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The CtdMAP™ Intervention Program© for Musculoskeletal Disorders

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THE MESSAGE

The National Academy of Sciences study found that musculoskeletal disorders of the back and arm are an important national health problem with over 1,000,000 workers missing time from their job each year, at a cost of over $50 billion a year (National Academy of Sciences, 1999). When one takes indirect costs such as reduced productivity, loss of customers due to errors made by replacement workers and regulatory compliance into account, estimates place the total yearly cost of all workplace injuries at well over $1 trillion or 10 percent of United States Gross Domestic Product (Melhorn, 2002b). Debates regarding causation and subsequent financial responsibility have delayed the opportunity to provide effective intervention and prevention in the workplace for musculoskeletal disorders. Effective prevention of musculoskeletal disorders (MSDs) in the workplace (illnesses) through active intervention is not only possible, but results in significant cost savings for the employer while reducing the physical and psychosocial disability experienced by the individual employee.

MSDs management refers to a collaborative process in which employers, healthcare providers and employees work together as members of a multi-disciplinary team to make the best possible options and services available to the employee. This collaboration includes assessing employee needs, planning and implementing intervention, healthcare treatment when appropriate, providing return to work options, coordinating services, monitoring and evaluating processes, and effective communication between team members. Although MSDs management systems can vary greatly in scope and design, the critical element is the use of an individual and job risk assessment instrument.

The benefits of MSDs management can include lower costs due to fewer MSDs, decreased absenteeism, reduced workers' compensation premiums, reduced

TABLE 1. Prevention Program Savings by Employer Type

Employer type	Savings/Dollar spent	Total employees	Dollars saved
Doctor	80	12	$10,000
Medical clinic	86	120	$120,000
Plastic	92	245	$810,000
Construction	121	8	$100,000
Legal	125	212	$400,000
Hospital	130	957	$1,000,000
Petroleum	145	6,200	$2,420,000
Plastic	185	2,100	$1,250,000
Elevator	212	378	$1,000,000
Education	214	891	$600,000
Grocery	216	1,700	$500,000
Aircraft	257	2,120	$1,300,000
Energy	288	10,000	$3,250,000
Aircraft	285	8,000	$2,300,000
Energy	288	10,000	$3,250,000
Salt	312	756	$1,100,000
Aircraft	390	6,000	$5,000,000
Aircraft	475	11,000	$2,420,000
Aircraft	Indirect	11,000	$13,500,000

disability, increased productivity, and higher product quality (Gough, 1985; McKenzie, Storment, & VanHoom, 1985; Lapore, Olson, & Tomer, 1984; LaBar, 1994; LaBar, 1989; GAO, 1997). The benefit to cost ratio (dollars saved per dollar spent) provides insight into the successfulness of MSDs programs. If a MSDs management program saved $100 dollars for every dollar spent, the benefit to cost ratio would be 100. Table 1 lists the dollars saved per dollar spent (benefit to cost ratio), total number of employees and the total dollars saved for different types of employers in a one year period who used the CtdMAP™ Intervention Program®.

INTRODUCTION

In 1975, the National Center for Health Statistics Interview Survey estimated that 16 million upper extremity injuries occur yearly and these injuries result in 16 million days lost from work (Kelsey, Pastides, & Kreiger, 1980). These numbers continue despite the 1986 National Institute for Occupational Safety and Health (NIOSH) national strategy for the prevention of work-related diseases and injuries (Melhorn, 1997c). After much debate, there is still little agreement on the three controversial aspects of cumulative trauma disorders (CTDs) and musculoskeletal disorders (MSDs): 1) appropriate definition for work-related musculoskeletal pain; 2) the best ergonomic and epidemiologic model for CTDs/MSDs; and, 3) the specific exposure relationships of the individual as they relate to the activities in the workplace. There is, however, common agreement on the need for reduction of CTDs/MSDs in the workplace. In 1997, direct health care costs were over $418 billion, and lower range estimates for indirect costs were over $837 billion for a total cost of $1.25 trillion (Brady et al., 1997).

As the costs for CTDs have risen there has been an effort to redefine the term CTDs by using the term MSDs (Melhorn, 1998d). Musculoskeletal pain is defined as any pain that may involve the muscles, nerves, tendons, ligaments, bones or joints. The United States government and other organizations have described MSDs pain as any musculoskeletal pain that an individual believes is associated with activities performed at work. For the pain to be considered as work compensable, state governments have legislated a variety of work contribution requirements (United States Bureau of Labor Statistics, 1996).

