Preemployment Screening

During 70 years of preemployment screening history, no one method has emerged as the most effective in identifying workers who are at increased risk for injury. The author urges physical therapists to rethink these methods—especially in response to the ADA.

By Dennis E. Schnepp, MS, PT

During the past 30 years, health care costs have been among the fastest-rising costs in the world. Costs incurred as a result of industrial injury have reached new heights, threatening to push some industries toward fiscal disaster. Although companies employing large numbers of workers who handle materials have the most dramatic expenditures in this area, the "corner store" may face the same level of financial burden because of proportionate increases in insurance costs. As the ultimate payer of the disability and medical costs related to occupational injuries, all business is motivated to institute any injury-prevention methods that may help reduce the financial drain.

Musculoskeletal injuries sustained on the job are a major contributor to morbidity in many industrial employee populations. In 1988, Isernhagen reported that injuries to the back and spine alone comprised more than 20 percent of all reported occupational injuries in the United States at an estimated annual cost of $30 billion. In 1981, upper and lower back injuries comprised 27 percent of all Workers' Compensation claims (Parniapour et al. 1988). Many different types of musculoskeletal disorders result from industrial injuries; however, because so much of the literature to date has focused on industrial workers with low back injuries, this discussion of preemployment screening is based primarily on those types of injuries.

Preemployment Screening: Definition to Be Announced?

Although preemployment screening is an injury-prevention method that has been in use for at least 70 years, it did not enter the limelight until technological advances in objective testing devices (such as the multiplane Isostation® B200®*) helped the field of industrial medicine take shape in the 1980s. Preemployment screening is defined here as the "medical and physical evaluation used either in procuring employment or in selecting workers for specific tasks in an industrial setting."

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When the Americans with Disabilities Act (ADA) goes into effect this July for companies with 25 or more employees, many employers—and physical therapists who consult to industry—will need to rethink and redefine their preemployment screening process.

Although the ADA permits employers to *inquire*—before offering employment—about the applicant's ability to perform job-related functions, it mandates that medical examinations can be performed only when a conditional offer of employment already has been made. In addition, *all* entering employees must undergo the same examination—which must be directly related to the individual's ability to perform essential job tasks (West 1991).

Under the ADA, the employer cannot refuse to hire an individual whose screening results indicate increased risk for injury *unless* the risk is significant, would involve a substantial injury, and has specific medical documentation (West 1991). The potential for injury on the job cannot be "speculative" or "remote" (personal communication, Compliance Division, Equal Employment Opportunity Commission).

The only relevant factor in preemployment screening then is whether the prospective employee *currently* is able to perform—with or without accommodation—the essential functions of the job. When an otherwise qualified applicant has physical (or mental) limitations, the employer must make "reasonable accommodation" by removing barriers to the workplace—unless this would cause "undue hardship" (i.e., be overly disruptive or expensive to the employer's business operations).

(For an overview of the ADA and specific information on the ADA and preemployment screening, refer to "Understanding the ADA," by J. Connolly, pages 40-45.)

Preemployment Screening: A Brief Historical Perspective

The first recorded "occupational injury" dates from 2700 BC when an Egyptian physician treating construction workers at the pyramid of Sakkara described a "sprain of a vertebra" (Brandt-Rauf and Brandt-Rauf 1987). With the introduction of radiography for diagnostic purposes in the twentieth century, it wasn't long before physicians began using radiographs to *predict* occupational injury.

In the early 1920s, reports began to surface about the use of radiographs in the diagnosis of congenital abnormalities of the lumbar spine. Straub (1923) asserted that these defects structurally weakened the back, predisposing it to injury. In 1929, Bohart found lumbar abnormalities in more than 40 percent of job applicants during preemployment screening using radiographs. He observed a sharp decline in industrial accidents when the radiographs were used to "screen out" workers who had these abnormalities. According to Bohart (1929), the policy of routine testing using preemployment radiographic examination of the lumbar spine would be implemented in the 1930s primarily to control the increasing costs of litigation and compensation for lumbar disability resulting from job injury.

Preemployment screening using radiographs continued throughout the 1940s and 1950s. Becker (1955) endorsed the use of preemployment radiographs,

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reporting a marked decrease in both the incidence and the severity of back injuries within a two-and-a-half-year period after the initiation of a radiographic screening program; however, he acknowledged that an accompanying industrial safety program may have contributed to the decrease.

The popularity of radiograph use in screening began to wane in the 1960s. In 1969, Rowe examined a matched cohort (100 men with low back pain and 100 control subjects) and compared radiographs for abnormal findings that may have identified potential low back problems. He reported no significant differences in the radiographs between the two groups and therefore questioned the efficacy of using radiographs to predict low back injury. In 1969, LaRocca and McNab compared the radiographs of 150 men receiving compensation for low back injuries with those of 150 matched control subjects and observed equal numbers of developmental deviations in the two groups. However, both Rowe and LaRocca reported an increase in hypertrophic changes only in the symptomatic group.

