The Multidisciplinary Approach to Occupational Low Back Pain and Disability

Rowland G. Hazard, MD

Abstract

Chronic disability generates most of the growing costs of occupational low back injuries. When back problems persist for more than a few months, traditional diagnostic and therapeutic approaches are rarely curative. Beyond the challenges of physical impairment, disabling back pain is commonly complicated by psychosocial issues, including depression, fear of reinjury, family discord, and vocational dissatisfaction. The biopsychosocial complexity of chronic disability often demands integrated care from physicians, physical and occupational therapists, psychologists, and vocational counselors. In the past decade, the care of back-injured workers has shifted emphasis from symptom palliation toward functional restoration. This evolution has been possible, in part, through improved quantification of physical capacities. Repeated objective measurements of function guide rehabilitation and recommendations for return to work and other activities. Published results of function-oriented multidisciplinary care depend on the outcome variables reported and the particular socioeconomic setting.

J Am Acad Orthop Surg 1994;2:157-163

The vast majority of persons who suffer an episode of acute low back pain recover comfort and function within several weeks. Unfortunately, the remaining 5% to 10% with persisting pain and disability face an ominous prognosis. Their chances of ever returning to work dwindle to 25% after 1 year and practically vanish after 2 years.[1] Meanwhile, the costs of their medical care and compensation soar, constituting up to 90% of the total expenditures for low back problems.

While the incidence of low back injuries and pain reports has not changed, the associated disability rates have exploded over the past two decades.[1,2] This disparity raises two key points about chronic disabling back pain. First, despite continuing diagnostic advances, such as computed tomographic scanning and magnetic resonance imaging, only a small minority of chronic back pain sufferers receive an operational pathoanatomic diagnosis.[3] Even when herniated disks or spondylolistheses are evident, the presence of such lesions in asymptomatic populations may raise doubts about their significance in a given patient. Second, our efforts to cure and rehabilitate these patients are frequently confounded by weak correlations between their self-reports of pain and disability and their observed physical capacities.[4]

A variety of related psychological, social, and financial problems further complicate the classic medical approach to diagnosis and treatment. Depression and hopelessness commonly arise from continuing pain and from loss of physical and economic self-reliability. Repeated flare-ups of pain after sometimes trivial physical stresses can lead to progressive fear of reinjury and self-imposed activity restrictions far below what the patient's extant symptoms might allow. Prolonged spousal role adjustments from houseparent to breadwinner or dependent to caretaker may be very hard to reverse, even if the patient does recover medically. Preinjury job dissatisfaction and the prospect of aging in a heavy-labor career may further dissuade the recovering patient from returning to work. Many patients with chronic back disabilities fear discrimination and dismissal should they attempt reemployment. Workers' compensation and personal injury suits can generate major disincentives to recovery, and the patient's attitude toward recovery can be greatly influenced by an attorney's counsel.

The multifaceted dilemmas of chronic back pain and disability are rarely resolved in a brief orthopaedic office visit. Certainly, the treatment plan must begin with a careful interview, a physical examination, and appropriate diagnostic

Dr. Hazard is Associate Professor of Orthopaedics and Rehabilitation, University of Vermont College of Medicine, Burlington.

Reprint requests: Dr. Hazard, Spine Institute of New England, Box 1043, Williston, VT 05495.

studies to evaluate "medical" and surgically correctable lesions. The relationship between patient and physician and the success of the interventions they choose rest heavily on their consensus about the diagnostic process and the interpretation of its results. But how can the many other issues, such as physical impairment, reemployment, and financial and psychosocial problems, be addressed?

The physical impairments commonly associated with back pain include trunk stiffness and weakness and reduced cardiovascular endurance. Training patients to reverse these deficits requires the skills of a physical or occupational therapist or experienced exercise instructor. Beyond specific muscle, joint, and cardiac reconditioning, problems with complex activities, such as lifting, carrying, and maintaining stressful postures may require task-specific training, often referred to as "work hardening." A therapist who can translate measurements of functional capacities into work and other activity recommendations may give critical input in this area.