The need for screening and prevention for CTDs/MSDs is documented by many groups including publications by Gordon, Blair, and Fine (1995), *Repetitive Motion Disorders of the Upper Extremity,* and Rosenstock (United States Department of Health and Human Services, 1997) *Musculoskeletal Disorders and Workplace Factors, A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back.* Gordon, Blair, and Fine (1995) recommended screening for cumulative trauma disorders and state that "workers with physically demanding jobs should undergo careful screening to disqualify those with unacceptable intrinsic risk factors, and a program of continuing physical conditioning should be required. In addition, it should be recognized that after 10 to 20 years, a worker should be transferred to a less demanding task. The belief that any worker can do any job until age 65, which is a premise of much workers' compensation policy and labor union rhetoric, is not realistic (page #)." Rosenstock (United States Department of Health and Human Services, 1997) recommends prevention and states: "The National Institute for Occupational Safety and Health (NIOSH) concludes that a large body of credible epidemiologic research exists that shows a consistent relationship between MSDs and certain physical factors. NIOSH will continue to address these inherently preventable disorders (page #)."

As important as diagnosis and treatment are for the restoration of the worker to the workplace, the NIOSH cannot, except administratively, address the larger scope of CTDs/MSDs. To control this increasing workplace problem, health professionals and employers alike must direct their attention to prevention of CTDs/MSDs. Traditional approaches to injury reduction in the workplace have focused heavily on ergonomics and methods of effecting change through manipulation of the physical environment (Hackman & Oldham, 1980; Nordin & Franklin, 1989; Grandjean, 1980). Beyond ergonomics and education, medical consultation broadens the scope of intervention to include active surveillance of the worker population by means of health screens, clinical examinations and when indicated early referral for conservative management. A physician knowledgeable about CTDs/MSDs and familiar with risks within the workplace is able to treat and rehabilitate injuries optimally for both the worker and the employer (Melhorn, 1996c; Melhorn, 1998g).

Occupational illness results from any abnormal condition or disorder (other than one resulting from an occupational injury) caused by exposure to a factor(s) associated with employment (United States Bureau of Labor Statistics, 1997). This category is often referred to as cumulative trauma disorders (CTDs), repetitive strain injury (RSI), repetitive motion disorder (RMD) or chronic overuse syndrome. Unfortunately, these descriptive terms are often considered medical illnesses or commonly described as injuries, which only adds to the confusion. These terms are not medical diagnoses but descriptive terms or labels for individuals that experience pain in the workplace.

MUSCULOSKELETAL DISORDERS ETIOLOGY

Many healthcare providers believe the etiology of musculoskeletal disorders is multifactorial but choose to focus on the things they can evaluate and change (medical conditions) rather than the things they cannot change (age, gender, inherited health risk) or things they do not typically treat (workplace conditions). Thus, some healthcare providers believe it is the individual's medical history that largely determines if he or she will develop a musculoskeletal disorder. Similarly, ergonomists, also fully aware of the multifactorial nature of musculoskeletal disorders, choose to focus on the things they can evaluate and change (workplace conditions) rather than those things they cannot change or things they cannot treat (medical conditions). The workplace, therefore, becomes their primary focus for understanding the causation of musculoskeletal disorders. Both groups have come to realize that there is a third factor influencing MSDs, commonly described as psychosocial or biosocial issues (Melhorn, 2003; Melhorn, 2002d; Melhorn, 2002c).

UNDERSTANDING RISK

For a CTDs/MSDs to occur two elements are required: an individual and a job. Each element is associated with unique risks. The bucket analogy can be helpful in providing an overview as to how these risks interact. Consider the individual body as a bucket with a faucet. Activities at work and home are like paint. As the activities increase, the amount of paint in the bucket increases. The capacity of the faucet is controlled by the individual's inherited health characteristics and psychosocial issues (learned behaviors). If too much paint is in the bucket or the faucet is too small, the paint will spill over. Likewise, if an individual's activity level is high and their learned behaviors are not adequate to accommodate this level of activity the chance of a CTDs/MSDs occurring is greater, as seen in Figure 1.

The paint (workplace stressors such as repetitions, force, postures, vibration, contract stress, and cold) can be modified or decreased by changes in the job, job activities, and management style. Changing the capacity of the faucet can be more challenging, as changing one's inherited health risk is very difficult. It is more realistic to focus on changing an individual's physical capacity. Conditioning a body for activity in the workplace can be accomplished as effectively as for performance in sport. This conditioning can result in improved performance and decreased injuries. The development of musculoskeletal pain in the workplace can be predicted based on individual risk contributing 65 percent and job risk 35 percent (Melhorn, Wilkinson, & O'Malley, 2001b).

Figure 2 suggests the impact ergonomic intervention could have, while Figure 3 suggests the impact that could result from medicine and psychosocial issues (learned behavior and biosocial issues). The best approach would likely result from combining the benefits obtained by ergonomics (the job) and medicine (the individual), requiring healthcare providers to be knowledgeable about musculoskeletal disorders and possess an understanding of the workplace.