Many studies have shown the radiographic lumbar examination to be effective in identifying degenerative changes but to be of questionable value in predicting low back injury. The use of preemployment radiographs traditionally has been based on the premise that abnormalities of the spine predispose an individual to an increased incidence of low back injury; however, the preponderance of evidence does not substantiate this premise, and it is common to encounter asymptomatic persons who have abnormal spinal radiographs (Montgomery 1976).

No more crystal balls. As medical costs and the number of compensation claims continued to spiral throughout the latter half of the twentieth century, it became clear that the radiograph was no longer the "crystal ball" on the tables of industrial medicine specialists. In the 1990s, preemployment screening therefore includes other methods with a degree of emphasis that varies according to the type of industry and the preferences of the physician and the employer: 1) a complete medical history and physical examination, 2) strength testing and functional evaluation, and 3) job-rating programs and risk analysis. These methods also have been sources of controversy.

The Medical History and Physical Examination

As early as 1954, Runge suggested that a thorough medical history and physical examination should replace radiographs as preemployment screening tools. Many people believe that the medical history is the most important part of a medical examination in identifying workers who are at risk for back injuries. A thorough medical history reveals previous back pain, which can be an important predictor: The probability of additional episodes of back pain in a worker may be up to four times greater following the initial episode (Dillane, Fry, and Kalton 1966).

However, it must be noted that, during the preemployment examination, the worker may not be frank about previous back pain. For this reason, Chaffin et al. (1978) were unable to show the effectiveness of these examinations in identifying workers at risk. In his study of the incidence of occupational low back injury, Ryan (1990) conducted a preemployment screening examination of 32 prospective U.S. Postal Service employees with a known history of lumbar laminectomy. After medical histories and physical examinations were conducted, these prospective employees were classified as having a low risk for back injury based on the information obtained from the workers during the screening process. The workers subsequently were hired. For the next four years, these workers were observed and compared with a matched cohort. Although preemployment screening results had indicated the workers had a low risk for injury, they were found to have an *increased* risk.

In Ryan's study, preemployment screening may have had limited value for identifying those at risk for occupational low back injury after lumbar laminectomy; however, without the screening—which did "screen out" nine high-risk applicants—the increase in job injuries may have been even higher.

Strength Testing and Functional Evaluation

Many industrial jobs require workers to exert great physical force when performing job tasks. When workers do not have adequate strength to perform these tasks, the incidence and severity of injury naturally increase among these individuals.

Chaffin et al. (1976) found that the likelihood of a back injury or musculoskeletal injury increases when a job's lifting requirements approach or exceed the strength capability demonstrated on an isometric (static) job simulation. In 1981, the U.S. Department of Health and Human Services published normative data for isomet-

ric strength testing (*National Institute for Occupational Safety and Health: Work Practices Guide for Manual Lifting)*, which have been widely used for preemployment screening.

The predictive value of static strength testing has been questioned over the years. In a 1989 study, for example, Batti'e examined 3,020 industrial workers and determined that the use of generalized isometric-lifting strength-testing data was ineffective in identifying individuals who are at risk for occupational low back injury.

Dynamic strength tests meanwhile have gained in popularity partly because they may be more generalizable and take into account "whole-body" capability—including variables such as cardiovascular performance and psychophysical factors—in measuring functional strength levels (Mayer et al. 1988). The progressive isoinertial (dynamic) lifting evaluation (PILE) described by Mayer et al. (1988) is a simplified lifting test that combines psychophysical and isoinertial protocols for unconstrained lifting. This test is a user-friendly, low-technology, repeated-lifting test during which the patient lifts a set amount of weight from floor to waist (0 to 30 inches) and from waist to shoulder (30 to 54 inches). The test begins with the individual lifting a load (five pounds for women, 10 pounds for men) at a rate of four times in 20 seconds. Upon successful completion of each lift, weight is added until one of three endpoints is reached: 1) the psychophysical endpoint, that is, voluntary cessation of the test by the person being tested; 2) the aerobic endpoint, that is, when 85 percent of the target heart rate is reached; or 3) the safety endpoint, that is, when 45 to 55 percent of the body weight is lifted. It should be noted that, although this test was heralded by its developers as being safer and more "functional" than other strength-testing methods that may not include a psychophysical endpoint measurement, researchers such as Troup et al. (1987) have reported that psychophysical tests have a low predictive value for future low back dysfunction.

Static vs. dynamic strength testing under the ADA. The advantages of dynamic strength testing may be *dis*advantageous when it comes to following ADA guidelines. When a worker lifts a box during a dynamic strength test, the test may involve variables *that do not necessarily relate to the force required for a specific job task.* Because static strength testing may be used effectively to obtain specific force measurements, this type of testing may be particularly useful in identifying potential risk for injury while also remaining within ADA job specificity guidelines—and therefore may have a resurgence in popularity (personal communication, Keith Blankenship 1992). Static strength testing may be used to determine, for example, the point at which an applicant is able to overcome inertia when lifting a load cell that represents a specific, job-related weight. The force measurement then may be compared with that required to perform the tasks of the job—as stated in the job description.

