OCCUPATIONAL HEALTH PHYSICAL THERAPY: WORK-RELATED INJURY/ILLNESS PREVENTION AND ERGONOMICS GUIDELINES

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Introduction

The purpose of an injury/illness prevention and ergonomics program in the workplace is to maintain the health and productivity of workers at an optimally safe level. Well-designed and appropriately implemented injury/illness prevention and ergonomics programs are most likely to decrease injuries and related costs and balance successfully the needs of individual employees and competitive performance of companies.

Physical therapist participation in injury/illness prevention and ergonomics programs continues to evolve in response to increased incidence and cost of work-related injury/illness. A physical therapist's ability to remediate occupational health problems related to bony and soft tissue pathology, and to human performance contributes significantly to the effectiveness of these programs.

The physical therapist is a vital member of the team performing workplace analysis and problem solving for injury/illness prevention and ergonomics programming. With expertise in identification of work-related risks to the neuromusculoskeletal system, the physical therapist can design, implement, and monitor solutions for an individual, group, or population to promote health, wellness, and fitness, and increase productivity.

Purpose

The purpose of this document is to establish guidelines for the delivery of occupational injury/illness prevention and ergonomics services provided by physical therapists. Injury/illness prevention and ergonomics programs are a pivotal resource for decreasing injury/illness incidence and severity rates, decreasing occupational and general health-related costs, enhancing employee safety and morale, and optimizing productivity and product quality. As such, the implementation of injury/illness prevention and ergonomics programs is beneficial to management and employees. Implementation and use of these guidelines is intended for:

1. *Physical therapists* to design and implement injury/illness prevention and ergonomics services;
2. *Occupational health providers and team members* to facilitate successfully integrated delivery of injury/illness prevention and ergonomics services in which physical therapists participate or provide management of such programs;
3. *Employers* to manage injury/illness prevention and ergonomics programs through utilization of physical therapists in the provision, or management, of such programs;
4. *Employees and labor organizations* to improve the health and safety of their members through the utilization of physical therapists providing and managing injury/illness prevention and ergonomics programs;
5. *Federal and state regulatory* agencies as definitional and guideline resources for patients/clients involved in, or considering injury/illness prevention and ergonomics programs in which physical therapists participate or provide management of such programs;
6. *Insurers, insurance brokers, and third party administrators* to facilitate reduction of costs for their employer clients through the use of injury/illness prevention and ergonomics programs in which physical therapists participate or provide management of such programs;

7. *Business groups and trade associations* to reduce costs of operations for their members, and to enlist their support for the initiation of injury/illness prevention and ergonomics programs;
8. *Educators, students, researchers, and others* as a resource document for injury/illness prevention and ergonomics programs that may be provided or managed by physical therapists.

Definitions

Several definitions are used in this document. They are defined here in the same manner as other documents of the American Physical Therapy Association.

Administrative controls refers to changes in the way that work in a job is assigned or schedules to reduce the magnitude, frequency, or duration of exposure to ergonomic risk factors [8].

Ergonomics[1] refers to the relationships among the worker, the work that is done, the tasks and activities inherent in that work, and the environment in which the work is performed. Ergonomics uses scientific and engineering principles to improve the safety, efficiency, and quality of movement involved in work.

Evaluation[1] refers to a dynamic process in which the physical therapist makes clinical judgments based on data gathered during the examination.

Evaluation of worker capacity refers to a detailed examination that measures objectively an applicant's/worker's current level of ability to perform the physical demands of a specific identified job. A physical therapist makes clinical judgments based on this data when providing a report.

Examination[1] refers to a comprehensive screening and specific testing process leading to diagnostic classification or, as appropriate, to a referral to another practitioner. The examination has three components: the patient/client history, the systems reviews, and tests and measures.

Injury/Illness[1]refers to the occurrence of work-related pathology/pathophysiology, pain, impairment, activity limitation, or participation restriction. The categorization of an incident to injury or illness may be different depending upon the regulations or regulatory agency involved.

Occupational health providers refers to health-care professionals who participate in the delivery of injury/illness prevention and ergonomics services.

Occupational health team members refers to all participants in a team effort for integrated injury/illness prevention and ergonomics in a defined work environment.