The various psychosocial problems attendant on chronic disability may best be dealt with by a clinical psychologist who is familiar with their impact in chronic pain settings and with cognitive behavioral approaches to pain management. Intervention must be timely in this area, since efforts by the other disciplines toward early reactivation and reemployment are not compatible with long-term counseling.

Finally, if these practitioners can help the patient regain function and psychological health, the social and economic barriers to finding and keeping a job may require attention from a vocational specialist who can administer and assess interest and aptitude tests, help write resumes, and coach in job-interview skills.

Unfortunately, all these experts with different backgrounds and often disparate philosophies may confuse the patient with discordant explanations and recommendations for his problems. Poor cross-professional communication leaves the patient "caught in the middle." Through strong emphasis on interdisciplinary cooperation, some rehabilitation centers have assembled full-time teams of professionals from these disciplines in integrated treatment programs focusing on functional restoration. The wide variety of approaches to managing the complex biopsychosocial problems of patients with chronic, disabling back pain includes pain clinics, hospital-based rehabilitation programs, and work-hardening centers. This article describes examples of interdisciplinary programs that combine functional restoration with behavioral support and reviews their published outcomes.

Functional Restoration Programs

In 1985 Mayer et al[5] described a multidisciplinary treatment program for patients with chronic back pain and disability. Following their example, Hazard et al[6] established a similar program. Recognizing that self-reports of pain and disability may not correlate well with physical capacities, Mayer et al founded their approach on repeated objective measurements of flexibility, strength, and endurance. Initial quantitative functional evaluations established baselines from which the patient and treatment staff could begin progressive physical training. Psychological evaluations allowed the treatment staff to formulate intervention techniques and styles appropriate to the individual patient's personality and other psychosocial factors. Mutually acceptable outcome goals were established, and subsequent functional tests assessed progress toward those goals. Failure to improve as projected required medical and psychosocial reconsideration and goal resetting when appropriate. As treatment concluded, repeated functional tests formed the basis for recommendations regarding return to work and resumption of other activities of daily living.

Quantitative Functional Evaluation

The physical impairments associated with low back pain present special measurement problems. Unlike an injured extremity, the physical performance of which can be compared with that of the opposite limb, the spine and its supporting structures have no anatomic standard for comparison. Initially, statistical norms for healthy populations were sought to provide treatment goals. Over time, the physical demands of anticipated work and daily activities have been found to make more practical targets in the goal- setting process. Another problem in measuring spinal function of disabled patients derives from the major impact of the patient's degree of effort during test performance. Submaximal test performance alerts the treatment staff to look for contributing psychosocial issues, which may be addressed in coordination with other members of the multidisciplinary team. Therefore, in addition to the usual testing criteria of safety, reliability, and validity, assessment of subject effort is critical.

Following initial comprehensive medical and surgical assessment, a brief functional evaluation is done to determine the patient's rehabilitation needs and treatment options. When the patient requires intensive therapy, more extensive testing is done during the first 2 days of the treatment program in order to establish functional baselines.

The most obvious physical impairment associated with low back pain is loss of trunk flexibility. Traditional methods for measuring spinal mobility include the skin-distraction technique, fingertip-to-floor measurement, and radiography. The two-inclinometer method most recently described by Mayer et al[7] is practical, since it has demonstrated reliability and an intrinsic method for effort evaluation. If the difference between the most restricted supine straight leg raise and the standing sagittal pelvic motion exceeds 15 to 20 degrees, the patient's effort is very likely restricted for some nonphysiologic reason.

The cardiovascular deconditioning typical of patients disabled by back pain can be assessed with stationary bicycling or treadmill protocols. Heart rate is monitored for safety and as an index of effort.

Trunk strength and lifting capacity are commonly lost as the patient avoids real or anticipated pain-provoking activities. While isometric and isokinetic testing have been popular in this area, problems with cost and biomechanical applicability to the physical demands of daily living have led to a preference for isoinertial testing. In particular, the progressive isoinertial lifting evaluation test described by Mayer et al[8] has proved its reliability, safety, and direct applicability to real-world requirements. This test involves timed, repetitive, floor-to-waist and waist-to-shoulder lifting of a crate, which is loaded with increasingly heavy weights as tolerated. Heart-rate response and observation by an experienced therapist provide objective assessment of subject effort.

