

# How to Develop and Manage an Ergonomics Process

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# **Section I**

## **Introduction**

**A. Overview of Ergonomics**

**B. A Systems Approach to Using Ergonomics**

**C. The Costs of Musculoskeletal Disorders**

**D. The Ergonomics Philosophy**

**E. Disclaimer**

## **Section I. Introduction**

### **A. Overview of Ergonomics**

Ergonomics is the multi-disciplinary science that is used to assess and design work environments to match the physical and cognitive capabilities of individuals operating within the work system. Application of ergonomics in an occupational environment can have a positive impact on the safety and health experience of the facility, the production process, as well as the quality of the product or process engaged in. For example:

- Injuries such as low back disorders resulting from physical stressors in the job can be reduced or eliminated by implementing controls in the work environment that reduce or eliminate the exposure to the causes of these disorders.
- Production can be impacted positively by reducing or eliminating tasks or work conditions within jobs that increase the fatigue of the workers, thereby allowing employees to continue to work at a desirable rate.
- Keeping employees healthy and injury-free allows production to continue without interruptions such as having to find less-experienced employees to replace an injured employee.
- The quality of the process or product also can be impacted, as fewer mistakes may result as a function of eliminating the factors that increase fatigue or the risk of injury.
- The use of an ergonomics process in the work environment has the potential to improve the attitude of the work force, through employee empowerment, which allows employees to take part in the improvement of the production facility, as well as their own safety and health matters.

### **B. A Systems Approach to Using Ergonomics**

Since ergonomics is multi-disciplinary in nature, drawing from the fields of engineering, biomechanics, psychology, physiology, and medicine, the application of ergonomics in an occupational setting must be approached systematically in order for it to succeed. The Occupational Safety and Health Administration (OSHA) has communicated that for ergonomics to be successfully applied, certain system components must be addressed (U.S. Dept. of Labor, 1990). These system components include:

- The commitment of management towards the prevention of work-related musculoskeletal disorders (MSDs);
- Procedures and structure in place for identifying and controlling workplace hazards;

- Policies for dealing with the medical issues related to injuries and illnesses; and
- Training for all levels of employment to communicate the process.

This approach, as described, has been successfully applied in many manufacturing industries and has been shown to result in reductions of workers' compensations costs ranging from 36% to 91% in some companies (U.S. General Accounting Office, 1997). Therefore, in order for an ergonomics process to succeed in reducing injury rates for the food distribution industry, it is imperative that a systematic approach also be applied.

### **C. The Costs of Musculoskeletal Disorders**

A systematic ergonomics process will generally be implemented with the objective of reducing or eliminating work-related musculoskeletal disorders. Musculoskeletal disorders are injuries and illnesses that affect the soft tissues of the body, including the muscles, tendons, ligaments, nerves, and intervertebral discs. MSDs include injuries and illnesses, such as sprains and strains to the low back and shoulder, rotator cuff tendinitis, carpal tunnel syndrome, and tendinitis (e.g., at the wrist or elbow).

The U.S. Bureau of Labor Statistics (2004) reported that, in 2002, over 1.4 million non-fatal injuries and illnesses involving days away from work were recorded in private industry. Of these, 43.0% were strains and sprains, 26.5% involved physical overexertion, and 14.5% involved overexertion specifically during lifting.

The costs associated with the development of MSDs are difficult to compute. However, Praemer et al (1999) estimated the direct treatment of MSDs in the U.S. in 1995 to be approximately \$88 billion and that all associated expenses (e.g., direct and indirect costs) totaled nearly \$215 billion.

Further, MSDs are reported to be the most frequent chronic condition causing long-term disability (Badley et al. 1994). Yelin et al. (1999) reported that 90% of disabled older workers had MSDs, and Lawrence et al. (1998) estimated that, by 2020, 18.4% of the U.S. population (nearly 60 million individuals) will suffer from one or more chronic MSDs.

These statistics make clear that systematically addressing the causes of musculoskeletal disorders in the workplace can produce significant cost savings for a company, in addition to reducing discomfort, pain, and suffering of affect employees.