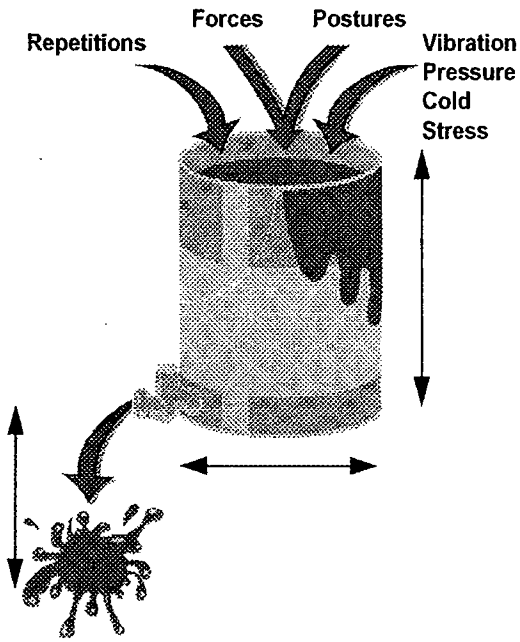

Figure 1. Individual Risk for CTDs/MSDs

Individual Risk Factors

Individual risk factors include age, gender, inherited health characteristics, psychosocial issues (learned behaviors and biosocial issues), and nonworkplace activities (Melhorn, 1996b; Melhorn, 1996c; Melhorn, 1998g; Melhorn, 1998a). Furthermore, the experience of pain is influenced by the ability to tolerate discomfort (Melhorn, 2003). Tolerating discomfort is determined by three elements: 1) the level of biological stimulus (discomfort or pain), 2) existing psychological distress, and 3) current personal social stress (Colledge & Johnson, 2000).

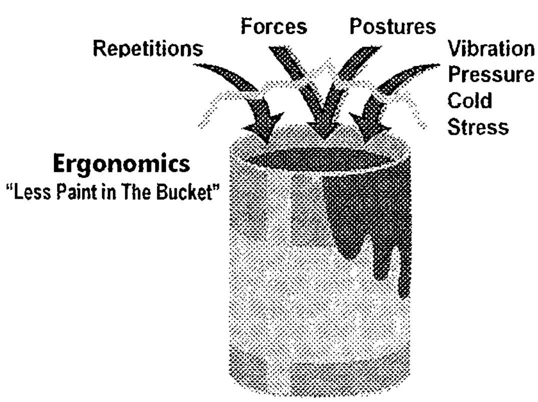

Figure 2. Ergonomics Perspective for CTDs/MSDs

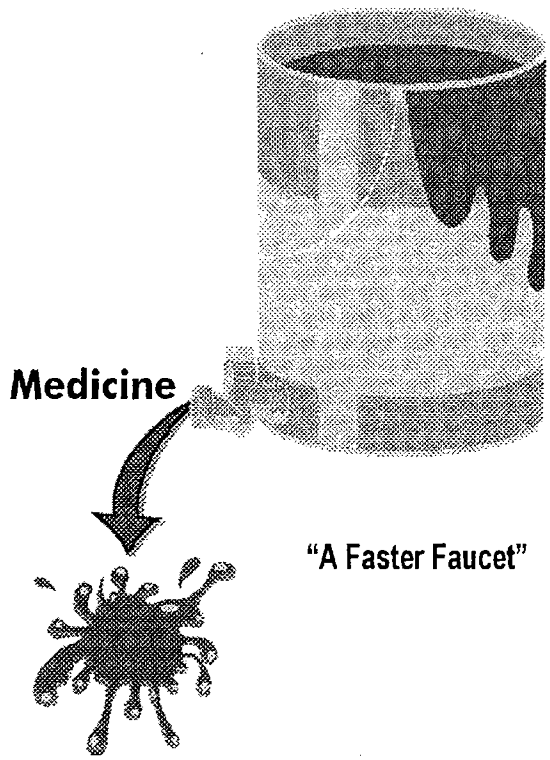

Figure 3. Medical Perspective for CTDs/MSDs

Employer Risk Factors

Workplace risk factors include all aspects of the production process (the manufacturing of a product). As discussed above, individual risk factors contribute to, moderate, and buffer the demands of the workplace and thus affect an individual's development of MSDs. Workplace or employer risk factors can be placed into three broad categories that include job or task demands, organizational structure, and the physical work environment. Epidemiologically identified physical stressors associated with job activities include repetition—frequent or prolonged repetitive movements, force—forceful exertions, posture—awkward postures, vibration—local or segmental, temperatures—cold, contact stress and static muscle loads, unaccustomed activities, and combinations (Hales et al., 1996).