Standardized obstacle courses can be very useful in evaluating the patient's speed and coordination in performing physically complex activities, such as pushing, pulling, climbing, crawling, shoveling, and carrying.

While there may be considerable professional overlap in functional evaluations, in our center physical therapists are responsible for flexibility, cardiovascular, and anatomically specific strength testing. Occupational therapists assess lifting and complex activity capacities that relate to the vocational plans they develop with the patients. The occupational therapists also conduct extensive interviews regarding employment history, skills, experience, job satisfaction, workplace dynamics, financial status, and expectations, in order to understand the patient's functional needs.

Since psychosocial issues so frequently complicate disability, our psychology staff design their interventions on the basis of extensive evaluations of personality traits, especially as they relate to the patient's style of coping with pain. Instruments such as the Beck Depression Inventory, the Millon Behavioral Health Index, and the Minnesota Multiphasic Personality Inventory can be helpful, but a structured interview has been the most productive. Intelligence and aptitude testing are particularly useful in assessing the feasibility of a patient's vocational plans.

Goal Setting and Treatment Planning

Once the patient's functional, psychological, and vocational data have been collected, the multidisciplinary team is ready to meet with the patient to establish treatment goals. This process is critical to successful therapy for two reasons. First, improvements in pain, physical capacity, and psychosocial problems may not coincide, and the patient's own goals in each area must be clarified accordingly. For instance, functional improvements through active exercise may not be rewarding for a patient whose only goal is pain relief. Conversely, self-care techniques that reduce pain without increasing work tolerance will not satisfy a patient who seeks reemployment. Second, patients' individual functional outcome goals may vary significantly. A musician who must sit for hours at a time to earn a living and a construction worker whose job requires repetitive heavy lifting and carrying have very different functional agendas. Targeting goals toward statistical norms makes little sense to patients who are constantly weighing their physical gains against the price they pay in terms of discomfort and perceived injury risk during rehabilitation.

Emphasizing the patient's role in determining goals removes whatever authoritarian and even policing aura the patient may perceive among the treatment staff. Once the patient's own goals have been set and accepted as realistic, treatment plans toward those goals can be made in an atmosphere of mutual understanding. This process can be very helpful in exposing and dealing with conflicting expectations from outside parties, such as spouses, attorneys, insurance carriers, and employers.

Treatment Program

A typical functional restoration program consists of multidisciplinary activities 8 hours each weekday for 3 weeks. A typical follow-up program consists of similar activities 1.5 days per week for up to 4 weeks, depending on the patient's needs.

Each day begins with 1 hour of flexibility, toning, and low-impact aerobic exercises. The second hour involves specific muscle-group weight training and exercise-cycling protocols. Next there is an hour of progressive training in lifting and other complex activities. Individual psychological and vocational counseling sessions are interspersed with these physical activities. Group educational sessions cover spinal anatomy, diag-

nostic technology and strategies, surgery, medications, nutrition, acute-pain self-management, sexual issues, patient-physician relationships, and reemployment issues. Most of this portion of the program is managed by the physical and occupational therapy and medical staff.

Individual sessions are geared toward short-term intervention for depression, anxiety, family discord, interpersonal problems, and fear of reinjury. In addition, the psychology staff offers classes in three areas. Rational emotive therapy focuses on cognitive reduction of "unrealistic" thinking, particularly regarding anticipated pain. Stress management techniques are integrated with physical methods for coping with pain. Assertiveness training helps patients to break out of passive-aggressive patterns of dealing with their problems and to forge new, more productive relationships at work and at home.

Multidisciplinary staff meetings are held twice weekly to discuss patient goals and progress and whatever problems may arise in rehabilitation, counseling, or vocational planning. Having full-time representatives from all disciplines on site reduces the number of instances of patients pitting professionals against each other and promotes the careful teamwork so critical in working daily with chronic-pain patients. Rapid and direct communication between disciplines improves patient care as well. For example, unnecessary diagnostic testing may be avoided if the occupational therapist warns the physician that the patient's increasing pain complaints are clearly motivated by a legal issue. Antidepressant medication may not be needed if the patient's affect brightens during physical therapy or following clarification of vocational dilemmas.