Prevention[1] refers to activities that are directed toward (1) achieving and restoring optimal functional capacity, (2) minimizing impairments, activity limitations, and participation restrictions, (3) maintaining health (thereby preventing further deterioration or future illness), (4) creating appropriate environmental adaptations to enhance independent functioning related to work.

Primary prevention[1] refers to prevention of disease in a susceptible or potentially susceptible (work-place) population through specific measures such as general health promotion efforts.

Secondary prevention[1] refers to efforts to decrease the duration of illness, severity of diseases, or sequelae through early diagnosis and prompt intervention.

Tertiary prevention[1] refers to limiting the degree of disability and promoting rehabilitation and restoration of function in patients with chronic and irreversible diseases.

Prognosis[1] refers to the determination of the predicted optimal improvement in functioning that might reasonably be expected, taking into account any stated fiscal or organizational constraints, for a given work station or work site, and the amount of time needed to reach that level.

Screening[1] refers to determining the need for further examination or consultation by a physical therapist or for referral to another health professional.

Surveillance refers to on-going observation and review of worker and work activities for the purpose of injury/illness prevention.
Tests and Measures[1] refers to specific standardized methods and techniques used to gather data about a patient/client and their work station, work site, and work habits, after historical and current patient/client and workplace systems reviews have been performed.

Work culture refers to the organizational and interpersonal milieu that influences attitudes and behaviors of individuals toward safety and injury/illness prevention, injury/illness management, productivity demands, communication, and work relationships.

Conceptual Model

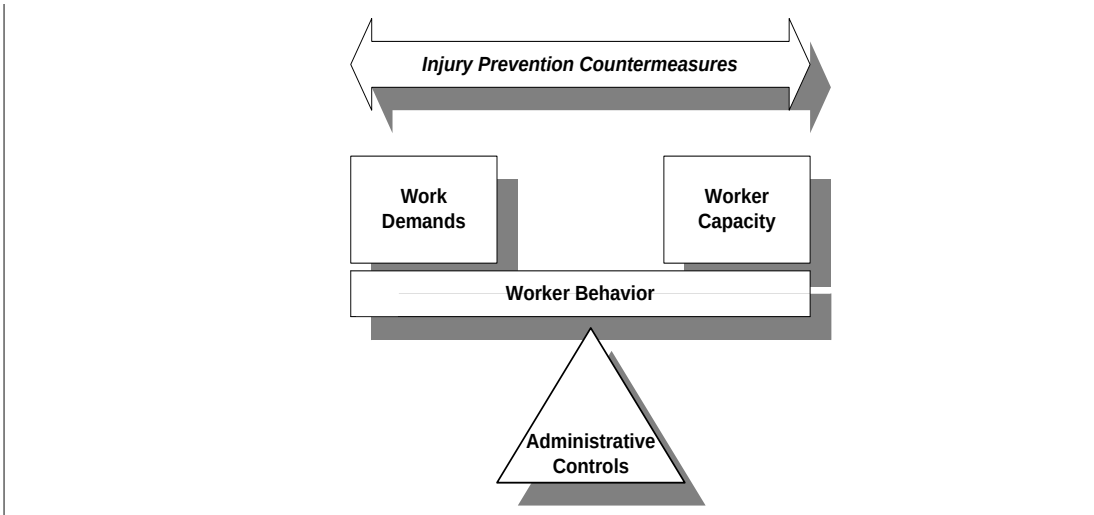
There is an interaction of the elements of work demands, worker capacity, worker behaviors, and administrative controls, in the conceptual model of injury/illness prevention (Figure 1). *Work demands* vary with changing processes and tools, variable production levels and changing work schedules. *Worker capacity* changes with aging workers, employment turnover and changes in worker health. *Worker behaviors* are affected by experience, policy, training and incentives. The work environment may be affected by such variables as regulations, productivity demands, weather, and administrative controls established by management.

Injury prevention in the arena of occupational health occurs in a complex and dynamic environment that is in constant flux. The challenge associated with injury prevention and ergonomics is to maintain a dynamic balance in the midst of changing and competing forces. Injury prevention is successful as long as a balanced state can be maintained. Changing any one or combination of elements may alter this balance. Injury prevention initiatives attempt to dynamically manage these elements through carefully considered and crafted strategies and tactics.

