Chronic, Recurrent Low Back Pain

A Methodology for Analyzing Fitness for Duty and Managing Risk under the Americans with Disabilities Act

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Chronic, recurrent low back pain, although one of the most commonly encountered medical conditions in the workplace, is one of the most difficult to manage. With the passage of the Americans with Disabilities Act, the proper management of the worker with recurrent low back pain poses an even greater challenge. We propose an interdisciplinary methodology to evaluate the worker at high medical risk of recurrent low back pain and determine the potential ergonomic risks of essential function tasks in material-handling work. The proposal considers the ethical and legal liabilities of risk assessment and fitness for duty evaluation that physicians, ergonomists, attorneys, and ultimately business managers and supervisors experience in balancing the societal interests represented by the Americans with Disabilities Act.

Occupational low back pain (LBP) is one of the most commonly encountered conditions in the industrial setting. Approximately 10 million employees in the United States suffer back pain that impairs their performance and an estimated 1 million employees file workers' compensation claims each year.[1] Of the more than 11,500 complaints filed with the Equal Employment Opportunity Commission (EEOC) from July 1992 to June 1993, 18.5% have been for back impairments, making them the most common EEOC complaint, and monetary benefit awards have now reached $26.7 million.[2] In a survey of 12 states, the National Safety Council found that occupational back injuries, the most frequently occurring workplace disorder,[3] account for 22% of workplace injuries/illnesses and 32% of workers' compensation costs. The Bureau of National Affairs[4] notes that about half of the 22.4 million cases of back pain reported in 1988 were work related. In 1986, it was estimated that the total compensable cost of occupational low back cases in the United States was more than $10 billion.[5] An anatomic cause is identified as a potential source of pain in only 10 to 20% of low back cases.[6] Vague, nonspecific terms such as "musculoligamentous," "mechanical," "lumbar strain/strain," "lumbar syndrome," etc, are frequently used to describe the patient without a specific lesion to explain the type of LBP. Regardless of the cause, approximately 70% of affected people recover in 2 to 3 weeks and 90% in 6 weeks.[7-10] Low back pain that persists for more than 7 weeks is considered chronic.[11] The complex biological, psychological, and sociological variables involved in managing the chronic LBP patient in

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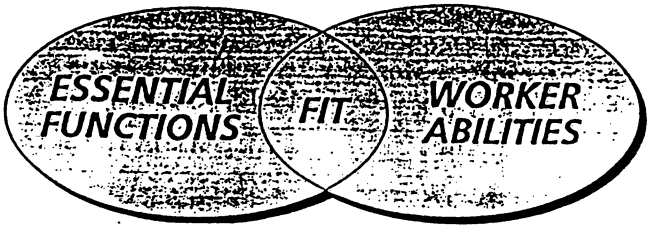

Fig. 1. Matching worker abilities to essential functions of the job.

rect threat" to health or safety must be based on a reasonable medical judgment that relies on the most current medical knowledge and objective evidence, which may include:

1. Input from the worker with a disability;

2. The experience of this worker in previous jobs; or

3. Documentation from physicians, psychologists, rehabilitation counselors, physical or occupational therapists, or others who have expertise in the disability involved, perhaps coupled with direct knowledge of the worker with a disability.

Decisions that affect worker's employment and earning capacity carry heavy legal and ethical responsibilities. Furthermore, assessment of prehire or posthire LBP risk may be illegal if not performed within the guidelines established under the ADA and the implementing regulations of the EEOC.[14,18] The ADA prohibits the employer, before a job offer, to inquire regarding a history of back problems which the job applicant may choose not to disclose. The EEOC also notes that 46% of back impairment charges have come from discharged employees versus 15% in the hiring process.[2] These data suggest and the ADA prohibition practically ensures that LBP disability will more frequently surface in the postemployment setting. Furthermore, epidemiologic studies that have attempted to describe various LBP risk factors are far from complete and frequently contradictory. In many of the studies, LBP is not well defined and individual characteristics are poorly quantified. However, the following risk factors have been described and should be individually considered when evaluating a patient with recurrent LBP: age and sex[27-29] (While these factors may be considered by the physician in his medical assessment, they cannot serve as a motivation for employment action. See Title VII of the Civil Rights Act, 42 USC §§2000e–2000e-17 (1988 & Supp 1993) and The Age Discrimination in Employment Act, 29 USC §§621–634 (1985 & Supp 1993.), anthropometry,[30-33] posture,[34-37] spinal mobility,[10,35,38,39] muscle strength,[10,40-43] physical fitness,[10,29,39,44] radiographic factors,[31,45-48] psychologic/psychiatric problems,[49-53] social factors[34,54,55] (social factors related to race cannot be used to reject job applicants if to do so has a disparate impact on a protected class. See Title VII case law.), job satisfaction/nonphysical factors,[56-58] smoking[31,59,60] (Whether a nicotine addiction can be a disability under the ADA remains an open question.), medical history,[61,62] and physical examination findings.[7] A detailed review of each risk factor and supporting medical literature is beyond the scope of our inquiry here and is in any event unnecessary for our proposal. For the purposes of our methodology, we suggest that the medical history is one of the most important factors a physician or employer can rely on to identify workers who could pose a LBP "direct threat" to themselves or others. The rationale for this recommendation is based on a pertinent review of the following medical literature.

