



INTERDISCIPLINARY MANAGEMENT

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“Levels of evidence” used in this section:

Level 1: Meta-analysis or systematic reviews.

Level 2: One or more well-powered randomized, controlled trials.

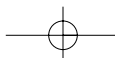
Level 3: Retrospective studies, open label trials, pilot studies.

Level 4: Anecdotes, case reports, clinical experience, etc.

THE RATIONALE FOR FUNCTIONAL RESTORATION

Complex Regional Pain Syndrome (CRPS) can be a very difficult condition to treat successfully. Not only is the syndrome biomedically multifaceted, comprising both central and peripheral pathophysiology, but it also frequently contains psychosocial components that are additional pivotal diagnostic features (and thus, treatment targets). The array of possible patient presentations and the fact that the presentation often changes over time also complicate successful identification and treatment.¹ To further add to the clinical challenges of managing CRPS, the epidemiology and natural history of CRPS are only superficially known; evidence concerning CRPS treatment has developed slowly, due in large part to the vagaries of diagnosis (see section 1); and, moreover, research data — when they are available — are challenging to interpret.² Given these obstacles to diagnosis, treatment, and research, how is a specialist to embark on a path towards the successful treatment of such a complicated and partially understood condition? The only treatment methodology that can possibly successfully span these gaps in medical science is a systematic and orderly interdisciplinary approach.³ Interdisciplinary treatment is defined (here) as a dedicated, coherent, coordinated, specially trained group of relevant professionals that meet regularly to plan, coordinate care, and adapt to treatment eventualities.

Even the identification and measurement of the pain, the principal symptom of CRPS, is problematic. The defining characteristic (and critical diagnostic criterion) is “continuing pain that is disproportionate to any inciting event”⁴ — pain deemed disproportionate, that is, in intensity and duration according to the (subjective) opinion of the diagnosing physician (see section one). This necessary yet flawed assessment of pain is compounded by the patient’s outlook; for although pain is clearly a central component of a CRPS patient’s condition, its report is always a personal, private, and entirely subjective experience. Any number of factors can affect pain report, including culture, memory of past pain experiences, the meaning and context of the pain, personality type, affective state, and many other functional variables.^{5,6} Furthermore, pain report is behavioral: filling out a visual analog scale is a behavior, and any such behavior can be affected by a range of psychosocial/operant features. Unfortunately, only the subjective experience of pain is quantifiable. Limited by this subjectivity of both physician and patient, the most pragmatic assessment of pain must be based upon the patient’s complete context: biologic, psychological and sociologic. Obviously, the only treatment methodology that can treat all these aspects effectively is, again, the interdisciplinary approach.



It is critical to identify and aggressively treat all spheres of the pain experience. Obsessing with only the biomedical sphere often dooms the clinician and patient to failure, especially in chronic CRPS. The other equally important features for accurate diagnosis and responsive treatment targets in CRPS are psychological factors/comorbidity (see section four). The psychological spheres of the pain experience can now be identified through the many psychometric, quantified measures that have been created and that have demonstrated efficacy in psychological assessment.⁶⁻⁸ Psychological features are sometimes critically important diagnostic components to identify and aggressively treat; psychometric scores are also often employed as secondary outcomes in research. CRPS is not a psychological disorder, however, and it is therefore illogical to designate psychometric outcomes as primary benchmarks of improvement in treatment. Thus, solely treating psychiatric aspects of a patient's CRPS is also doomed to fail. Pain intensity and the psychological sequelae/comorbidities of pain are recognized, fundamental elements in understanding the whole patient, yet the subjective character of these elements and of their measurement deem them less suitable for research or for interpreting clinical outcomes. More objective clinical benchmarks and outcomes should be identified — standards upon which clinical decisions may be made and success may be measured. Ideally, treatment of CRPS should rely upon an intuitive, measurable, and stepwise functional restoration algorithm as the pivotal feature of treatment of CRPS.^{1,9,10}

Functional restoration has historically and empirically been considered a critical and necessary component of interdisciplinary pain management programs for CRPS. This contention has been codified by two large international consensus-building conferences.^{9,11} Baron and Wasner concluded that physiotherapy is “of utmost importance,”¹² and Birklein et al argued that rehabilitation techniques should always be employed for the “obvious reasons” that he outlines in these manuscripts.^{13,14} Furthermore, the Initiative on Methods, Measurement and Pain Assessment in Clinical Trials (IMMPACT) has concluded that physical functioning is a “core domain” in the assessment of pain treatment efficacy, second only to pain assessment.^{15,16}