In pursuit of injury prevention, there are no simple solutions. Multiple strategies exist that can be used by physical therapists to restore a desired balance in the workplace, as presented in the model below (Figure 1). The model presents the reality that worker behaviors attempt to balance the demands of work with the worker's capacity. Worker behavior in this balance is affected by administrative controls.

After thorough study of a workplace, each of which presents a unique set of needs, physical therapists may, for example, choose to address. *Work Demands* vary with changing processes and tools, variable production levels, and changing work schedules. The physical therapist may recommend ergonomic changes to match worker demands to the worker's capacity, or vice versa. *Worker Capacity* may be addressed by job-specific exercise programs developed by physical therapists. Worker Behavior may be modified by management and employee education developed and presented by a physical therapist.

Figure 1[2]
A Balance Model for Injury/Illness Prevention Management



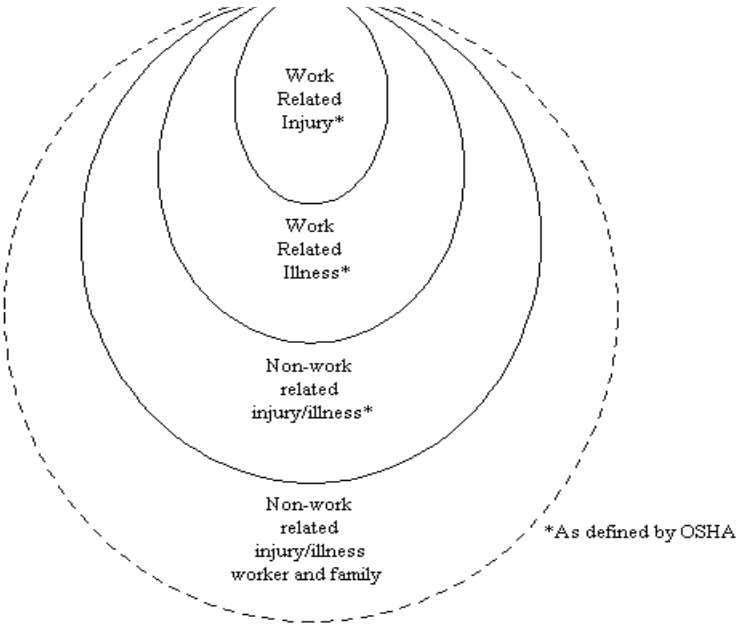
A Balance Model
For Injury/Illness Prevention Management

In-depth understanding of a workplace by physical therapists, including work demands, worker capabilities, work rules, safety rules, governmental rules and regulations, production constraints, and economic factors of business necessity, are of utmost importance when developing injury/illness prevention strategies that are to be presented to management. Thorough dialogue with management and employees is essential to understand fully the unique set of administrative controls and constraints, and availability of resources before a specific injury/illness prevention and ergonomics plan is constructed by a physical therapist.

Injury/illness prevention and ergonomics programs may focus on different populations (Figure 2). The first populations include workers only. These populations may be workers who have an injury or illness that is overtly caused by work, workers whose injury or illness evolves over time as a result of work, or workers whose injury or illness, either work-related or non-work-related, is exacerbated by work. The second population may extend beyond workers, to include families of workers.

To an employer, the cost-effectiveness of incorporating injury/illness prevention and ergonomics programs developed, initiated, and managed by physical therapists occurs because of a physical therapist's clinical expertise in managing a wide range of patient/client conditions. Business and industry are beginning to address health risk behavior modification, health promotion, ergonomics, and injury/illness prevention for workers and their families. Depending upon the employer-sponsored health plan, workplace and non-workplace-related injury/illness prevention and ergonomics services can be provided by physical therapists. Such services can encompass the cardiovascular/pulmonary, integumentary, musculoskeletal, and neuromuscular systems. All such injury/illness prevention and ergonomics services are integral to the practice of physical therapists. Increasingly, management perceives that broader programs have a positive impact on total health-care costs.

Figure 2
Populations Included in Injury/Illness Prevention Programs



Knowledge Base

Physical therapists participate in injury/illness prevention and ergonomics programs by assuming a variety of roles. Physical therapists have mastered the appropriate knowledge base(s) necessary to fulfill these roles. As a general knowledge base, physical therapists participating in injury/illness prevention and

ergonomics programs must have an appropriate background in anatomy, biomechanics and mechanics, kinesiology, pathokinesiology, motor control, statistics, epidemiology, and ergonomic processes.