## **D. The Ergonomics Philosophy**

The ergonomics philosophy has the potential to make great strides in the reduction of musculoskeletal disorders, as well as the costs associated with MSDs. Many facilities have safety and health programs in place; these programs may address several components of the ergonomics process identified in this guide. Therefore, it is not the intent of this document to completely revamp existing programs, but to enhance the safety and health of businesses through the application of observed best practices and application of ergonomics principles.

## **E. Disclaimer**

The recommendations contained within this document are based upon the best available knowledge about the causes of musculoskeletal disorders, their prevention through implementation of an ergonomics process and specific control strategies, and the observed practices currently found in the industry. The recommendations contained in this document are purely advisory in nature, and no guarantee of success is offered for the reduction of injuries as a result of implementation of any practices or controls identified in this document.

# **Section II**

## **The Ergonomics Process**

- A. Description of the Ergonomics Process**
- B. Management Commitment**
- C. Establishment of the Ergonomics Committee**
- D. Medical Management Program**
- E. The Ergonomics Expert**
- F. Ergonomics Process Findings from Site Visits**

## Section II. The Ergonomics Process

### A. Description of the Ergonomics Process

A *process* is a system whereby necessary components function and interact to produce a desired goal. Similarly, an *ergonomics process* is a plan in which a facility gathers all relevant information on work organization, employee capabilities and limitations, and work-related MSDs, to develop solutions to better accommodate these employees and reduce MSD rates and their associated costs. One important aspect, actually the process's key purpose, is to communicate information among all those involved, so that adequate and feasible solutions to problems having ergonomics issues can be solved. Employee involvement in the ergonomics process, across several layers of an organization, helps to ensure its success. When individuals in a company, from the upper echelons of management to the hourly employee, contribute to making changes in work systems and job sites, they become empowered and more responsible for these changes. This cooperation and employee involvement leads to feasible and successful changes that serve to improve the company.

A successful ergonomics process needs to be implemented and refined across various types of organizations, so that a wide variety of work-related issues can be incorporated. One such process is shown in Figure 1. It comprises five fundamental elements:

- The Workplace;
- The Ergonomics Committee;
- Management;
- Medical Management; and
- The Ergonomics Expert.

The element from which basic ergonomics issues arise is the Workplace; that is, the area in which the physical work is being performed and where employees become injured due to musculoskeletal stressors. It is the responsibility of the Ergonomics Committee to identify these stressors and provide solutions. The remaining three components (management, medical management, ergonomics expert) provide support for the interaction between the Workplace and the Ergonomics Committee. The company's management is responsible for committing to the process itself; that is, emphasizing the value it places on its employees, and for initially providing monetary and personnel resources to sustain the Committee and the changes it makes within the facility. The Medical Management component deals with the health of the employees, by pro-