Functional restoration emphasizes physical activity (“reanimation”), desensitization and normalization of sympathetic tone in the affected limb, and involves a steady progression from the most gentle, least invasive interventions to the ideal of complete rehabilitation in all aspects of the patient's life (see Figure 1). Although the benefits of functional restoration may be obvious to experienced clinicians, the evidence required to buttress these empirical impressions remains to be collected. The hard data needed to determine which aspects of treatment demonstrate efficacy, which specific components of a functional restoration program yield positive outcomes, as well as which modalities should be delivered, when, and for how long, are currently unavailable.^{11,17}

EVIDENCE

The data suggesting the significance of functional restoration and reanimation is currently modest but credible. It is important to note that in a 1997 meta-analysis, Kingery notes that “CRPS trials tended to use less subjects and were less likely to use placebo controls, double blinding, or perform statistical tests for differences in outcome measures” (than neuropathic pain).² Early, uncontrolled work by several investigators focused on preliminary concepts of quantifying different facets of function and biometrics in “Reflex Sympathetic Dystrophy” (RSD, aka CRPS I).¹⁸⁻²² In a pivotal 1988 paper, Davidoff et al conducted a prospective uncontrolled study in RSD that determined three key concepts: that objective functional components and biometric data could be quantified

longitudinally, that these components were reactive enough to display change over time (in response to a functional restoration-based interdisciplinary program), and that they were associated with improvements in subjective outcomes (decreased pain) (level 3).¹⁰ These initial studies supplied the primary rationale for a reliance on functional measures as the basis for assessing success in the treatment of RSD/CRPS. In an open label sample of musculoskeletal pain, Baker et al convincingly illustrated the value of quasi-quantitative and psychometric measures in estimating functional outcome (level 3 evidence) (although this may not generalize to CRPS completely).²³

Various uncontrolled studies suggest that CRPS patients benefited from certain physiotherapeutic modalities, including stress loading and isometric techniques²⁴ (level 3 evidence). Oerlemans et al conducted a prospective controlled study of 135 CRPS patients with pain located in an upper extremity, and she reported that both physical therapy (PT) and occupational therapy (OT) proved valuable in managing pain, restoring mobility, and reducing impairment^{17, 25} (level 2 evidence). In their prospective assessment of 145 patients, Birklein et al found that pain was notably less for patients undergoing PT¹³ (level 3 evidence). In another study of 28 children meeting the IASP criteria of CRPS, 92% reduced or eliminated their pain after receiving exercise therapy²⁶ (level 3 evidence).

Both functional restoration and reanimation may have beneficial effects for the CRPS patient. Immobilization is a diagnostic criterion for CRPS that is recognized as a possible cause and/or perpetuating factor in the syndrome (criterion one).⁴ A prevalence of motor abnormalities (dyscoordination, dystonia, weakness, and tremor in CRPS^{27, 28}) is a recently accepted criterion and these have been integrated into the Budapest group's suggestions for new diagnostic criteria (see section one). Additionally, the role of pathological involvement of local muscle spasm, reactive bracing, and disuse in the face of severe pain in relation to the syndrome should not be misjudged or underestimated; these secondary pain sites can cause severe pain and disability and all must be assessed and actively treated in an interdisciplinary-based functional restoration or "normalization" program.

Normalized movement may also be a key aim in avoiding or inverting some of the more understated, higher central changes linked with the syndrome, usually categorized under the rubric of "altered central processing" and recently, "neglect."²⁷ Moseley et al expands on this hypothesis and suggests that the elements of CRPS indicate a central mismatch of afferent input and central representation,²⁹ and that graded motor imagery may "repair this dynamic central mismatch."²⁸ In a novel experiment using mirrors, sensory mismatch was demonstrated to produce sensory disturbances in normal volunteers³⁰ and has also been employed in a controlled pilot to successfully treat CRPS I.³¹ These interesting and technical studies provide a theoretical rationale for the more pedestrian physical and occupational therapeutic methodologies of simple functional restoration, graded exposure, and ordered normalization of movement patterns.

In addition to the reversal of immobilization, the subsequent conquest of operant-based movement phobia ("kinesiophobia") presented by so many of our patients may supply another rationale for establishing "functional restoration" as a fundamental requirement and provide a primary role for cotreatment of the physical and the psychological therapies. The research that Crombez et al conducted on back pain patients supported their statement, "Pain-related fear is more disabling than pain itself," and this fear appears to be a dynamic clinical factor in CRPS.³² The fear-avoidance paradigm may be very prominent in some CRPS patients, and an open label pilot in back pain conducted by Boersma et al has shown that "lowering" fear can reduce the ensuing avoidance of motion and use, and thereby lead to improved function.³³ Others have also successfully exploited this concept for treating low back pain

(see ³⁴ and ³⁵; level 3 evidence.) A definitive investigation of this concept in CRPS has not been undertaken, but clinical experience has indicated that this approach provides a lot of positive reinforcement (at least for the clinicians!) in our clinics. The benefit of a pragmatic integration of graded, supported “exposure” to normalized movement into functional restoration programs for CRPS may be self-evident but requires validation.