For LBP risk assessment, the most important part of the medical history is the identification of previous back problems. In fact, some physicians maintain that it is the only useful predictor of risk in the medical history.[61,62] Recurrent episodes of LBP appear frequently to be a precursor of future LBP. Rowe[40] found that 83% of those with LBP had recurrent attacks. Patients with sciatica had a recurrence rate of 75%.[36] Similar recurrence rates have been reported by other investigators.[12,63]

A few studies specifically consider previous back problems in terms of risk of recurrence. Chaffin and Park[64] found a threefold increase in the risk of back problems in subjects with a previous history of back pain. Bergquist-Ullman and Larsson[27] reported that 62% of their group of 217 workers with acute LBP had recurrences within a year, whereas another 18% had recurrences within 2 years. Pedersen,[63] Troup et al,[12] and Biering-Sorensen[65,66] all found a history of sciatica to be a risk indicator. Magora and Taustein[67] found that persons who had had sciatica in the past experienced more frequent and longer sickness absence periods than those with a previous history of pain in the lower back only, a finding confirmed by Andersson et al.[7]

Low back pain in the past, worsening of the pain from its onset, and sciatica were all risk indicators in men, whereas aggravation of low back pain when standing was a risk indicator in women.

Pedersen[63] found that a history of more than three previous episodes of LBP was ominous because new episodes for these workers were both longer and more severe. Acute onset of LBP, irrespective of cause, results in a longer duration of the pain episode.[27,63,66]

In a prospective study, Lloyd and Troup[68] found four historical factors to be of predictive value concerning risk of recurrent low back pain in patients returning to work after LBP: residual leg pain on return to work, falls as a cause for back pain, sickness absence of 5 weeks or more, and a history of two or more previous attacks.[68] The greater the number of these factors, the higher the risk of a recurrent attack.

Combining a history of previous back pain with other tests may be a way of increasing the predictive value. Indeed, Troup et al[69] found this to be the case when the predictive value of a psychophysical test program was evaluated. Physicians can also increase the objectivity of a LBP risk

Mital[73,74] notes the following average maximum weights for male industrial workers for 8- and 12-hour shifts, respectively, lifting medium-size boxes at a rate of 1 lift per minute.

Floor to knuckle, 33.3 lb (15 kg) or 26.5 lb (27 kg); knuckle to shoulder, 35.9 lb (16.2 kg) or 28.3 lb (12.75 kg).

The AIHA Ergonomics Guide to Manual Lifting suggests that a 50-lb (22.5 kg) maximum for weights held 20 inches (50 cm) away from the body is acceptable for 75% of the male industrial population.[75] Chaffin and Park[76] suggest that two-handed lifting in the sagittal plane of loads greater than about 35 lb (15.75 kg) is associated with increased incidence of LBP if the load is held close to the body. Herrin[77] notes that loads in excess of 50 lb (22.5 kg) cause an increase in medical incidents and significant increase in days lost and days on restricted duty. Snook[78] notes the following average maximum weights for lifting medium-size boxes at a rate of 1 life per minute will accommodate 75% of the male industrial population (Snook's data have been summarized to facilitate concise presentation): floor to knuckle, 49.2 lb (22 kg); knuckle to shoulder, 44.1 lb (19.8 kg).

Snook also notes a maximum carry weight of 62.8 lb (28.3 kg) for an approximate 8-ft (240 cm) carry. The limit for the lift *and* the carry would, of course, be less than the lift alone.