MUSCULOSKELETAL DISORDERS ERGONOMICS PROGRAM

Successful Ergonomic Programs

The development and implementation of an ergonomics program requires a team effort. The implementation of a successful ergonomics program can benefit the employer and employee by: 1) reducing the number and severity of work-related injuries and illnesses, 2) reducing employee turnover, 3) increasing productivity, 4) increasing product quality, and 5) increasing employee morale. These benefits result in lower costs due to fewer MSDs, decreased absenteeism, reduced disability, reduced workers compensation premiums, increased productivity and higher product quality (Gough, 1985; McKenzie et al., 1985; Lapore et al., 1984; LaBar, 1994; LaBar, 1989). The General Accounting Office (GAO)(GAO, 1997) and NIOSH (Cohen, Gjessing, & Fine, 1997) list six critical elements necessary for a successful ergonomics intervention program in the workplace: 1) Management commitment (Hoffman, Jacbos, & Landy, 1995), 2) Employee involvement (Noro & Imada, 1991), 3) Risk assessment of individual and job (Melhorn, 2001), 4) Analysis of data and development of controls (Melhorn, Hales, & Kennedy, 1999a; Keyserling, Stetson, Silverstein, & Brouwer, 1993), 5) Training and education (Melhorn et al., 2001b), and 6) Traditional health care management (Melhorn, Wilkinson, & Riggs, 2001b).

Risk Assessment Instruments

Although the concept of MSD prevention is appealing, in practice some health care providers may have difficulties assessing individual and job risk factors. It is likely that an appropriate effective, risk assessment instruments must meet certain criteria. They must possess: reliability (test-retest reliability or reproducibility); internal consistency (the ability of a scale to measure a single coherent concept); validity (the instrument actually measures what it is purported to measure); and sensitivity or responsiveness to change (the instrument's ability to detect changes in clinical status) (Franzblau, Salerno, Armstrong, & Werner, 1997; Guyatt, Walter, & Norman, 1987; Guyatt, Kirshner, & Jaeschke, 1992; Amadio, 1993; Bergner & Rothman, 1987). Additionally, research has shown that disease specific instruments are usually more accurate and sensitive than general outcome instruments for measuring specific injuries or illnesses (Guyatt, Bombardier, & Tugwell, 1986; Dane et al., 2002).

The remainder of this chapter will discuss successful management of MSDs in the workplace using the CtdMAP™ Intervention Program® that assigns individual risk for upper extremities, lower extremities and the back. Individual risk is based on age, gender, inherited health characteristics, biosocial issues, learned behaviors and nonworkplace activities (Melhorn, 1996b; National Academy of Sciences, 1999; National Research Council, 1998; Melhorn et al., 2001b; Melhorn, 1996c; Melhorn, 1998g; Melhorn, 1998a). Job risk is based on input (raw materials), production (methods, materials, machines, environment, physical stressors [such as repetitions, force, postures, vibration, contract stress, and cold]) and output (finished product) (Melhorn, 1998b). Since MSDs require an individual to be employed, both individual and job risk assessments can be combined to produce a composite risk score, from 1 (low) to 7 (high), to assist in management protocols. Individual risk is assessed via 79 questions and 24 physical measures (Melhorn, 1996b), while job risk is evaluated by 85 questions and use of a modified rapid upper limb assessment instrument (Melhorn, 2001). Previous publications have documented reliability, internal consistency, validity, and sensitivity (Melhorn, 1996b; Melhorn, 1996a; Melhorn, 2002a; Melhorn, 1997a; Melhorn, Wilkinson, Gardner, Horst, & Silkey, 1999b; Melhorn, 1999b; Melhorn, 1998a; Melhorn, 1998e; Melhorn, 1998f; Melhorn, Wilkinson, & O'Malley, 2001a; Melhorn et al., 2001b).

THE EVIDENCE

Occupational Management of Current Employees

In 1998, an aircraft company modified their medical intervention protocol to include the use of the CtdMAP risk assessment instrument to assist in the decision of medical referral after retrospectively reviewing the previous two years workers' compensation records. A decision was made to address medical management of MSDs seen by health services. The foundation for this combined approach was supported in previous studies (Melhorn, 1994; Melhorn, 1996b; Melhorn, 1996a; Melhorn, 1997c; Melhorn, 1997d; Melhorn, 1998a; Melhorn, 1998c; Melhorn et al., 1999b).

A prospective study was developed with a specific decision tree for all employees that reported to health services with a recordable OSHA 200 MSD as seen in Figure 4. The company physician evaluated each employee using traditional healthcare techniques and the completion of the risk assessment instrument. After completing the history and physical examination, the physician would review the current and previous individual risk score. If either individual risk score was above average (>4),

