

Ergonomic Analysis

Its Use in Medical Causation Cases

By Vic Zuccarello

Training in ergonomics is an essential part of the skill set for health professionals working in industry. Often, healthcare professionals are asked to put these skills into practice in cases in which the physician and/or the courts wish to determine whether a claimed injury was indeed caused by the job in which a claimant is engaged. Is the job safe, does it have some risk or is it hazardous? Workers' compensation law in many states dictates that for an injury to be compensable, the job must be at least a substantial factor, if not the prevailing factor for the injury.

In addition to ergonomics training, a background in anatomy, kinesiology and acute pain management are essential skills in this process and in the process of assisting the determination of medical causation. This article addresses the manner in which an industrial therapist can identify work-related risk factors and help a physician determine medical causation.

Healthcare Provider's Role in Determining Medical Causation

The role that healthcare providers fill in industry continues to expand as insurance companies, attorneys, physicians and employers recognize the unique combination of skills that occupational therapists (OTs), physical therapists (PTs), nurses and other health specialists provide. Especially true with OTs and PTs, few professions combine the principles of anatomy, physiology, kinesiology and task analysis the way that OTs and PTs do in day-to-day practice.

The applied distillation of these skills when combined with workers' compensation law is increasingly being called into practice when the healthcare provider performs an ergonomic analysis used in medical causation. This article describes

the healthcare provider's role in this process and outlines the manner in which these specialized assessments are performed.

Medical Causation

Causation refers to an act that produces an effect. In forensics, *medical causation* is a medical/legal process in which a set of elements is examined to determine whether those elements produced a claimed effect. In workers' compensation, this process is used as a mechanism by which an event is alleged to have caused a condition and/or an injury claimed to be work-related. The process is medical because it consists of analysis processes performed by a physician and healthcare provider relative to a medical problem. The process is legal because the process by which the condition is deemed compensable or work-related is argued in court and ruled upon by a judge. Injuries often alleged to be work-related in medical causation cases involve the spine, upper back and shoulder (NIOSH, 1997), the elbow, wrist and fingers (Chin & Jones, 2002).

The Goal of the Medical Causation Process

The goal of the medical causation process in workers' compensation cases is to determine a cause-and-effect relationship between a set of job tasks and a worker's claim of work-related injury. In these cases, it is not a question of whether the worker has a medical problem. Indeed, these workers have a legitimate, diagnosed medical condition such as a neuropathy or an inflamed tendon or ligament. It is a question of how the condition occurred—either primarily the result of a set of job tasks or the result of a preexisting medical condition that has been exacerbated by a set of job tasks (Fisher, Gorsche & Leake, 2004).

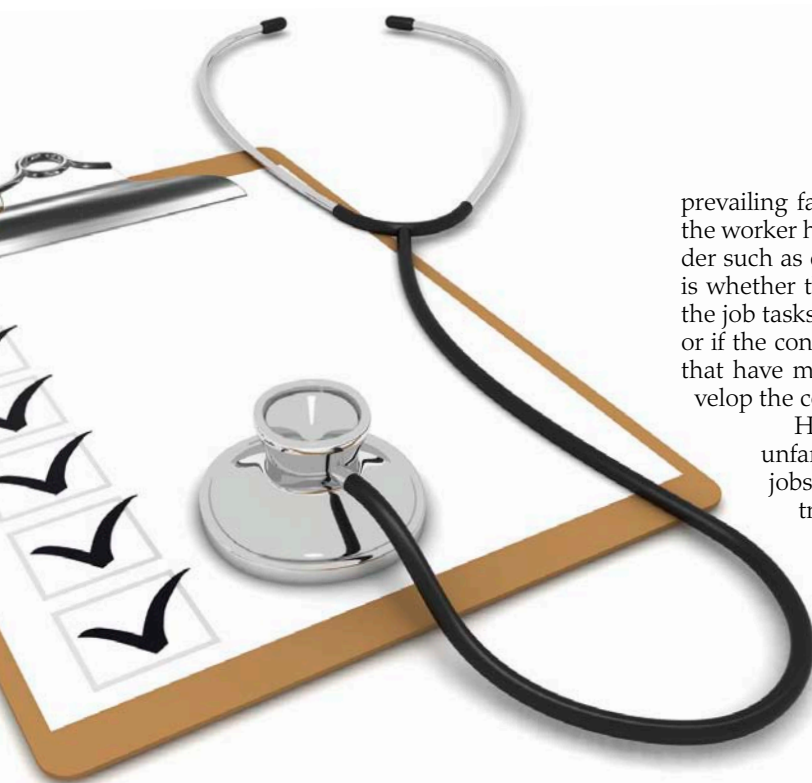
Work-Related Injury, Disease or Condition

Increasing medical evidence has supported the opinion that an individual's health can affect the manner in which work-related motions produce an effect on the human body (Werner, Franzblau, Gell, et al., 2005). For example, carpal tunnel syndrome, formerly assumed to be primarily a work-related injury, occurs in the general population at similar rates regardless of the type of work performed (At-

IN BRIEF

- This article discusses fundamentals of the medical causation process and reviews the role of healthcare providers in helping physicians determine causation.
- The article also covers the manner in which ergonomic analysis is performed in medical causation cases.
- Finally, common ergonomic analysis tools used in medical causation cases are discussed.