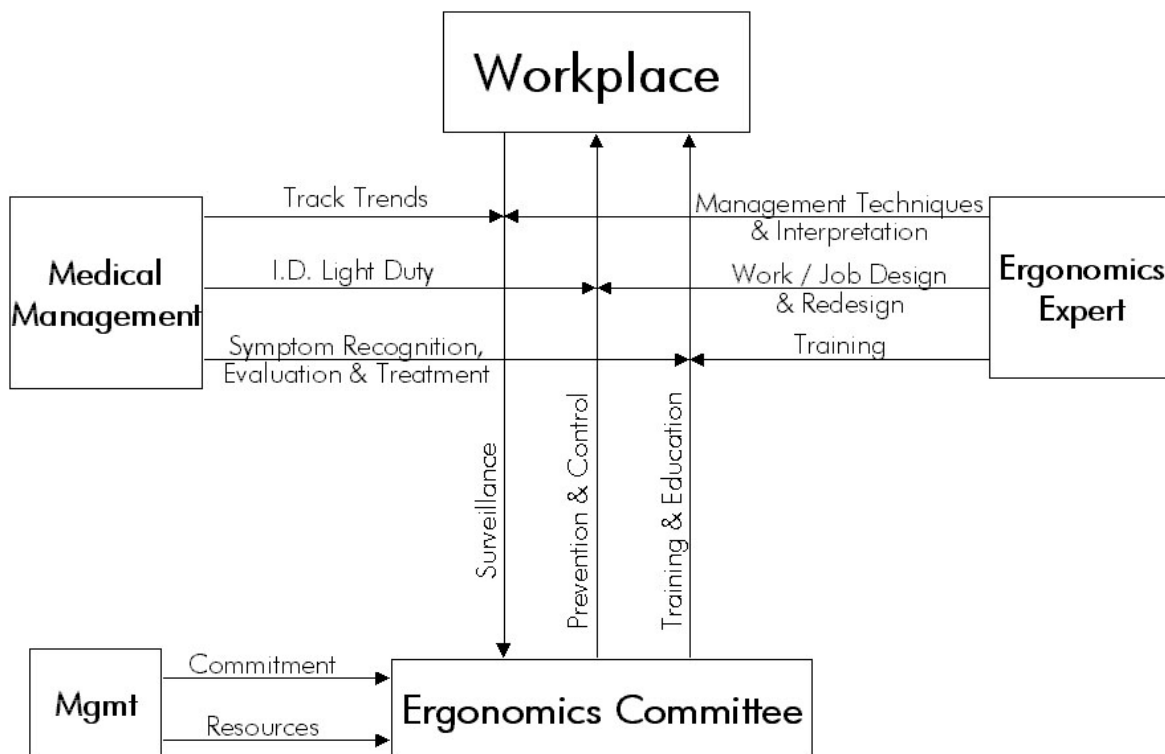


Figure 1. Chart of the major components of a typical ergonomics process and how these components interact with each other.

viding symptom recognition, providing prompt and appropriate treatment, and returning injured employees back to work as efficiently as possible. Finally, the Ergonomics Expert is tasked with training the Ergonomics Committee, providing ergonomics input beyond the Committee's expertise, and assuring that the team progresses in the correct direction.

The description of the **Ergonomics Process** contained in this document can be used as a guide for the interested reader or for those developing an ergonomics process within their company. The components outlined and discussed are consistent with the components of Ergonomics Processes outlined by the Occupational Safety and Health Administration in their document *Ergonomics Program Management Guidelines for Meatpacking Plants*. Many facilities already have active safety and health programs, which may consist of similar components (in name) as those outlined here. However, many MSDs differ from acute injuries, in that these injuries develop over time, and there may be many risk factors throughout the entire job that

contribute to these types of injuries. Thus, components of an existing safety and health program may need to be enhanced to facilitate the understanding of these types of injuries, as well as their causes and prevention strategies.

The responsibility of these components in dealing with Workplace issues within the Ergonomics Process each are outlined below.

## **B. Management Commitment**

For an ergonomics process to be successful, the company's management must be fully committed to integrating ergonomics into the workings of the organization. This includes understanding ergonomics concepts on a global level—that work systems designed within individuals' capabilities and limitations will improve work efficiency and productivity and will reduce the numbers and costs of MSDs. A progressive management structure is one that honestly values its employees and communicates this commitment through corporate policies that tout this dedication to employee health and well-being; this includes the implementation of an ergonomics process.

Management must further understand that ergonomics itself is a *process*, not a special program within the company that has a defined beginning and end. A successful ergonomics *process* must be approached like any other process within a company, such as production, maintenance, or safety, where there is a commitment to continuous improvement.

This level of commitment by management is necessary because of the types of MSDs often addressed by ergonomics committees. These MSDs usually are cumulative in nature; that is, they do not occur after a one-time exposure but rather they accrue over a period of weeks, months, or years of activity considered stressful to the body. Because of their cumulative nature, workplace changes may not immediately result in a drop in injury rates. Management must realize that some patience is required when beginning an ergonomics process and that, over time, the benefits of the investment will be returned, in terms of reduced numbers of MSDs and their associated costs, and an increase in productivity.

Management commitment also includes provision for the needed capital to organize, train, and support the Ergonomics Committee. Funds will be needed to implement engineering and administrative controls aimed at reducing or eliminating the exposure of employees to MSD risk factors, until the committee has the ability and the means to justify the costs themselves. The investment in resources by management is not all just monetary, however. Management must

also be willing to provide the *time* for committee members to meet, discuss, and conduct the work necessary to ensure its progress and success.