Within the realm of ergonomic processes, knowledge of data review, work analysis, worker and workforce analysis, surveillance, stressor identification and analysis is required. Data review requires knowledge of the types of records relating to injury reporting, the requirements and limitations involved in reporting and recording occupational injuries, and statistical methods of evaluating injury data. Work analysis requires knowledge of industrial processes, availability and functionality of industrial equipment and tools, how workers may be assisted/constrained in performing occupational tasks, and how industrial processes; equipment, tools, and tasks may be modified within appropriate economic constraints. Analysis of workers and the workforce requires knowledge of how individual workers perform occupational tasks, and the make-up of the general workforce participating in similar industrial processes.

Surveillance, a workplace safety strategy defined, described, and mandated by the *Occupational Safety and Health Administration (OSHA)* in preventing injuries, is a process by which physical therapists follow the flow of work and resultant injury/illness to provide information concerning work practices and injury/illness. Examination and evaluation of the interaction of each of these components of the ergonomic process by physical therapists permits identification of stressors imposed upon workers and the workforce. Evaluation and analysis of identified stressors provides opportunities for intervention to alleviate stressors, and prevent potential injuries.

Opportunities for intervention by physical therapists to alleviate stressors may include education and training, health promotion, ergonomics, and work re-entry management. Education and training provides an opportunity for physical therapists to demonstrate the best use of available equipment, tools, and methods of task performance. Education and training is necessary for both management and workers, so both share the responsibility of appropriate supervision and use. Health promotion encourages employees to engage in wellness and fitness behaviors that may contribute to primary injury/illness prevention. Ergonomics addresses the physical demands placed on workers as part of their job, and work re-entry management provides for a smooth, safe, and cost-effective means of returning injured workers to the job.

There are several laws and agencies responsible for implementation and oversight of laws and regulations, relating to industry and injury prevention. Among these are the:

1. United States Department of Labor (DOL)
2. Occupational Safety and Health Administration (OSHA)
3. Occupational Safety and Health Ergonomic Standards 7
4. Americans with Disabilities Act (ADA)[4]
5. Equal Employment Opportunity Commission (EEOC)
6. Uniform Hiring Guidelines[5]
7. State Department(s) of Labor
8. State workers compensation statutes
9. State ergonomics guidelines and standards

Each of these agencies and laws are relevant to different parts of employment law. The U.S. DOL is involved in overseeing the entire spectrum of employment law and safety. The ADA relates, in part, to the prevention of discrimination in hiring. The EEOC is involved as the agency responsible for receiving, evaluating, and pursuing appropriate claims filed under the ADA. OSHA is responsible for enforcing the safety rules and regulations promulgated under the Occupational Safety and Health Act. Uniform Hiring Guidelines[5] require uniform application of procedures and requirements for all job applicants applying for a specific job within a company. State departments of labor oversee employment, safety, and worker compensation, laws, rules, and regulations specific to each state, with the latitude provided by federal law. Physical therapists participating in, or managing, injury/illness prevention and ergonomics programs use their knowledge concerning these laws, regulations, and agencies as the basis for developing, and assisting clients in implementing, appropriate injury/illness prevention strategies.

Physical therapists combine these areas of knowledge to provide services to client companies. As such, physical therapists are uniquely qualified to develop, implement, and manage effective injury/illness

prevention and ergonomics programs. They are also qualified to evaluate the outcomes created by these programs. Physical therapists practicing in the occupational health realm, especially those providing or managing injury/illness prevention and ergonomics programs, recognize the value of expanding their knowledge base in areas applicable to the dynamics of the workplace, and workplace organization. Physical therapists recognize that general knowledge of organizational structure is necessary when consulting for a specific client company. This includes knowledge of the: 1) policies and procedures specific to a client company; 2) latitude permitted in developing, implementing, and enforcing policies and procedures under state and federal law; and 3) ability to work within different labor environments, such as union and non-union shops. Physical therapists also recognize that the ability to develop and implement such programs may be limited or enhanced by client company organization, policies and procedures, state and federal law, and management and employee (union or non-union) participation, support, and work rules.