Throughout the rehabilitation program, measurements of physical capacity are recorded and compared with goals. If progress is less than what is required by the patient's goals, multidisciplinary conferences with the patient may elucidate the reasons or suggest that new goals must be set. Toward the end of the 3-week program and again at the end of follow-up treatment, functional testing objectively demonstrates the patient's capacities and limitations, providing a realistic foundation for recommendations regarding return to work and other activities.

Treatment Program Outcomes

To assess the published results of multidisciplinary functional restoration programs, one must consider three key components of outcome evaluation: generalizability, outcome specificity, and socioeconomic setting.

Treatment results depend heavily on the initial condition of the patients, especially in the case of patients with low back pain. Since most people recover spontaneously from a back injury within several weeks, any treatment will appear more successful for patients in the acute phase of pain than for those who have suffered for more than a few months. Therefore, durations of patients' pain and disability from work must be similar to allow comparison of outcomes of different treatment approaches and translation of published results to one's own clinical population. Clearly, the cost (ranging from $4,000 to $15,000), time, and effort required for the kind of multidisciplinary program described above make this approach impractical for care of acute low back pain.

Given the frequent disparities among the self-assessments of pain and disability, the observed physical impairments, and the employment outcomes of patients with chronic pain, treatment results are best evaluated separately in each of these areas. Such piecemeal consideration is particularly important in reviewing reports from different socioeconomic settings. For example, reemployment results may vary between treatment programs with otherwise similar outcomes if they are studied in countries with differing financial-compensation and work-incentive programs.

Mayer et al

In 1985 Mayer et al[5] reported 1-year follow-up results for patients with chronic back pain and disability resulting from industrial injuries. The purpose of the study was to compare the results of an intensive, multidisciplinary treatment program, as described above, with those of unassigned treatments chosen by patients. Entry criteria included a minimum 4-month work loss, absence of a surgically correctable lesion, and willingness to participate in treatment. Of the original 111 patients who fulfilled these criteria, 38 were denied admission to the treatment program by their insurance carriers; those 38 formed the nonrandom comparison cohort. Of the 73 patients who entered the 3-week program, 7 dropped out before completing treatment, and 66 graduated.

Treatment participants underwent functional evaluations after program completion. Self-assessments of pain, disability, and depression improved significantly for the treatment group. Measured improvements were also noted in isokinetic trunk strength, frequent-lifting capacity, and sagittal-trunk flexibility.

One year later, all three patient groups (graduates, dropouts, and comparison patients) were contacted through structured telephone interviews. Contact rates were 100%

for program graduates, 98% for the comparison cohort, and 86% for program dropouts. While only 45% of the comparison group and 20% of the dropout group were employed, 86% of the treatment group were either working or involved in a vocational training program. During the follow-up year, spinal surgery rates were 7% for graduates, 33% for dropouts, and 6% for the comparison group.

Using similar study populations and designs, Mayer et al[9] later reported 2-year follow-up results after a multidisciplinary treatment program. Over 85% of the original 116 program graduates and 72 comparison patients were contacted 2 years after beginning treatment. Of the patients contacted, 87% of the graduates were working, compared with only 41% of the comparison group. Furthermore, the comparison group required more than double the subsequent spinal surgery and health-care visits needed by the graduates.

Hazard et al

In 1986, Hazard et al established a multidisciplinary treatment program based on the approach of Mayer et al. To test the efficacy of this treatment, 90 patients who met the criteria of 4-month chronicity, lack of a surgically correctable lesion, and absence of psychosis or personality disorder severe enough to preclude participation in group treatment were assessed.[6] Of the original 90 patients, 3 were unwilling to participate and were lost to follow-up. The 17 patients who were denied treatment by their insurance companies formed a comparison group. An additional 6 patients were authorized and treated after initial treatment denial for the first 6 months of the study. Of the 64 patients who entered the treatment program, 59 graduated from the program, and 5 dropped out. Although these patient groups were not randomized, they were statistically similar in terms of age, sex, number of spinal surgical procedures, medications, smoking history, education, self-assessments of pain, disability, depression, and objective measurements of flexibility, strength, and endurance. The graduate group had a slightly higher percentage of persons receiving workers' compensation.