## **C. Establishment of the Ergonomics Committee**

This process has its core within the Ergonomics Committee. It is within the committee that all activities in the facility having ergonomics impact be directed. The formation of the committee and their training is no effortless matter, however. These tasks must be undertaken seriously and with much thought. A strong committee foundation will result in a more comprehensive understanding of workplace concerns (surveillance), more complete evaluations of workplace stressors and solutions more likely to be technically feasible (hazard prevention and control), and a better understanding and acceptance of the ergonomics process throughout the facility (training and education). These elements of the committee are described below.

### **1. Composition of the Committee**

Just as ergonomics itself is comprised of multiple disciplines, an Ergonomics Committee should be comprised of members with diverse backgrounds and areas of expertise. It is important to consider what traits each team member can contribute to the ergonomics process. Manufacturing engineers, for example, have an understanding of why existing work processes were designed as such and can give insight as to what potential solutions may or may not be feasible. Experienced production employees from different departments within the facility often have performed many jobs and have an excellent working knowledge of the tasks involved in the jobs, as well as insights for potential solutions to problem areas. Other members to consider for the Ergonomics Committee include: plant manager, plant IE manager, process engineer, human resources or safety manager, department supervisors, and maintenance personnel. The committee should be comprised of individuals who are known and respected within the facility, since others will be more likely to provide information and accept job changes if they also are supported by these employees.

It is extremely important to maintain balance within the committee. That is, the team should be comprised of half management and half production personnel. This is especially important when the process is being implemented within a union facility. The Ergonomics Committee must be viewed as part of a company *co-operative* endeavor rather than one strictly created by and under the direction of either labor or management.

The number of team members also must be considered. For any type of committee, more than eight to ten members can become unwieldy and unproductive. An ergonomics committee is no exception. However, when implementing an ergonomics process within a large corporation, a team of this size may not be able to address all ergonomics issues that arise. When this is the case, separate sub-committees, having similar compositions, can be formed that periodically report to a main overseeing body.

## **2. Training the Committee**

Before beginning to evaluate the facility from an ergonomics perspective, the team first must receive training. Because of the multi-disciplinary nature of this field and the diversity of educational backgrounds of committee members, only a general awareness of ergonomics concepts may be possible. That is, the committee must have enough training to understand how work activities can affect the body and produce MSDs.

The training topics covered should be tailored to the needs of the facility. For example, if a majority of MSDs to employees occur in the low back, then the principles of low back disorder research should be thoroughly covered in the training materials. Similarly, if many jobs are performed within noisy work environments, then concepts of perception, communication, and noise abatement should be addressed. These special topic areas need to be addressed in addition to the basic ergonomics principles that can be applied to a wide-range of work situations.

## **3. Active and Passive Surveillance**

One goal of the Ergonomics Committee is to adequately survey the workplace for problem areas. This includes identifying both jobs and work practices that have historically caused MSDs and those destined to produce future problems if not corrected.

To begin, the committee will undoubtedly focus, with the help of medical management personnel, on those jobs and work areas known already to have caused MSDs (passive surveillance). These initial areas of focus usually arise from a review of accident and injury reports (e.g., OSHA 300 logs, an example of which is shown in Figure 2) and "common knowledge" that particular jobs are more difficult and cause more problems than others. This *reactive* approach is accepted as the method for committees who are beginning to tackle ergonomics issues. However, the ultimate goal of the ergonomics process is for the team to become *proactive*. This occurs over time as the team acquires a



Proper identification of job stressors likely to produce MSDs is gained through the ergonomics training previously received by the committee. The training also should provide team members with an understanding of which ergonomics tools and methods are most appropriate for proper risk factor identification. The assessment tools should be of a form to enable the team to assess the extent of the problem, that is, how risky a job or job task is.

Potential solutions to these problems are generated by team members (initially in coordination with the ergonomics expert), from discussions within the committee and through testing of ideas, so that the best solution can be determined and then be implemented. Thorough follow-up, consisting of job re-evaluation, is necessary to ensure that no additional problems have been created and to determine if the solutions are working as hoped.