The traumas usually identified in the etiology of CRPS most likely begin with peripheral nociceptive overstimulation, and this “nociceptive barrage” can eventually create and sustain the central sensitization that is indicated by the sensory factors of the syndrome. It is hypothesized that normalization of activity will adjust and normalize the afferent input and its processing; for example, an increased functional input on large fiber tracts may modulate or partly obstruct the activity on small fiber tracts, according to Melzack’s gate theory of pain.³⁶ Blood flow and nutrition to the area may be improved by local activity in the affected part, and processes such as osteopenia (ie, “Sudeck’s atrophy”) may also be reversed. Research with rats supports this concept, as do comparisons made to CRPS patients with casts: patients with prolonged casting of a limb often present with many diagnoses considered part of the CRPS criteria: vasomotor and sudomotor asymmetry, trophic/dystrophic changes including osteopenia, and occasionally sensory disturbances.³⁷ Intuitively, normalizing function in such CRPS patients should reverse changes wrought by casting, and this impression has been confirmed in Guo et al’s rat research where casting led to autonomic disturbance and allodynia.³⁸

These studies all support the traditional functional/physiotherapeutic rationale, although there is currently no level 1 or 2 evidence specifically for interdisciplinary treatment for CRPS. It is important to note two meta-analyses that have shown that an interdisciplinary approach improves symptoms in patients with chronic pain: Flor et al³⁹ (which included “RSD” among other diagnoses) and Guzmán et al⁴⁰ (both level 1 evidence). (More detail of the available evidence is presented in the specific sections below).

PRINCIPLES OF FUNCTIONAL RESTORATION THE MALIBU CONFERENCE

In order to expedite reanimation and normalization of use and movement of the affected extremity, functional restoration should efficiently supply a range of interventional and noninterventional treatment methods. In an effort to explore the creation of a stepwise functional restoration through a physiotherapeutic algorithm, a Dahlem-type consensus-building symposium was held in Malibu in 1987. The core principles of the algorithm generated by this group include patient motivation, desensitization, and reactivation facilitated by pain relief; the use of pharmacologic and/or interventional procedures to treat specific signs and symptoms; and cognitive behavioral psychotherapeutic techniques. As a result of the conference, the symposium members produced a white paper about the purpose and usefulness of an assortment of functional restoration treatment designs; they also recommended formal treatment guidelines.⁹ These treatment guidelines are considered pivotal,⁹ and the algorithm we present here is a modification of the one advocated by the Malibu group (see Figure 1).

The “Malibu” guidelines created some new problems. First, although these guidelines recognize several specific interventions to be applied (physical, medical, anesthesiological, and psychological), they offer no recommendations regarding optimal sequence or duration of these various interventions. Second, the guidelines stress the concept of time contingency, ie, the implication that all “patients should progress in each treatment level in two weeks or less”⁹

which has proven to be far too rigid and unrealistic in this complex clinical scenario. Third, the guidelines assert that drugs, injections and psychotherapy should be reserved and used only in cases where progress in the functional restoration-based algorithm has not been achieved. They fail to recognize the frequent necessity of providing medications, blocks, and psychological support from the beginning (and not “reserve” these interventions until after a patient has “failed to progress”). In our experience, it is more often than not the case that multiple interventions are required to get a patient started in a functional restoration process.

THE MINNEAPOLIS CONFERENCE

Because of these and other issues, a second expert panel (the Minneapolis Group) revisited the Malibu guidelines in August 2001, along with the pertinent literature up to that time. In response to clinical evidence suggesting that sequencing and timing of the treatment guidelines could be improved (eg, under certain circumstances, concurrent rather than linear utilization of interdisciplinary interventions provided optimum treatment), the Minneapolis group recommended the use of concurrent “pathways,” which were still built upon the original domains of rehabilitation, pain management, and psychological treatment. Additionally, the Minneapolis group liberalized the use of analgesic modalities, deemphasized time-contingency, and preserved the important focus on a more quantifiable, objective functional algorithm.¹¹

Both the Malibu and the Minneapolis groups emphasized the pivotal importance of functional restoration. Both acknowledged that pain was also important, but as a subjective and an operant phenomena that must be secondary as an outcome. Both groups recognized that pain would logically drive the type, quality, intensity, and pace of other interventions used to achieve the primary, functional outcomes. The next sections provide a detailed examination of each therapy directly involved in functional restoration.