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roshi, Gummesson, Johnsson, et al., 1999). Carpal tunnel syndrome has been considered by some to be a product of a somatization disorder in which there exist physical symptoms without an identifiable physical origin versus a true physical injury (Barsky & Borus, 1999).

Disease processes or conditions can predispose certain workers to develop a cumulative trauma condition. These diseases include arthritis, renal disease, hypothyroidism, obesity and others. Besides disease, females are three times more likely to develop cumulative trauma disorders because of certain hormonal effects caused by menopause, or from the temporary effects of pregnancy. Finally, lifestyle habits can predispose a worker to development of cumulative trauma conditions; these include secondary employment, smoking, drug or alcohol use, and high-risk or repetitive hobbies (Falkiner & Myers, 2002).

Many states have provisions in their laws that differ in the burden of proof required to begin the workers' compensation benefits process. For example, in the State of Missouri, the current standard is that the job must be the "prevailing factor" for an injury for that injury to be deemed compensable (Missouri Department of Labor and Industrial Relations, 2006). Prior to a change in Missouri law in 2005, that language was preceded by the provision that the job merely be a "substantial factor" for the injury. This language made it relatively simple to allege a condition was the result of the worker's job since the job could be merely a factor (albeit substantial) in its cause.

Medical Causation in Workers' Compensation Cases

In workers' compensation, physicians have a responsibility to critically examine cases with respect to the manner in which a worker's job tasks contributed to the development of a condition. The physician's job is to balance the effect of preexisting conditions of the worker versus risk factors in the worker's job to determine whether the job is the

prevailing factor for the injury claim. Remember, the worker has a diagnosed musculoskeletal disorder such as carpal tunnel syndrome. The question is whether the condition is primarily the result of the job tasks the worker performs on a daily basis, or if the condition is the result of diseases present that have made the individual more likely to develop the condition.

However, physicians have often been unfamiliar with the manner in which most jobs are performed. Physicians are not trained in determining the tasks and functions of specific occupations as well as how a worker's medical condition interacts with occupational demands (Rondinelli, Genovese, Katz, et al., 2008). They have found that they need additional information in the form of a job analysis.

Healthcare providers are often asked to perform ergonomic assessments to help identify job hazards and to assist a physician in determining whether the job was indeed the prevailing factor for a claimant's injury. Because of their unique combination of skills in anatomy, physiology and kinesiology, healthcare providers have been seen as highly credible analysts in these cases particularly when these providers have additional training or certification in ergonomic evaluation.

Ergonomics is an applied science concerned with designing and arranging things people use so that people and things interact safely and efficiently. Job hazards are the result of a combination of various ergonomic risk factors such as awkward posture, force, repetition, contact stress or vibration. Secondary hazards are related to temperature, duration and pacing.

A risk factor itself is not necessarily a causation factor for an injury (Szabo, 2006). Many times it is not simply the presence of a risk factor that may lead to an injury, but the degree to which the risk factor is expressed. Most often it will be a combination of multiple risk factors rather than any single factor that contributes to or causes a condition. A comprehensive causation analysis case requires that an objective ergonomic evaluation be performed to outline the level of risk involved in all essential functions in a claimant's job.

Performing Ergonomic Analysis

The ergonomic analysis process differs little in medical causation from its traditional use in general injury prevention. This author follows four basic steps in performing an ergonomic analysis in either case. These steps are reported in the literature as 1) interview; 2) observation and measurement; 3) analysis; and 4) report preparation (Malchaire & Piette, 2002).

Interview

The claimant's human resources (HR) representative and supervisor are interviewed first. If the

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employer has a job description, it is reviewed in this meeting. Key points covered in the interview are:

- job purpose and essential functions;
- length of time employed in the present job and other jobs at the company;
- employee's schedule, breaks and lunch;
- number of other employees performing the job;
- PPE.

After the HR representative and supervisor are interviewed, the claimant is interviewed. The key points covered in the claimant interview are:

- age, height, weight and hand dominance;
- length of time employed with the company and length of time in the present job;
- previous employment, secondary employment;
- verify the job purpose and essential functions outlined in the interview with the HR representative and supervisor;
- if a printed job description is being used as a resource, verify the accuracy of the job functions listed in the document;
- development of claimant's symptoms—when they began, what they are and in what activities (including non-work-related activities) they are most noticed;
- whether claimant has a prior injury to the same body part or the same injury to the opposite side.

Observation & Measurement

The claimant is then observed performing his/her work at the usual and customary pace. Observation of all essential functions and job tasks should be performed. The analyst determines the work cycle, pacing, duration of work, duration of rest periods and repetitions. The tasks should be videotaped and still photographs of the worker's posture(s) should be taken.

