplace factors related to CTD (Armstrong, Fine, & Goldstein, 1987; de Krom, Kester, & Knipschild, 1990; Gilad, 1995; Joseph & Bloswick, 1991; Silverstein, 1986). High-risk occupations rely on the repetitive use of the upper extremities, particularly the hands. Static positioning and constrained postures, attributed to poorly designed workstations, promote problems of the shoulder and neck. Psychosocial factors are also thought to contribute to the incidence of CTD.

Our findings of women having greater susceptibility to repetitive movement injury were consistent with previous studies (Ashbury, 1995; Fine, Silverstein, & Armstrong, 1986; Silverstein, 1986). These studies also noted that it is generally women in the workforce who perform highly repetitive tasks, such as data entry, that require extensive use of the hands.

Our data showed a high correlation among physical and emotional exhaustion, control of work pace, and the incidence of self-reported symptoms. Hocking (1987) suggested that psychosocial factors, including stress, had an important role in CTD. Himmelstein, Feuerstein, and Stanek (1995) reported that 15% of 124 patients with CTD had a previous psychiatric condition and, when compared with a control sample not affected by CTD, had higher levels of stress and anger toward their employers and lower levels of lifestyle organization. The researchers also noted that 47% of their patients had been given an indeterminate diagnosis, and they cited literature implicating stress and work pace as factors. Additionally, newspaper workers, who work at a fast pace, face frequent deadlines and conflicting demands, and spend a lot of time key-boarding, sometimes with their videoscreens in nonoptimal positions, reported more severe symptoms (Polanyi, Cole, & Beaton, 1997). Increases in electromyographic activity were associated with faster work pace and even with unsuccessful attempts to increase speed (Arnt, 1987). In assembly line workers, Arnt showed a 38% increase in pinch force with a 10% increase in speed. However, Feuerstein, Armstrong, and Hickey (1997) could not demonstrate an association between speed and force of keystroke in office workers. A self-reported survey of 420 secretaries in a large medical center indicated that musculoskeletal pain disorders of the shoulder and neck were mostly associated with a perceived poor psychological work environment (Linton & Kamwendo, 1989).

Conclusion

This study demonstrates the usefulness of the OSHA symptom survey in the active surveillance of musculoskeletal problems in the workplace. The data generated helped us to identify high-risk workers within our organization. We found a cluster of workers with repetitive movement injuries in the hand who performed the same task demanding speed and constant pace. There was also considerable employee turmoil in that section. We have incorporated the questionnaire in our evaluation of new patients who report to the occupational health clinic to help us assess their perception of the severity of symptoms. We intend to use this instrument as an adjunct to a comprehensive ergonomics program at our facility. We hope that the data generated will assist us in identifying workers who will most benefit from ergonomic, educational, and clinical intervention. ▲

Acknowledgments

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References