The ability to provide successful intervention is most often defined by economic benefit determined by all participants. Economic benefit may be limited within a given workplace by internal factors, such as product characteristics, and production processes. External factors that may affect economic benefit are insurance carrier programs, the availability of occupational health provider resources, and history of occupational health-cost.

Two major issues relating to the relationship of individual workers and employers, and their impact on acceptance of injury/illness prevention and ergonomics programs, are recognized and understood by physical therapists. The first issue is compensation and benefits paid to workers. Specifically this issue encompasses, salary, incentives and bonuses, leave policies, and medical and disability benefits. The second concerns labor relations. The union/non-union status of a company, the method by which labor contracts are negotiated, and the methods, by which labor contracts are implemented and enforced, including administrative and legal processes for grievances and appeals, will have a major effect on the acceptance of these programs.

There are three aspects relating to a client company's activities and processes that impact the individual worker must performing occupational tasks that are understood by physical therapists. Appropriate work assignment may involve job matching, job accommodation, or job rotation. Each of these aspects will have an impact on who is hired, and how well the workers may be able to avoid or prevent occupational injury/illness. Whether relating to existing employees or potential new hires, the current environment of human resources management must be understood. Issues affecting existing and potential workers include the current status of hiring efforts, potential or actual lay-offs, disciplinary action for safety or productivity infractions, and company downsizing.

Finally, there are three issues relating to design, production, and quality standards and processes, taken into consideration by physical therapists as they develop injury/illness and ergonomics prevention programs. Each of the following will affect how workers and management interact:

1. Development and implementation of design, production, or quality standards
2. Changes in design, production or quality standards; and
3. Managing changes in production volume while adhering to design, production and quality standards and processes

All aspects of worker - management relationships have an impact on corporate values and work culture. Physical therapists participating in occupational health have a clear understanding of the issues and relationships. Therefore, these issues must be examined and understood to anticipate how workers and management will respond to, and implement, injury/illness prevention and ergonomics programs.

Management Model

Physical therapists, in their management of individual patients/clients, integrate five elements in the management scheme; examination, evaluation, diagnosis, prognosis, and intervention(s). These elements are incorporated in a manner designed to maximize anticipated outcomes. This approach is also successfully employed by physical therapists in the development, implementation, and management of workplace injury/illness prevention programs.

Examination

When investigating the potential for injury/illness prevention and ergonomics programs, the first step is to take a complete history of the client company's injury/illness experience. Investigation starts with a review of epidemiological and worker demographic information. This information can be extracted from OSHA reportable injuries/illnesses (OSHA 200 logs), an analysis of loss time records, productivity records, medical records, near-miss and at-risk behavior logs, incidence rates (noted by Standard Industrial Classification (SIC)[7] group), and insurance reports. Access to these records, and others listed previously, should be granted by a client company if the client company wishes to design and implement an effective injury/illness prevention and ergonomics program.

Some companies may not have an analysis of loss time records, near-miss/at-risk behavior logs, or incidence rates. These data may have to be constructed *post hoc*. Insurance carriers often share data generously for consultants who are working to decrease costs associated with occupational injury and illness. Information available from insurance carriers will include loss run, experience modification rate, and insurance reserves data. Loss run data demonstrate the effects of injury/illness on time lost from work. Experience modification rate data demonstrate how insurance costs are modified based on a client company's injury/illness experience. Insurance reserves data indicate the financial implications of funds allocated for injury/illness, and how injury/illness prevention programs can decrease the amount of funds encumbered for insurance coverage.

The first tests and measures to be performed relate to individual work sites and work stations. Ergonomic tests and measures examine the environment, site, tools, equipment, materials, and machinery, individual work flow, general production processes, rate, quality, and production demands, physical demands, physical stressors, and task rotation. Environmental factors of noise, ambient temperature, humidity, light, and air quality all may contribute to potential injury/illness during performance of occupational tasks. Physical characteristics of the work site and workstation, including surfaces, work station area size and configuration, and seating also may contribute to potential injury/illness during performance of occupational tasks. Individual aspects of occupational tasks that may contribute to potential injury/illness may include tools, equipment, materials, machinery, individual work sequencing and pacing, general production processes, and rate, quality and production demands. Specific physical demands placed on individuals during occupational tasks may include force, repetition, postures and motions, vibration, and surface temperature of materials. Examining work sites and work stations requires an appropriate surveillance system for identification of at-risk employment situations/work processes within which accurate tests and measures can be performed and recorded.