## **5. Ergonomics Awareness**

One final goal of the committee is to generate awareness of ergonomics throughout the facility. This includes the promotion of the team, its duties, and its purpose. The purpose here is for the team to interact with the work force and explain how they can change jobs to make them easier and safer for individuals to do. They also need to create an environment where employees feel comfortable bringing up issues to team members. This involves, to some level, team members describing ergonomics principles to employees so they see how ergonomics can improve their jobs. One effective way to accomplish this is through a "train-the-trainer" approach. With this technique, ergonomics principles are taught to personnel at the upper levels of a facility, then those individuals teach others, and this follows through the company's chain of command. This system assures that all employees become familiar with the ergonomics process, and it also increases the likelihood that the process will be accepted by employees on many different levels.

These methods are an integral part of providing *effective communication* within the facility. As employees become familiar with the concept of ergonomics and understand that such a process exists within their facility, they intend to see it work. It is the responsibility of the team to continually keep employees updated on the team's activities. For example, if a work site is ergonomically evaluated, affected employees must be kept apprised of the status of the evaluation. Similarly, the team should develop a "hit list" that prioritizes jobs based on past injuries or current levels of discomfort. Because not all

concerns will be addressed at once, this list can be used to explain why some jobs or processes are receiving more attention than others.

## **D. Medical Management Program**

A medical management program addressing injuries and illnesses is essential for the success of a facility's efforts to reduce both the incidence and severity of MSDs. As highlighted in Figure 2, a medical management program includes components that address:

- Tracking the trends of MSDs and physical discomfort in the workplace;
- Identifying jobs within the facility that employees with temporary physical limitations can perform; and
- Assisting in educating the work force about what symptoms may develop into a MSD if exposures to job stressors are not corrected as well as effective treatment of MSDs.

Each of these components are elaborated upon below.

### **1. Track Trends of Musculoskeletal Disorders**

Most companies keep a record of injuries and illnesses that occur within their facility (e.g., medical department visits, OSHA 300 logs). Tracking the type and duration of MSDs found within the company, whether it is performed by the medical staff or the ergonomics committee, provides important information. For example, injury tracking can identify jobs or departments that may account for the majority of MSDs and indicate the types of MSDs most prevalent among employees. The computation of MSD incidence based on these injuries can signal if rates are changing (increasing or decreasing) over time. These activities will allow the ergonomics committee to focus on known problem areas.

Tracking also can be accomplished with symptoms of MSDs that have not yet developed into reportable or lost-time events. Discomfort surveys (an example of which is shown in the Appendix) given to employees by the ergonomics team and medical management personnel allow them to indicate areas of their bodies where they experience pain or discomfort and also to note the extent of this discomfort (e.g., mild or severe). The periodic administration of these surveys also provides the team with trend information; that is, if levels of employee discomfort are changing over time.

## **2. Develop a Return-to-Work Plan**

Early return-to-work has been found to reduce the health-care expenditures associated with these injured employees and other direct and indirect costs (U.S. Dept. of Labor, 1990), in addition to increasing the likelihood that an injured person will eventually return to gainful employment. The logic behind the use of restricted-duty jobs is that employees recovering from an MSD can return to work earlier if a job or certain tasks are found that accommodates their temporary physical impairments, identified as restrictions for return-to-work by the treating physician.

Identification of restricted-duty jobs or tasks requires an assessment of the physical requirements of jobs. These requirements are then matched with the physical restrictions of employees returning to work from an injury, so that the ailment is not aggravated. This process requires good communication with the employees' treating physician(s), so that detailed and relevant information about the types of restrictions are passed to the ergonomics committee and the person responsible for the return-to-work. In general, physicians who treat the company's employees need to understand the physical nature of the jobs in the facilities, and the company and Ergonomics Committee need to understand the MSDs that occur to employees.

## **3. Recognition and Treatment of Musculoskeletal Disorder Symptoms**

Health care providers knowledgeable about the causes and treatment of MSDs may be called upon to educate the work force about general symptoms that may be related to future MSDs, if work activities go unchecked. This is a part of the committee's long-range goal, to address and remedy workplace stressors before they become more severe problems.