I believe that the most appropriate use for dynamic strength testing may be in return-to-work testing after an injury already has been sustained on the job.

What do we do with the strength-testing data we collect? Inherent in preemployment screening is the use of a normative database for injury predictability. Most normative databases were generated many years ago using either small college populations or industrial populations. The precision of analysis may be greatly reduced when comparing patient results with these data "tables" (Timm 1991).

The precision of injury predictability may be significantly improved, however, when the normative databases are self-generated (i.e., generated within your facility, using your equipment and methods). Standardization of the databases may be accomplished using methods such as those described by Mayer and Gatchel (1988). These researchers suggested that using "effort factors"—such as range of motion, heart rate, maximum lift, and trunk strength—may make normative databases informative about the possibility of future injury. However, ADA requirements may preclude the use of some of this type of data in preemployment screening because of the job specificity issue.

Regardless of ADA requirements, we must remember the risks we take when we make assumptions based on normative data. By definition, normative databases are "descriptive in nature, not prescriptive" (Timm 1991). It may be more useful to recognize the individual's physiological endpoints and to report those limitations than it is to make predictions based on the point at which an individual falls on a data table.

Physical fitness level. Another aspect of the strength testing and functional evaluation is the determination of the individual's physi-

cal fitness level. Morris (1985) reported that poor physical fitness was associated with the incidence of low back pain. In a study of 1,652 firefighters, Cady et al. (1979) reported that a high level of physical fitness had a significant effect in preventing low back pain. The problem with using fitness level as a predictor, however, is that it can change rapidly; preventive effects may be reversed.

Job Rating and Risk Analysis

Reducing injuries in industry means reducing risk factors in the workplace. The process of preemployment screening must begin with an analysis of the job's demands at the workplace *before the actual screening process takes place*. Without an ergonomic analysis of the job site, it is impossible to tailor the evaluation to the job so that the results are predictive of future injury—and so that the screening process meets the requirements of the ADA. Pertinent information regarding the job site can be obtained from a variety of sources—for example, from job descriptions, from the *Dictionary of Occupational Titles* (1991) manual, or from insurance claims—to identify trends in injuries for a given job.

Although workplace modification has received less attention in the literature than other preemployment screening methods, it should emerge as a practical and necessary amalgamation of worker and job design. Keyserling et al. (1980) concluded that workplace redesign is the ideal solution to materials-handling injuries. Because ergonomics initially can be an expensive approach to industrial injuries, ergonomics programs still can be difficult to "sell to management"; however, the ratio of compensation costs to implementation costs may prove these programs to be a cost-effective control in the long term.

Workplace design vs. job design. Snook, Campanelli, and Hart (1978) stated that the most effective way to control industrial injuries is to design jobs to fit the work. Their survey found that commonly used employee selection techniques—careful selection of workers, thorough training in safe lifting, and ergonomic job design—are not effective in preventing or reducing the incidence of low back pain in industry.

Preemployment Screening: How Far Can It Go?

What rights do employers have in hiring the individual who is the best "fit" for a job? The answer to this question ultimately will direct federal and state governments in determining the future of preemployment screening. In the effort to ensure equal opportunity employment, future legislation may ban all types of employee screening—with the possible exception of drug screening.

Enforced by the Equal Employment Opportunity Commission, the ADA will have a big impact on preemployment screening. As I already have mentioned, the ADA does not rule out testing before a person is legally hired. The ADA does, however, rule out the wholesale testing of applicants to remove individuals who have a disability that, if workplace accommodations were made, would *not* interfere with the ability to perform essential job tasks (West 1991). The keys to preemployment screening in the 1990s are:

1. A clearly written job description that includes essential job functions.
2. Testing that is related directly to essential job functions.
3. Testing that is valid.

Current federal guidelines offer no clear definitions of validity. It is likely that validity in preemployment screening will be determined in courts of law.

When the ADA goes into effect in July, revisions in the philosophy and implementation of preemployment screening will be imperative. Look for further discussion of this topic in *Clinical Management.*

No Clear-Cut Solution

There is no clear-cut solution to reducing morbidity and disability in the industrial worker population. No single approach will control the problem. Only when we use a combination of approaches—job design (ergonomics), job placement (worker selection), and education and training—will we make progress in controlling and preventing industrial injuries.

The foundations of industrial medicine still are being laid. Physical therapy clinicians have a great opportunity to help close the gap between current practices and new developments. We must take part in the scientific evaluation of the

screening techniques we currently use in the clinic, discarding those whose usefulness we cannot substantiate. We must participate in the search for new, improved—and proven—procedures that meet the equal opportunity mandates of the ADA. Is it possible that preemployment screening procedures may never be effective tools in determining who will and will not be injured on the job? **CM**

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