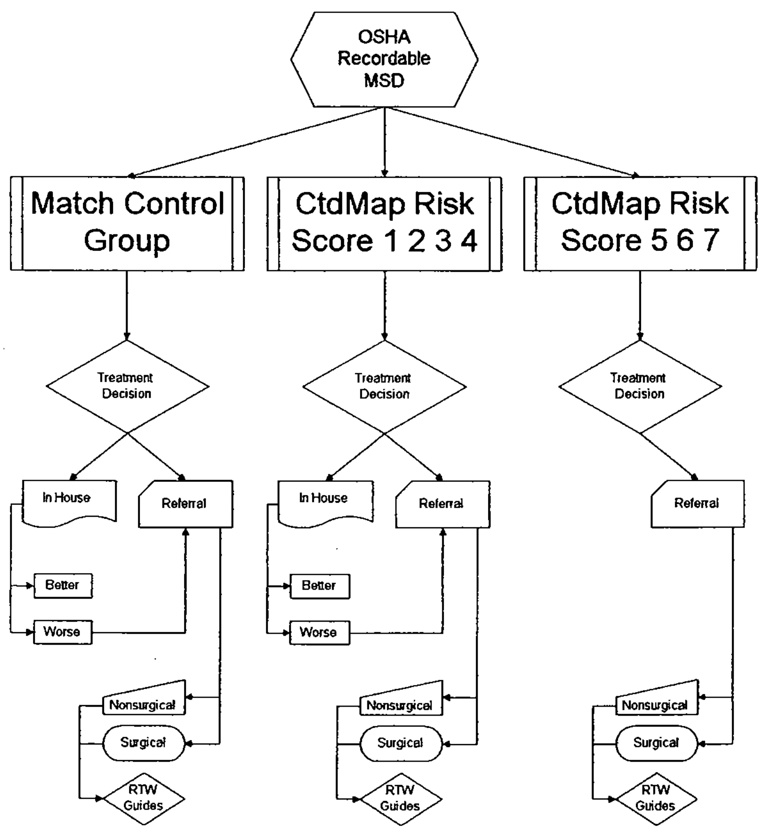

Figure 4. Algorithm for Intervention os OSHA Recordable CTDs/MSDs

TABLE 2. Workers' Compensation Costs per Case by CtdMAP™ Risk Level

CtdMAP™risk level	Cost per case in (dollars)	Total costs in (dollars)
1	842	842
2	1211	9004
3	1794	21672
4	2479	32487
5	2609	88060
6	3142	22672
7	5126	69314
Mapped average	2468	433421
Matched average	3800	838704
Study group average	3134	636062
Company average	2691	

the employee was referred to a specialist for additional treatment. If the individual's risk score was below average or average (≤ 4) in-house medical care was provided.

Ten outcome measures were analyzed and reviewed (recordable case incidence rate, lost time case incidence rate, lost time day severity incidence rate, airplane production, costs of intervention program, estimated workers' compensation costs, number of operations, medical treatment and job activities or new tasks). Improvements in incidence rates and production occurred with reduction in costs, surgery and treatment as seen in Table 2. New tasks and onset of symptoms were reviewed. Over 70 percent of low risk individuals and none of the high-risk individuals had experienced a job change or new task in the previous 6 weeks prior to onset of symptoms. Conclusions: traditional medical management of MSDs can be enhanced by using a risk assessment instrument. Employer-estimated savings in direct workers' compensation costs were $2.42 million and estimated indirect savings were more than $13.5 million during the study with a benefit to cost ratio (or direct costs only) of over 398 percent for the program.

Observations: Individual risk scores of 6 and 7 did not require a change in job or a new task to trigger a MSDs event. As the individual risk score decreases the job requirements or task change could increase without risk of a MSD. The data suggests an individual to job risk ratio of 65 to 35 for predicting the likelihood of an individual developing a MSD. This ratio is currently being further evaluated to assist in better allocation of intervention funds in an effort to reduce risk and incidence.

MSDs Prevention in New Hires Modified by Job Requirements

In January of 1995, an aircraft company established a prospective MSDs risk management program for new hires. The MSDs intervention program was designed to integrate a traditional occupational medicine clinic (physician on site) and a risk assessment instrument for assigning risk and implementing intervention (Melhorn et al., 1999b). The MSDs intervention program was designed to prospectively evaluate each new employee for his or her individual risk of developing MSDs in the workplace and assist the physician in matching the employee to the most appropriate available job. The concept of best fit (the goal of ergonomics) was utilized in this practical situation. Since these employees were being hired for many different jobs,

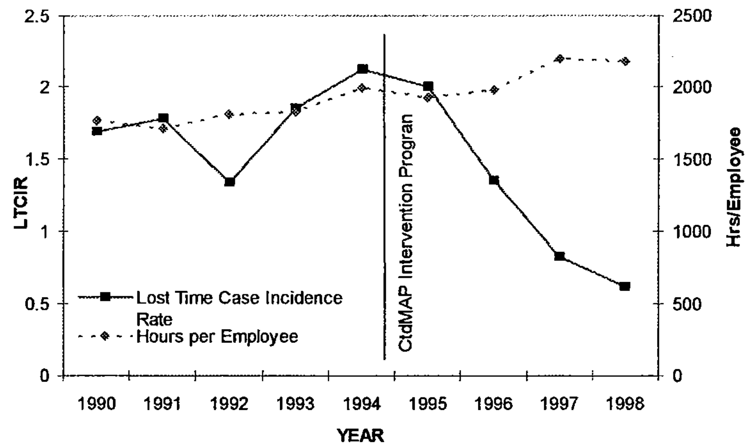

Figure 5. Lost Time Case Incidence Rate by Hours Worked per Employee Pre- and Post-CTD Intervention Program

each job was risk assessed and an essential functions description was developed. The physician used an algorithm based on individual risk score and provided transitional work options, long-term work guides, education and exercise programs. Before job placement, individuals at higher risk were assigned to a period of transitional work.