The treatment of MSD symptoms also is an important part of the medical management strategy, where the focus initially is on conservative treatment. A flow chart (Figure 3) has been developed and used for upper extremity disorders (U.S. Dept. of Labor, 1990) to direct the type and course of treatment employees should receive.

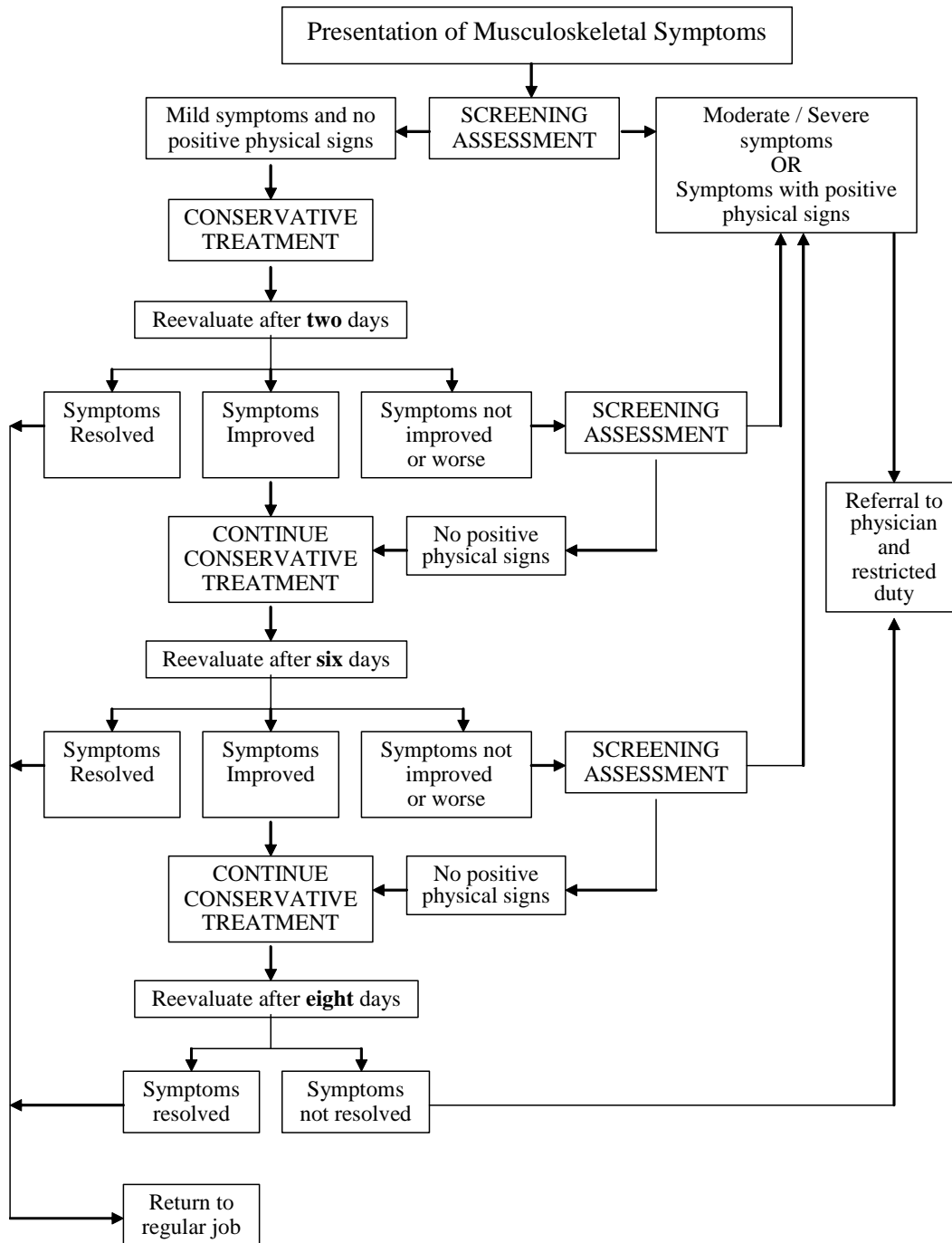


Figure 3. Flowchart of the medical management process, showing the steps necessary to assess and treat symptoms.