Directly after the 3-week treatment program, self-assessments of pain, disability, and depression, as well as measurements of physical capacities, had improved significantly for the program graduates. Except for partial loss of cycling endurance, lifting ability, and isokinetic trunk strength, physical improvements were maintained by the 37 graduates available for functional testing at the end of the year.

At the 1-year follow-up, work status was determined for all patients in the study. Eighty-one percent of the graduates, 41% of the dropouts, and 29% of the comparison group had returned to work. All 6 crossover patients had returned to work within 6 months of program completion. Although self- assessed disability scores, trunk flexibility, and cycling endurance were superior for graduates who were actively working at year-end, none of the other self-assessments or physical measurements were significantly different when workers were compared with their unemployed peers.

These partial disparities between pain, impairment, and employment outcomes prompted a 5-year follow-up study of the original 90 patients, searching for the outcomes most closely related to the patients' treatment satisfaction.[4] Correlation coefficients comparing pretreatment pain, disability, and physical impairment scores were all less than 0.50, confirming a similar observation by Waddell.[1] For the 65 program graduates, treatment satisfaction 5 years later did not correlate closely with self-assessments of pain and disability and physical capacities at the end of treatment. Five-year satisfaction was only weakly correlated with simultaneous self-assessments of pain and disability. Treatment satisfaction scores were higher for patients who had returned to work after 1 and 5 years, although the difference was statistically significant only for the 1-year data.

Tollison et al

In 1989, Tollison et al[10] described a multidisciplinary functional restoration program similar to the programs already outlined, with the addition of selective nerve blocks. Insurance-carrier denial of treatment authorization was again used to separate the comparison cohort from the treatment group. As in the previous two studies, the authors reported that the carriers refused authorization as a matter of policy, rather than discriminating against specific patients. The 18-month telephone follow-up rates were 88% for the 72 program participants and 90% for the 41 patients who were denied treatment. Of the patients contacted, 56% in the treatment group were working, compared with only 27% in the nontreatment group. The treatment group had less than half the medication usage, additional surgery, and hospitalization rates. Self-assessments and physical capacity results were not reported in this study.

Sachs et al

In 1990, Sachs et al[11] compared their "work tolerance" program results with those of Mayer et al and Hazard et al. While apparently similar in other ways to these two programs, the approach of Sachs et al differed in duration and intensity (involving 12 4-hour work sessions

over 4 weeks) and in its relative de-emphasis of behavioral intervention. Unfortunately, several factors clouded comparison of the original patient groups in the three studies. Perhaps most important was that 20% of the patients in the study by Sachs et al did not meet the other studies' criterion of a work loss of at least 4 months. Furthermore, the follow-up rates were only 71% for the treatment group and 36% for the nonrandomized comparison group. Despite these problems in comparing treatment outcomes, this study did demonstrate treatment-related improvements in symptoms and trunk flexibility, and the employment rate was better for the treatment group (60%) than for the comparison group (33%) at 6-month follow-up.

Oland and Tveiten

Oland and Tveiten[12] recently reported the results of their "modern active rehabilitation" approach to chronic back pain and disability in Norway. This program differed from the other functional restoration models already described in that there was less formal functional trunk testing, less integrated counseling, and an additional course of passive interventions, such as pool and traction therapies, for some of the patients. These programmatic differences, along with patient-exclusion criteria including prior spinal surgery, somatoform disorder, fibromyalgia, and spondylolisthesis, obscure comparisons between this and previous studies. Although the patients treated with traction had some temporary pain reduction, the 66 patients in the study had no mean pain or disability score improvements at the 6-and 18-month follow-up evaluations, and only 23% had returned to part-time or full-time work 18 months after treatment.

Oland and Tveiten concluded that health-care resources should be directed away from rehabilitation toward subacute interventions to prevent chronicity, and that persons with chronic back-related work loss should be attended to by the social security system. In fact, over half of the patients in their study were receiving disability pensions 18 months after treatment. However, an equally viable conclusion would be that truly integrated biopsychosocial approaches, such as have been described in this article, are more effective for reversing chronic back disability than the Norwegian program, with its more physical focus. This analysis is supported by the fact that self-assessments of pain and disability did not improve over time for the patients treated in their program.