Analysis of six outcome measures was reviewed (recordable case incidence rate, lost time case incidence rate, lost time day severity incidence rate, airplane production, costs of intervention program and estimated workers' compensation costs) as seen in Figure 5. All rates were converted to 200,000 hours worked per year to allow comparison with other publications. There was no significant change in recordable case incidence, a significant reduction in lost time and lost time day severity incidence rate and no change in airplane production. Risk intervention costs over 4 years were: $122,928 for 3152 assessments, $29,697 for 761 repeat assessments, $142,500 for transitional work (production loss), $2,028 for education and $7,485 for administration with a total of $304,470 or $76,118 per year which represented less than 0.06 percent of the employer's annual salary costs. Workers' compensation cost decreases per year were: 16 percent, 3 percent, 24 percent and 12 percent, while work hours increased 56 percent as seen in Figure 6. Employer-estimated savings in direct workers' compensation costs per year were $469,990, $678,337, $1,936,105 and $1,995,759 during a time when the total hours worked doubled with a benefit to cost ratio of over 390 percent for the program.

Conclusions: New hire MSDs management can be improved by including the risk associated with the future job activities. After a period of transitional work, most employees will not require permanent work guides. This will become increasingly important as the national workforce ages and more individuals with disabilities are employed. Observation: Only 11 of the 34 (29 percent) with risk scores of 7 required permanent restrictions as follows: vibratory or power tool was limited to 6 of 8 hours in time blocks of $1\frac{1}{2}$ hours per 2 hours and repetitive motion tasks were limited to 6 of 8 hours in time blocks of 50 to 55 minutes per hour. This group represents less than 1 percent of the original high-risk group (risk scores 5 to 7, n = 761) and only 0.4 percent of the entire study group.

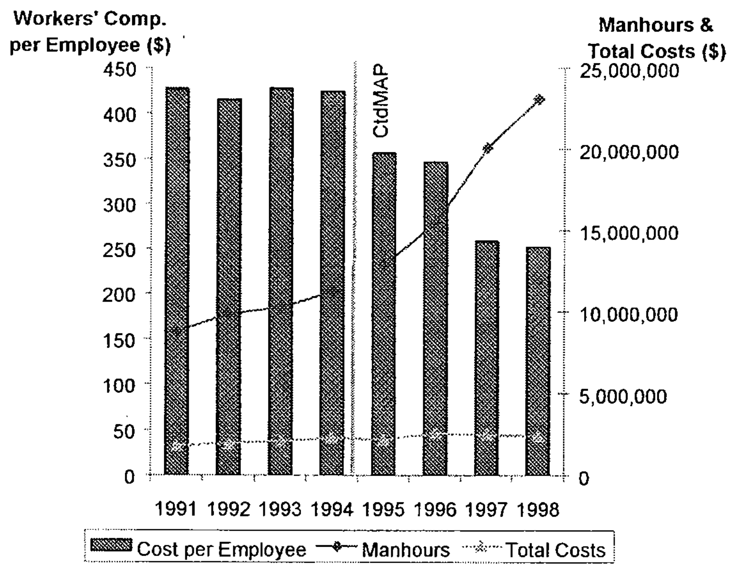

Figure 6. Study Company Workers' Compensation Per Employee

MSDs Prevention for New Hires

A prospective study with historical data for comparison was completed for an aircraft manufacturer using an assessment instrument (Melhorn, 1996b; Melhorn & Wilkinson, 1996; Melhorn, 1997c; Melhorn, 1997d). During a two-year period, 1010 new employees were hired. The company elected to risk-assess individuals for the high risk job of sheet metal mechanic (n = 754) and not to risk assess individuals for the low risk job of administrative staff (n = 256) which served as the control group. After a conditional job offer, each individual was seen by the company physician for a functional capacity assessment, which included a traditional employment examination and laboratory testing. Risk assessment was provided for the high-risk job group only. The individual risk assessment scores were used to help the physician develop individual specific education and exercise programs as seen in Figure 7. Education included review of ergonomics in the workplace, proper lifting, body mechanics and early reporting of MSD symptoms and signs. Exercises included strengthening and flexibility programs to develop endurance, similar to the concept of spring training in baseball. Job matching was not a part of this study, as all individuals were hired for a specific job title. No intervention was provided for the control group.