## **E. The Ergonomics Expert**

For companies that are beginning to implement an ergonomics process, the ergonomics expert has the initial responsibility of developing this process within the facility. This individual should have received formal training in the field of ergonomics (e.g., Masters Degree, Certified Professional Ergonomist credentials) and experience in applying ergonomics concepts to physical work. It is usually this individual who is tasked with convincing management and labor of the benefits to be derived from introducing such a process within the company's organizational framework. Given that the process has already been established, the expert is tasked with three general responsibilities to the Ergonomics Committee:

- Training;
- Merging the ergonomics process with the management style of the company; and
- Providing expertise and assistance when requested by the committee.

These three functions are discussed below.

### **1. Training the Ergonomics Committee**

The ergonomics expert must educate the committee regarding those ergonomics principles and concepts that are relevant within the facility. Because of the multi-disciplinary nature of this field, a comprehensive review of all ergonomics issues would be extremely time-consuming. Therefore, topic areas included in the training should be selected carefully. The goal of the training is not to make team members experts themselves, but to enable them to recognize work-related factors that may be causing or contributing to MSDs and how to resolve these problems.

As mentioned, many topic areas within the field of ergonomics may be applicable. However, it is recommended that the following basic concepts be included: a discussion of body size and strength differences among people (anthropometry); loading of the joints in the body due to both external and internal forces (workplace biomechanics); and how to evaluate a work site from an ergonomics perspective (task analysis). Other topics may need to be included, depending on the needs of the facility.

As discussed earlier, a train-the-trainer approach may be useful, so that these team members not only understand how the ergonomics process is to function, but have the ability to train others within the facility on ergonomics concepts.

## **2. Management Techniques and Interpretation**

Each company manages their work processes differently, and an ergonomics process is not exempt from these differences. The ergonomics expert is responsible for understanding the company's work environment and integrating the process within this atmosphere. Organizational structures differ. Some companies communicate policy better than others. Sometimes employees are unionized. The expert must successfully integrate the ergonomics process into these business practices.

## **3. Work/Job Design and Redesign**

A properly trained Ergonomics Committee will be able to accomplish much within a facility, evaluating and correcting work sites that contain MSD risk factors. However, there may be circumstances when the issues of a problem work process are beyond the capabilities of the committee. The ergonomics expert can assist the team with these problems, by applying additional knowledge of the field or by evaluating the workplace with more sophisticated or technical equipment. It is the responsibility of the expert to know which advanced tools need to be applied, when they should be used, and how this information will benefit the ergonomics team and the company.

In summary, the objective of the ergonomics expert is to direct a fledgling team and their activities. This relationship should continue until a time is reached where the team is able to sustain itself independently, with little or no expert assistance.

# Section III

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# Appendix

## Example Employee Discomfort Survey

**ERGONOMICS** is a method of designing work places, tools, and other equipment so they can be used by people safely and efficiently. Ergonomics takes into account that fact that everyone is different, so work should be designed to consider these differences and the capabilities and limitations of each person. An Ergonomics Team has been established here at this facility. One purpose of this team is to find out what concerns you have with your job, before they become more serious and put you at risk of becoming injured.

Please take a few minutes to fill out this form. **All information will be kept confidential!** If you have any questions, please ask a member of the Ergonomics Team. When you are finished with this form, please give it to one of the team members. Thank You!

Your Name (Optional): \_\_\_\_\_ Date: \_\_\_\_\_

List below the job(s) you have done in the past 2 years. (If more than 3, just list the last 3 you have done.)