Bendix et al

In contrast to the program of Oland and Tveiten, Bendix et al[13] developed a multidisciplinary program in Copenhagen based on the functional restoration model already described. In a presentation to the 1993 conference of the International Society for the Study of the Lumbar Spine, they reported outcomes in 118 patients with chronic back-related disabilities randomized to multidisciplinary care, physical training, or counseling with limited "warm-up" exercises. Patients participating in multidisciplinary care had greater reductions in self-reports of pain. They also had a significantly better rate of employment 4 months after treatment (66% compared with 47% and 36% for the other treatment groups). Like Oland and Tveiten, Bendix et al recognized that their results were affected by ambient unemployment rates and pension disincentives to recovery. They reported work-capability rates of 76% for the multidisciplinary-care group, 56% for the physical-training group, and 39% for the group who received counseling with limited warm-up exercises.

Conclusion

Quality in health care has recently been defined as a ratio of value to cost. Realizing that the vast majority of costs in occupational low back pain stem from long-term disability, and that most purely biologic technologies available today have a limited capacity to identify and cure the painful lesion, quality care must be directed toward interventions that reduce disability. Fortunately, most back-injured workers recover and return to work without extensive rehabilitation or surgery, both of which are expensive. Careful selection of the right treatment for an individual patient is a critical step toward reducing unnecessary costs. For patients with chronic disabling back pain and no clearly identified surgically correctable lesion, functional restoration programs with integrated treatment teams to address the biopsychosocial components of disability have established a record of outcomes that stands as a basis for future study and quality improvement.

References

1. Waddell G: A new clinical model for the treatment of low-back pain. *Spine* 1987;12:632-644.

2. Cats-Baril WL, Frymoyer JW: The economics of spinal disorders, in Frymoyer JW, Ducker TB, Hadler NM, et al (eds): *The Adult Spine: Principles and Practice.* New York: Raven Press, 1991, vol 1, pp 85-106.

3. Haldeman S: Failure of the pathology model to predict back pain. *Spine* 1990;15:718-724.
4. Hazard RG, Haugh LD, Green PA, et al: Chronic low-back pain: The relationship between patient satisfaction and pain, impairment, and disability outcomes. *Spine* (in press).
5. Mayer TG, Gatchel RJ, Kishino N, et al: Objective assessment of spine function following industrial injury: A prospective study with comparison group and a one-year follow-up. *Spine* 1985; 10:482-493.
6. Hazard RG, Fenwick JW, Kalisch SM, et al: Functional restoration with behavioral support: A one-year prospective study of patients with chronic low-back pain. *Spine* 1989;14:157-161.
7. Mayer TG, Tencer AF, Kristoferson S, et al: Use of noninvasive techniques for quantification of spinal range-of-motion in normal subjects and chronic low-back dysfunction patients. *Spine* 1984;9:588-595.
8. Mayer TG, Barnes D, Kishino ND, et al: Progressive isoinertial lifting evaluation: I. A standardized protocol and normative database. *Spine* 1988;13: 993-997.
9. Mayer TG, Gatchel RJ, Mayer H, et al: A prospective two-year study of functional restoration in industrial low back injury: An objective assessment procedure. *JAMA* 1987;258: 1763-1767.
10. Tollison CD, Kriegel ML, Satterthwaite JR, et al: Comprehensive pain center treatment of low back workers' compensation injuries: An industrial medicine clinical outcome follow-up comparison. *Orthop Rev* 1989;18:1115-1126.
11. Sachs BL, David JF, Olimpio D, et al: Spinal rehabilitation by work tolerance based on objective physical capacity assessment of dysfunction: A prospective study with control subjects and twelve-month review. *Spine* 1990;15:1325-1332.
12. Oland G, Tveiten G: A trial of modern rehabilitation for chronic low- back pain and disability: Vocational outcome and effect of pain modulation. *Spine* 1991;16:457-459.
13. Bendix AF, Bendix T, Busch E, et al: Comparison of different active treatment programs for patients with chronic low back pain. Presented before the International Society for the Study of the Lumbar Spine, Marseilles, France, June 15-19, 1993.