The International Labor Office suggests the following maximums for healthy men[79]: 20 to 35 years old, 55.1 lb (24.8 kg); 35 to 50 years old, 46.3 lb (20.8 kg); more than 50 years old, 35.3 lb (15.9 kg).

The National Institute for Occupational Safety and Health Work Practices Guide (NIOSH WPG) cites research by Ayoub that indicates that the average maximum weight acceptable to male industrial workers is[19]: floor to knuckle, 61.7 lb (27.8 kg); knuckle to shoulder, 57.5 lb (25.9 kg); floor to shoulder, 51.4 lb (23.1 kg).

The Foundation for Occupational Health Care in the Dutch Construction Industry indicates the following tentative directives for frequent lifts by men during the whole day[80]; 21 to 44 years old, 39.7 lb (17.8 kg) under ideal conditions and 17.6 lb (7.9 kg) under aggravating conditions; 45 years or older, 33.1 lb (14.9 kg) under ideal conditions and 11.0 lb (4.9 kg) under aggravating conditions.

If a single lift limit were to be recommended, it would appear that research supports a lifting limit of between 30 and 50 lb (13.5 and 22.5 kg) independent of the load location. In light of the fact that lift frequency is often higher than the one lift per minute used in many of these studies, and the awkward postures that must sometimes be assumed in the industrial workplace, an approximate limit of 30 to 50 lb (13.5 to 22.5 kg) would be in the acceptable range. In most cases, however, lift frequency and a more detailed description of posture are of critical importance and the implementation of more comprehensive analysis techniques is required.

Pushing and Pulling Limits. Low back stresses during pull activities can approach those stresses that occur during lifting. Lee[81] modeled the peak compressive forces at the L5-S1 disc during cart pushing and pulling activities. He found that, during the pulling activity, the low back compressive forces were highest when pulling with a cart handle height of 26 in (65 cm) and lowest when pulling with a handle height of 45 in (112.5 cm). The low back compressive forces during cart pushing were low for handle heights ranging from 26 to 60 in (65 to 150 cm).

NIOSH Work Practices Guide for Manual Lifting. The NIOSH WPG for Manual Lifting published in 1981 and revised in 1993, establishes acceptable lifting limits based on selected task parameters and specifies recommended administrative or engineering controls.[19,72,82] The NIOSH WPG recognizes the effect of metabolic energy expenditure, strength, and compressive force on the low back and determines "acceptable" load weights based on the posture used, frequency, and duration of the lift. The revised version also recognizes torso rotation and type of grip.

To use the guide, it is necessary to record the object weight, posture used at the beginning and end of the lift, frequency of lifting, duration of lifting, and (for the revised WPG) the type of coupling between the hands and the load. These parameters are used to determine acceptable lifting limits for a work force that is physically fit and accustomed to physical labor.

Biomechanical Analysis. Biomechanical analysis is possible with any of several different computer models. The University of Michigan 2-Dimensional Static Strength Model, a computerized biomechanical model, computes back compressive force values and joint moments for common manual handling tasks such as lifting, pushing, and pulling, as a function of the worker anthropometry, load, and posture.[83] The logic and assumptions for the model are beyond the scope of this document. Other computer models are available but the University of Michigan two-dimensional model has gained considerable acceptance among the industrial and consultant community as a relatively easy to use analytical tool. A three-dimensional model is also available but is somewhat more complex.

It should be emphasized that biomechanical analysis techniques can be used to design or redesign the work place to minimize hazard and not just to quantify an existing hazard. For example, using the University of Michigan two-dimensional static strength model, a biomechanical model analysis was run to establish the relationship between back compressive force, load, and lift posture. This was done to establish acceptable storage locations for loads of 10, 20, 30, 40, and 50 lbs (4.5, 9, 13.5, 18, and 22.5 kg). The analysis was run for a 50% male (height, 70 in [175 cm]; weight, 166 lb [74.7 kg]). The results are noted in the Table.