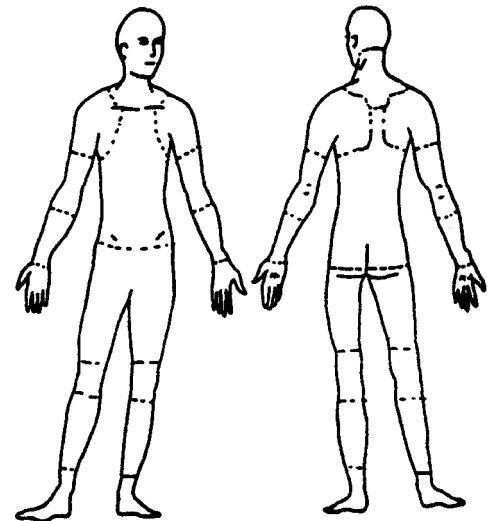
	Job Name	Department	How long on this job?	Did you ever have any discomfort when doing this job?	
Most recent job				YES	NO
Second most recent job (if applicable)				YES	NO
Third most recent job (if applicable)				YES	NO

How you had any job-related pain or discomfort during the **past year**? \_\_\_\_\_ Yes \_\_\_\_\_ No

If you answered "No" to the above question, stop now and turn in this survey.

If you answered "Yes" to the above question, please continue.

Carefully mark with an "X" in the drawing to the right those areas which bother you the most.



Front

Back

Please continue on the next page

## Employee Discomfort Survey (continued)

Of these body parts listed:    • *Neck*            • *Shoulder*        • *Elbow/Forearm*        • *Hand/Wrist*    • *Fingers*  
    • *Upper Back*    • *Lower Back*    • *Thigh/Knee*            • *Lower Leg*     • *Ankle/Feet*

Please answer the following questions for each body part you listed.

Write in the space below the body part that causes you the **most discomfort** on the job(s) you do NOW.

Write in the space below the body part that gives you the **second most discomfort** (if any) of the job(s) you do NOW.

Write in the space below the body part that gives you the **third most discomfort** (if any) of the job(s) you do NOW.

When did this discomfort start?    **ŷ**

\_\_\_\_\_   
 \_\_\_ (month), \_\_\_ (year)

\_\_\_\_\_   
 \_\_\_ (month), \_\_\_ (year)

\_\_\_\_\_   
 \_\_\_ (month), \_\_\_ (year)

What do you think caused this discomfort?    **ŷ**

\_\_\_\_\_   
 \_\_\_\_\_

\_\_\_\_\_   
 \_\_\_\_\_

\_\_\_\_\_   
 \_\_\_\_\_

Using the scale below, what number related to discomfort would you rate how this body part feels:

**1 2 3 4 5 6 7 8 9 10**  
 None            Moderate            Unbearable

Today: \_\_\_\_\_

Today: \_\_\_\_\_

Today: \_\_\_\_\_

At Its WORST: \_\_\_\_\_

At Its WORST: \_\_\_\_\_

At Its WORST: \_\_\_\_\_

Have you had medical treatment for this discomfort?    **ŷ**

\_\_\_ No    \_\_\_ Yes

\_\_\_ No    \_\_\_ Yes

\_\_\_ No    \_\_\_ Yes

If "No", why not?    **ŷ**

\_\_\_\_\_   
 \_\_\_\_\_

\_\_\_\_\_   
 \_\_\_\_\_

\_\_\_\_\_   
 \_\_\_\_\_

If "Yes", where did you get treatment?    **ŷ**

\_\_\_ First Aid  
 \_\_\_ Personal doctor  
 \_\_\_ Other (\_\_\_\_\_)

\_\_\_ First Aid  
 \_\_\_ Personal doctor  
 \_\_\_ Other (\_\_\_\_\_)

\_\_\_ First Aid  
 \_\_\_ Personal doctor  
 \_\_\_ Other (\_\_\_\_\_)

Did the treatment help?    **ŷ**

\_\_\_ No    \_\_\_ Yes

\_\_\_ No    \_\_\_ Yes

\_\_\_ No    \_\_\_ Yes

How much time have you lost in the last 2 years because of this discomfort?    **ŷ**

\_\_\_\_\_ Days

\_\_\_\_\_ Days

\_\_\_\_\_ Days

Could you have done light duty work, even with this discomfort?    **ŷ**

\_\_\_ No    \_\_\_ Yes

\_\_\_ No    \_\_\_ Yes

\_\_\_ No    \_\_\_ Yes

What do you think could have reduced your discomfort?    **ŷ**

\_\_\_\_\_   
 \_\_\_\_\_

\_\_\_\_\_   
 \_\_\_\_\_

\_\_\_\_\_   
 \_\_\_\_\_