The second tests and measures to be performed relate to individuals who will perform occupational tasks. Examination of each worker and the work force includes anthropometrics, including age and gender, examination of the individual worker, evaluation of the physical capacities of the worker, and assessment of work and health habits, risk behaviors, and worker/work force characteristics. Health habits should include nutrition, exercise, and smoking history. These aspects of individuals should be examined for workers who are new hires, transferring jobs within the same client company, or returning to work following injury/illness, leave, or lay-off.

Evaluation, Diagnosis and Prognosis

Reports relating to the evaluation and diagnosis of work sites or work stations, with respect to preventing injury or illness, should include data analysis; work analysis; evaluation of worker/work force, safety, behavior, and compliance; identification of at-risk employees; identification of at-risk work processes/work stations; and identification of solutions. Reports relating to prognosis of work sites or work stations, with respect to preventing injury/illness, should include an estimate of goals and outcomes for all interventions.

Interventions

Successful injury/illness prevention and ergonomics programs address the needs of both individual workers and employers. The dynamic nature of these programs mandates careful analysis and balancing of relevant components of intervention.

There are two major areas of intervention. The first area of intervention includes those aspects of prevention programs where physical therapists take primary leadership roles. Procedural intervention components include monitoring at-risk employees and work processes, ergonomics, education and training, health promotion, return-to-work case management, and occupational health committee/team development.

The second area of intervention includes those aspects of injury/illness prevention and ergonomics programs in which physical therapists most often participate as team members. Participatory intervention components include involvement as a team member in work assignment, human resources management, compensation and benefits, labor relations, corporate values and work culture, and design and production standards.

Overall, an occupational health injury/illness prevention and ergonomics system developed, implemented, and managed by a physical therapist should provide explicit definition of what services a physical therapist will perform, and what a physical therapist anticipates as outcomes. A comprehensive occupational health injury/illness prevention and ergonomics program developed, implemented, and managed by a physical therapist will explicitly define the; 1) scope of the program, program plan, relevant policies and procedures, 2) authorities, responsibilities, accountabilities of those participating in the program, 3) surveillance strategy, benchmark, baseline, and triggering indicators, and intervention protocols, 4) content and process of report generation, report distribution, 5) maintenance of the program, and 6) methods of program evaluation and improvement through measures that determine actual outcomes.

Outcomes

Physical therapists participate in, and direct, the development of evidence that injury/illness prevention and ergonomics programs are efficacious and effective. In doing so, physical therapists generate, analyze, and interpret data related to incidence rates, severity rates, restricted duty rates, modification rates, direct and indirect health-care costs, direct and indirect worker compensation costs, cost per case, aggregate annual costs, insurance reserve pool, quality control, productivity, employee morale/turnover, and return on investment for injury/illness prevention and ergonomics programs. Generating, analyzing, and interpreting data related to injury/illness prevention and ergonomics is performed by physical therapists using of the full range of statistical and epidemiological methods, and appropriate application of such methods.

Resources

Several agencies and resources produce or encompass important guidance, rules and regulations, and data with respect to morbidity and mortality, costs, and the need for injury/illness prevention programs. Included among these agencies are the:

1. United States Bureau of Labor Statistics (BLS)
2. United States Department of Labor[3]
3. Department of Labor for each individual state
4. Statistics department for each state's Department of Labor
5. National Safety Council
6. Insurance Company
7 Insurance industry statistics and modification rates for each insurance carrier

Comprehensive injury/illness prevention and ergonomics programs by physical therapists, as described in this guideline, can have a significant positive impact on a wide variety of workplaces by reducing the prevalence of cardiovascular/pulmonary, integumentary, musculoskeletal, and neuromuscular

injury/illness. When physical therapists develop, implement, and manage injury/illness prevention and ergonomics programs in conjunction with other occupational health physical therapy services, such as the evaluation of functional capacity, on-site management of the acutely injured worker, and work hardening/work conditioning, significant and lasting positive workforce health improvements and workplace health-related cost reductions can be expected.

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