Analysis of outcome measures showed a reduction in lost work hours from 3000 to 1000 and 1000 to 650 in years one and two compared to 780 to 782 and 782 to 791 in the control group. Over the two-year study period, the number of surgeries in the study group was reduced from 14 per 754 (1.9 percent) to 1 per 754 (0.1 percent) compared to the control group with 3 per 256 (1.1 percent) to 2 per 256 (0.78 percent).

Conclusions: Individuals bring a unique risk for the development of MSDs to the workplace. Although the job may act as a trigger event for a MSD, intervention should involve an approach that takes into account the individual. Interesting observations

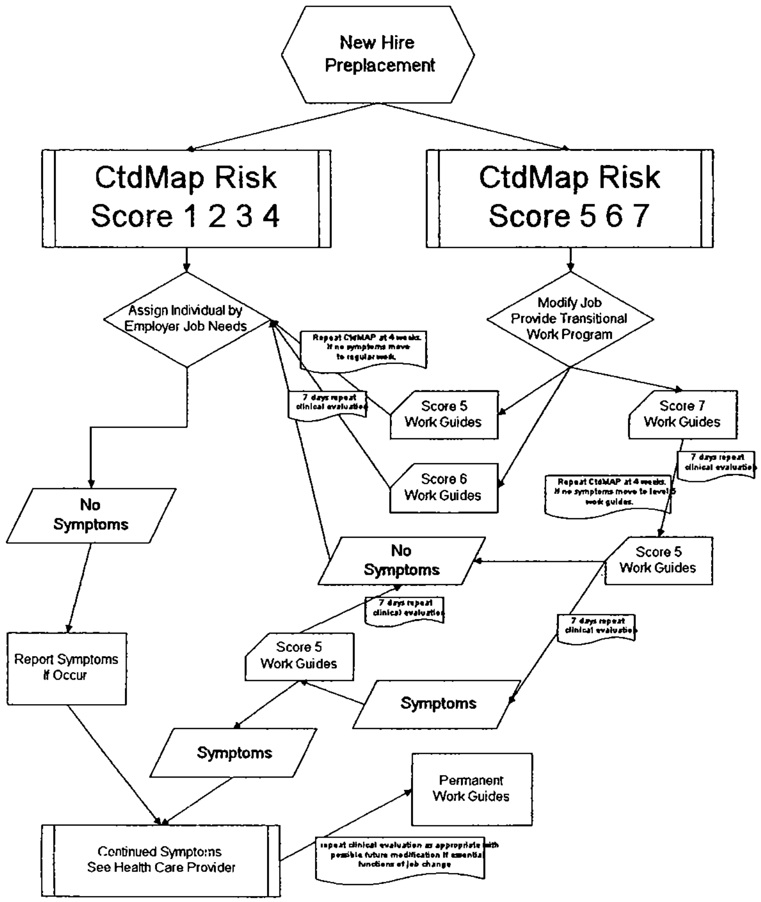

Figure 7. Algorithm for Intervention for New Hire by CtdMAP™ Risk Level

included: a lower rate of surgery for individuals now performing the "high risk job", 0.1 percent versus 0.78 percent, and a lower lost work hours to employee ratio, 0.8 ratio versus 3.1. When considering the reduction in lost work hours and the direct costs of workers' compensation, the employer estimated savings of $1.8 million for the two year period with a benefit to cost ratio of over 257 for the program. The data seemed to suggest that additional benefits could be obtained by adding job risk evaluation to the new hire placement process.

Workplace Intervention Program

In a prospective study, a plastic products manufacturer wanted to improve their safety program by identifying individuals and jobs at risk (Melhorn, 1997c). All jobs were analyzed for workplace risk factors (methods, materials, machines, environment and physical stressors) and were prioritized for interventions based on job and individual risk. The ergonomics team (which consisted of an employee representative, supervisor, ergonomists, safety engineer, health nurse and physician) reviewed higher risk jobs (Melhorn et al., 1999a). Job modifications included administrative controls, work practice modification, personal protective equipment, retrofit engineering and informed purchasing. When new product lines were developed, workplace design was part of the initial consideration based on the benefits of previous job modifications and job risk reduction, as measured by the risk assessment instrument. Individual intervention included education, exercise and job training.

Quarterly analysis showed a reduction in the OSHA 200 incidence rate, lost time workday severity index and workers' compensation costs while production increased and rework decreased. Over a 24 month period, the combined composite risk score from the instrument for the company moved from 4.79 to 3.95. Conclusions: A risk assessment instrument can be used to identify job risk, to prioritize job modification by an ergonomic team and to identify individual risk for development of personalized intervention programs based on education, exercise and job training. This combined approach provided the employer with reduced costs of $234,000 for year one and $953,000 for year two when compared to the previous two years. The benefit to cost ratio was 185 for the intervention program without consideration of the increased production. Observations: Individual and job risk assessment resulted in effective distribution of limited funds that were available for this prevention program.