Loads of 50 lb (22.5 kg) lifted from the floor (or 4-in [10 cm] pallet height) generate back compressive forces in excess of 770 lb (346.5 kg) regardless of horizontal location. Loads in excess of 30 lb (13.5 kg) lifted from the floor (or 4-in [10 cm] pallet height) must be held close to the body. A vertical distance of approximately 36 in (90 cm) appears to be acceptable for all loads

down by the ADA guides both the physician and the employer.[14,18]

The mere concern that a worker will harm himself or herself further does not provide a sufficient reason to deny employment. Furthermore, mere speculation that the employee, once on the job, could cause harm to others will not justify a denial of employment. As previously noted, a direct threat exists where there is a current specific risk, rather than a speculative or remote risk, which is significant in nature and which threatens substantial harm. The physician must demonstrate through objective medical data that a current risk exists. Speculation that in a number of years a low back condition is likely to deteriorate is insufficient with respect to the imminence of the potential harm. The employer must be able to show that the disability presents a significant risk with a high probability of substantial harm.

We submit that in most circumstances the worker found to be at high risk for recurrent LBP may in some cases pose a direct threat to others. The direct threat would most likely be apparent if a high-risk worker is placed in a job that requires handling of hazardous materials, assuming awkward postures, or using moving machinery such as cranes or forklifts that might dump materials on or run into coworkers if the disabled worker were to experience the acute onset of LBP symptoms. Similarly, these workers may pose a direct threat to others where the workers handle materials as a team without mechanical assistance. For example, a high-risk worker carrying materials in tandem with or side-by-side a coworker may cause injury to the coworker when a sudden onset of LBP forces the worker to drop the load.

The ADA Technical Assistance Manual[18] offers a hypothetical example described as follows: "a medical history reveals that the individual has suffered serious multiple re-injuries to his back doing similar work, which have progressively worsened the back condition. Employing this person in this job would incur significant risk that he would re-injure himself."

While the ADA[14] defines direct threat as a significant risk to the health or safety of others, the regulations implementing the ADA broaden the term to include a risk of substantial harm to the health or safety of the disabled worker as well. Establishing direct threat to the disabled individual requires, we submit, a greater quantum of evidence demonstrating the imminence of potential harm.

Although it is possible that a person considered at moderate risk by our categorization could be found to present a direct threat to himself or herself or others, under most circumstances employees with a moderate risk profile should be managed only as a possible direct threat. The patient should be notified, however, of the risk category and possible fitness-for-duty decisions that might arise should another back injury occur moving the person into the high risk and likely direct threat category. (The reader is referred to the supporting literature for a more comprehensive discussion of the validity, reliability, practicality, legality and predictive value of each factor in assessing future LBP risk.)

Obviously, the more detailed the medical history and objective the risk data provided by the physician from the examination and identification of other LBP risk factors, the more secure the employer can feel in a determination that a person does or does not pose a direct threat.

Again, at this stage the employer must analyze the nature of the threat and determine whether there is a reasonable accommodation that could be achieved to eliminate the threat. Here the physician can provide valuable input, without having to make ultimate employability decisions.

Recommendations

The physician confronted with a material handler showing increased risk of LBP has the responsibility of determining fitness for duty. Typically, treating physicians simply write return-to-work notes stating: "light duty," "no heavy lifting," "no repetitive lifting, bending, stooping, etc," without regard to the worker's LBP risk status or essential functions of the job. Such restrictions are meaningless in properly placing the worker because most physicians simply do not understand the patient's job or workplace. Thus, restrictions are usually based on what the physician subjectively thinks the patient can or cannot do. These restrictions are occasionally based on what the patient tells the physician about the job requirements or functional capacity evaluation reports, but they are rarely based on a description of essential job functions or visits to the workplace.

The primary responsibilities of a treating physician in a compensable disability setting are accurately and objectively to: (1) determine causation in terms of "reasonable medical probability" (usually greater than 50%), (2) provide appropriate medical treatment, monitor rehabilitation efforts, (3) determine the end of a healing and rehabilitation period, (4) rate permanent impairment, and then (5) return the patient to work in a timely manner, if possible. Many physicians, however, perpetuate or prolong disability through inappropriate patient advocacy, which keeps the employee off work after maximum medical improvement has been reached. Most progressive companies have early return-to-work policies and programs that will accommodate reasonable medical restrictions. Most restrictions are temporary until the patient has sufficiently healed to perform full duty. Occasionally, however, when a "high-risk" medical condition is encountered, the physician may recommend permanent restrictions in an effort to protect the worker from aggravating a stable injury or illness. However, a medical examination is permitted only when it is necessary to determine whether the worker has a disability, whether the worker can perform the essential functions of the job, and whether there is an effective accommodation that could assist the otherwise qualified worker with a disability to perform the essential functions of the job. If the employee is obviously having difficulty performing the job, then the underlying medical condition can be ascertained through a physical examination and appropriate medical inquiry. Thus, assuming either a return-to-work sit-