Observation occurs for as long as needed to outline and analyze any work cycles included in performing the essential functions of the job. Measurement should include weight, force, height, width and length of all items handled or operated, and all the workstations at which the worker interfaces. A tape measure, calibrated industrial scale and force gauge are used as measurement devices. If vibrating tools are used, the duration, pacing, weight of the tool, posture and height at which the tool is used is recorded.

Analysis

The appropriate ergonomic assessment tool must be chosen to identify the risk involved in the job's physical tasks. Several standardized ergonomic assessment tools are available. It is recommended that the analyst use at least two assessment tools in the analysis. Each tool allows a level of risk to be assigned to a given task or set of tasks. Common tools and applications are:

- Moore-Garg Strain Index: Risk factor analysis for the elbows, wrists and hands (Rucker & Moore, 2002);
- Rodgers Muscle Fatigue Analysis: Body-part-specific analysis of forces, repetitions and duration/pacing (Rodgers, 1992);

- Rohmert's Recovery Guidelines: Required rest periods for work cycles based on the level of force required by the job tasks (Rohmert, 1973);

- Washington State ergonomics rule: Assessment and classification of job tasks into caution zones or hazards, lifting analysis and vibration analysis tool (Washington State Department of Labor and Industries, 2000);

- Threshold limit value for hand activity level: Assessment of risk based on force versus pacing in mono-tasks (Latko, Armstrong, Franzblau, et al., 1999);

- Rapid upper limb assessment: Assessment of risk for static upper extremity postures (McAtamney & Corlett, 1993);

- Rapid entire body assessment: Assessment of risk for static upper and lower body postures (Hignett & McAtamney, 2000).

Other available tools can be used specifically to assess keyboard and mouse use. These are used in conjunction with a keystroke counter, such as KeyGhost (www.keyghost.com). To perform a keystroke analysis, the therapist attaches a keystroke counter to the claimant's computer for a specified period of time (the author prefers a full week). The number of hours the claimant is performing computer work is totaled after downloading the data from the keystroke counter.

The number of hours the worker is using the mouse is totaled and based on the ratio of mouse clicks to keystrokes, an estimate of the number of mouse-clicks is calculated. That number of additional clicks is added to the mouse hand (usually the right) as an additional set of keystrokes. Based on the final total of keystrokes (including mouse-clicks), the number of keystrokes per hour and per minute is calculated, then analyzed using the following assessment tools. Each tool assigns a level of risk to the task.

- ANSI Z365 (draft) Proactive Job Survey for Keystrokes per Hour (ANSI, 1998);

- Kilbom's Guidelines for Keystrokes per Minute (Kilbom, 1994);

- Washington State ergonomics rule for use of a data input device (Washington State Department of Labor and Industries, 2000).

Some workers use vibrating tools such as grinders, chippers and sanders. Vibration in significant amounts has been shown to cause hand-arm vibration syndrome (NIOSH, 1989). Vibratory tools can be assessed by recording the tool type, make and model, and level of acceleration for the tool. The website of the tool manufacturer or other specifications can be used to find a comparable tool for the acceleration level—a figure in meters per second squared. Acceleration is defined as the time rate of change of velocity—a parameter indicating the amplitude of vibration of a tool (Workers' Compensation Board of British Columbia, 2003).

The number of hours the vibrating tool is used per day is calculated via survey of the supervisor, the worker and other workers, and observation. The acceleration level is plotted on a graph relative to the number of hours used per day to arrive at a

level of risk using the Washington State ergonomics rule—Vibration Analysis Tool (Washington State Department of Labor and Industries, 2000).

Report Preparation

The report should outline information derived from the interviews, the job functions and physical tasks, the tools utilized and their numerical levels of risk. The assessment tools may determine one of the following final conclusions:

- The job is not a hazard and no ergonomic controls are indicated.
- The job is not a hazard but general controls are indicated to improve worker comfort.
- The job is a hazard and controls are indicated to reduce or eliminate the hazards.

Final Outcome in Medical Causation Cases

After submitting the report to the physician, the analyst's task is usually complete. Typically, the only circumstance in which the analyst acts in the case after submitting the report is if s/he testifies as an expert or is compelled by subpoena to testify as a fact witness. Administrative determination is made by the judge who renders a decision based on the credibility of the witnesses and the peer-reviewed scientific basis behind each expert's opinion. The case is finally closed with the decision won or lost by the claimant and a final cash settlement is determined.

Conclusion

Medical causation cases occur when a question exists as to whether a worker's claim of injury is work-related or is the result of a medical condition. Healthcare providers such as OTs, PTs, nurses or others are often utilized by physicians and employers to identify job hazards, and these hazards are identified through observation and analysis using standardized ergonomic assessment tools. The determination of medical causation is made by the physician but a final decision is determined after a judge reviews all relevant evidence. **PS**

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