Tools and Ergonomic Program Design

A prospective study (Melhorn, 1996b) using the CtdMAP™ randomly sampled 212 workers out of an 8,000 member workforce who were assigned randomly to one of four primary factor groups: vibration-dampened rivet guns, standard rivet guns (control group), ergonomic training, and exercise training (Melhorn, 1996a). Risk assessment was performed at the start of the study and at 7 and 15 months. Ergonomics training included awareness of early warning signs of MSDs, methods for controlling risk factors, techniques to apply forces with less stress or strain, and correct posture and stance to improve balance and absorb forces. Exercise training included muscle relaxation and gentle stretching of muscles and tendons. Tools included vibration dampening rivet (recoilless) gun or standard rivet gun, training and practice using those tools, and conventional bucking bars. A study model was developed with results showing ergonomic training to be the only main factor that was statistically significant. Additional reduction of risk occurred with ergonomic training for the covariates of dominant hand, time spent in an awkward position, and number of standard rivets bucked. Exercise training demonstrated a risk reduction benefit for the covariates of dominant hand, number of parts routed, and number of parts ground. Vibration dampening riveting provided risk reduction for new employees but increased risk for current employees. Vibration dampening riveting increased the risk for the covariates of number of rivets bucked. Employees benefited from ergonomic training and exercise training with decreased symptoms; the employer estimated savings of $4 million with a benefit to cost ratio of 285.

Impact of Workplace Screening

A prospective study of the impact of workplace screening was undertaken in 1997 by a financial institution with 82 employees assigned to six branch offices. Data was collected for age, gender, job, branch local and study group (control or screened). The control group was made up of individual employees who received no information regarding the study or MSDs in the workplace. The study group was introduced to MSDs in the workplace by an office memo, employee management meetings, educational materials and a question and answer session over a four-week period followed by 40 of the employees being screened using an assessment instrument (screened group) (Melhorn, 1996b).

The screened group was further randomly divided into a group of 20 individuals who were informed of their risk assessment score and 20 who were not informed. Individuals were notified or informed of their individual risk level by letter and were given a follow-up interview. Education was provided to the informed group but no specific health interventions, workplace modification, or ergonomic programs were provided. Retrospective data was collected for the 5 years before the start of this study. During the study period, the employer experienced the usual first aid events and workplace injuries, but no OSHA 200 "F" injures (MSDs). Conclusions: Employers may be concerned with workplace screening, however, this study suggests that the impact to the recordable rate may be minimal.

OSHA "Quick Fix" Ergonomic Intervention

A prospective study for evaluation of the CtdMAP^{TM} OSHA "Quick Fix" ergonomic intervention module was established with a fast food provider. Using the proposed 1999 ergonomic standards (NIOSH, 1999), a "Quick Fix" approach was developed using the CtdMAP^{TM} individual symptoms survey, the job activities form (completed by employee and employer), and the job ergonomics form. These four assessment instruments are combined to provide an incidence specific report the OSHA 200 recordable MSDs. The CtdMAP^{TM} I & E (injury and ergonomics) Report provides information on the individual (date of onset, current individual risk score, symptom complaints, body part for complaints), job risk, average risk for all individuals performed job with highest and lowest individual risk, ergonomic risk details as identified by the ergonomic standards, maximum hours and body part with exposure to possible physical stressors, an intervention form that includes options for identifying source of risk, preprinted suggestions, and options for workplace improvement. This form is then completed and the appropriate ergonomic workplace modifications provided with documentation on the I & E Report.

Over a 12 month period, 12 OSHA 200 recordable MSD events occurred in a workforce of 134 employees for an incidence rate of 8.95. This rate was consistent with the previous four years of 9.87, 8.43, 8.54, and 8.99 respectively for an average of 8.94. For each event, the four forms were completed and workplace modifications were provided. Time to complete the four forms was 60 minutes with an additional 20 minutes to review the job I & E Report, develop job modifications, and discuss the I & E Report with the employee.

SUMMARY

Successful management of occupational musculoskeletal problems goes beyond the traditional medical dimension. Despite the continuing debate on causation, current medical and epidemiological literature support a relationship between activities and musculoskeletal pain. Reasonable management decisions can be made based on individual and job risk provided by assessment instruments (Melhorn, 1998a; Gordon et al., 1995; American College of Occupational and Environment Medicine, 1997; Day, 1988; Herington & Morse, 1995; Melhorn, 1997b). The dollar savings to the employer for musculoskeletal disorder interventions can be over 300 percent (Melhorn, 1999a; Melhorn, 1996a; Melhorn, 1998a; Melhorn, 1998f). Financial and legislative initiatives mandate prevention from a public health perspective (Baker, Melius, & Millar, 1988; NIOSH, 1999). Prevention by risk assessment currently provides another opportunity for reduction of the incidence and severity of work-related musculoskeletal disorders by allowing engineering controls to be applied in a prioritized approach, resulting in real solutions for the problems facing the American worker.

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