(high risk) or nine times per hour (moderate risk) for less than 1 hour at a time involving loads not greater than those identified in No. 1 above and 30 in (75 cm) from the floor at the beginning of lifting. (Because restrictions for these type of activities are more difficult to derive, the reader is referred to the 1993 NIOSH WPG for further guidance.[19,72,82] The frequency multiplier in the 1993 formula is defined by the number of lifts per minute (frequency), amount of time engaged in lifting activity (duration), and the vertical height of the lift from the floor. Our hypothetical restriction is based on lowest risk frequency of 12 lifts per hour, lift tasks of less than 1 hour duration, beginning 30 in [75 cm] from the floor and continuing our proposed use of a 50% reduction factor for high-risk and 75% factor for moderate-risk employees.)

4. Pushing/Pulling. No single-person pulling activities requiring more than 50 lb (22.5 kg) of hand force (as measured by strain gauge equipment) to pull a load on a level surface with good traction at approximately a 43-in (107.5 cm) grip height using appropriate posture. (Research indicates that pulling with 50 lb [22.5 kg] on a 43-in high handle [107.5 cm] generates a back compressive force of approximately 385 lb [173.2 kg][81] or 50% of the 770 lb [346.5 kg] limit established by NIOSH.[19,82])

When the postural requirements are more clearly defined, an employer may consider employability decisions using more quantitative analytical methods such as the NIOSH WPG or biomechanical modeling techniques. For example, as noted earlier, the 51-lb (22.9 kg) load constant used in the revised NIOSH WPG may be reduced to recognize the actual lifting capacity of the moderate-risk or high-risk worker in the "optimum" posture. As the posture varies from the optimum, the factors will decrease from 1.0 and the lifting limit for the specific worker will also be reduced. Biomechanical modeling techniques may be used to determine the back compressive force resulting from specific jobs compared to the 385 lb (173.2 kg) maximum suggested for high-risk and 578 lb (260.1 kg) suggested for moderate-risk workers.

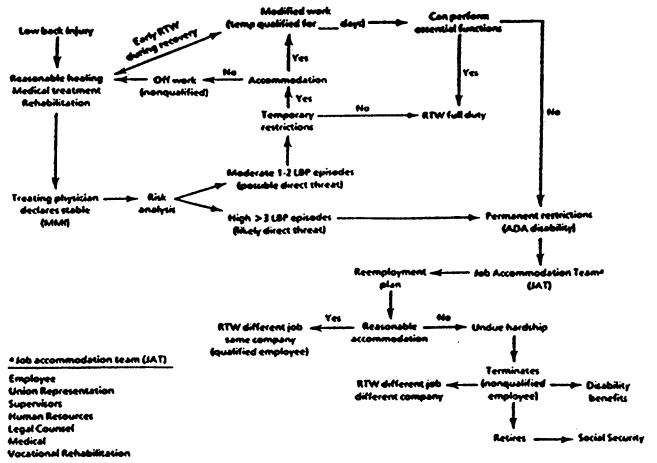

Fig. 2. ADA risk assessment/fitness-for-duty LBP case management model.

The above medical, legal, and ergonomic criteria can be incorporated into a practical algorithm for use by physicians and businesses alike. The algorithm shown in Fig. 2 will help define the pathways in managing the difficult decisions for an employee who develops a "high-risk" LBP profile or any other type of medical disability that creates a "direct threat" or "undue hardship."

Conclusions

Whether an applicant for a position or a worker seeking to continue employment, the high-risk LBP person whose condition limits a major life activity, rendering him or her a disabled person, is protected by the ADA with respect to employment decisions. Management, the physician, and the ergonomic expert should work together applying the methodology we have outlined here for risk assessment and fitness-for-duty evaluations. Reassignment or termination actions should be reviewed by counsel experienced in ADA law. A coordinated approach such as we have suggested significantly reduces the potential of employer liability for increased risk of both workers' compensation actions brought by an employee who injures himself or herself or others on the job, as well as for violations of the ADA. We believe our proposal represents a starting point for additional research into quantifying risk and fitness for duty among workers with chronic, recurrent low back disability.

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