OCCUPATIONAL THERAPY

The occupational therapist is the ideal therapeutic leader in the functional restoration process.⁴¹ The occupational therapist must first evaluate the patient’s current functional use of the affected extremity. The therapist objectively gauges active range of motion with a goniometer and measures edema (fluid displacement) with a volumeter (essentially a large graduated beaker into which the affected limb is placed, and water displacement is then compared to the unaffected limb; this process can be followed as an objective clinical or research outcome). The occupational therapist must also appraise pain/sensation, skin/vasomotor changes, coordination/dexterity, and extremity use during activities of daily living (ADL).

In general, OT of CRPS should aim to normalize sensation, promote normal positioning, decrease muscle guarding, minimize edema, and increase functional use of the extremity in order to increase independence in all areas — work, leisure, and ADL.⁴² Occupational therapy of CRPS begins with the management of edema, initiation of gentle active movements, and institution of preliminary desensitization modalities. Specialized garments, bandaging, and manual edema mobilization techniques can help manage edema. A small randomized, controlled trial (RCT) of manual lymph drainage plus PT vs. PT alone showed no statistical advantage, but showed a “tendency” towards greater pain reduction in the group receiving lymph drainage.⁴³ This trend should be examined in a study with larger

numbers. Superficial or subcutaneous desensitization techniques will aid in normalizing sensation to the affected area (such as rubbing the affected area with something soft, like silk, and progressing to rough or textured materials, like burlap).⁴⁴ Regular use of the affected limb during everyday tasks is promoted and strongly reinforced throughout the rehabilitation process.

A stress loading program that initiates active movement and encourages compression of the affected joints should be implemented as soon as possible.²⁴ At first, stress loading may exacerbate symptoms in the extremity, but after several days, pain and swelling should decrease. Scrubbing and carrying are the *sine qua non* of a stress loading rehabilitation program (see ²⁴ and ⁴⁵; level 3 evidence). “Scrubbing” entails the back-and-forth movement of a weight-bearing affected extremity.^{24,45} Patients conventionally use a scrub brush and assume a quadruped position (for upper extremity involvement) or an elevated sitting position (for lower extremity involvement). Positions can be adapted to encourage optimal compliance and performance; for instance, upper extremity patients can scrub in a standing position, and patients with carpal tunnel syndrome can scrub with a handled scrub brush.⁴⁶ The duration of the activity and the amount of weight applied to the affected extremity are both gradually increased. The Dystrophile® is a device designed to facilitate scrubbing by activating a light when the patient has reached and maintains the preset load. Although it may help the patient maintain consistent weight bearing and compliance, the device offers no other perceived advantage over a simple scrub brush.

“Carrying” is the second element in a stress-loading regimen. For upper extremity conditions, patients begin weight-loading by carrying small objects in the hand, progressing to carrying a handled bag, which then can be loaded with increasingly heavy weights; these weights should be carried at all times during the day while the patient is standing or walking.^{24,45} A variety of weight-bearing techniques exist for lower extremity patients. Walking is a principal loading technique, provided that weight bearing does indeed occur through the affected leg during gait, particularly when an assistive device is used. Verbal and physical cueing can help ensure increased weight bearing during gait. Having the patient carry a weighted object on the affected side can also increase weight bearing. Additional methods that can help encourage weight bearing include engaging the patient in activities that promote weight shifting/balance (eg, a ball toss) or having the patient place the nonaffected foot onto a small footstool during stationary tasks.

Once the patient is actively involved in an edema management and stress loading program, functional restoration treatment can begin. The decreasing pain and edema will allow the patient to better endure and partake in active range of motion, coordination/dexterity, and strengthening tasks. One of the first techniques of functional restoration is the use of proprioceptive neuromuscular facilitation (PNF). PNF patterns are spiral and diagonal combinations of motion that “permit maximum elongation of related muscle groups so that the stretch reflex can be elicited throughout the ‘pattern.’”⁴⁷ These patterns, akin to normal movement patterns, simultaneously facilitate strength and balance as they increase the ability to perform ADL. PNF patterns promote “response of the neuromuscular mechanism through stimulation of the proprioceptors”⁴⁷ and are usually well tolerated during the rehabilitation process.⁴⁶ In extreme CRPS cases, functional splinting may be required to encourage improved circulation/nutrition to the affected area as well as to promote more normal tissue length/positioning during rehabilitation.

The primary objective of OT for CRPS is to lead the patient through a program that minimizes pain and edema while maximizing functional use of the affected limb.⁴² Because the severity and duration of CRPS are quite variable, and can be persistent and severe, the therapist must maintain an enthusiastic espousal of the patient's progress throughout the rehabilitation process. (All occupational therapies mentioned are level 3-4 evidence.)

PHYSICAL THERAPY

PT clearly plays a critical role in functional restoration, and PT activities are designed to complement those of occupational, recreational, and vocational therapy; according to the experienced Mayo anesthesia group, "Physical therapy is the cornerstone and first line treatment for CRPS."⁴⁸ The physical therapist can help patients increase their range of motion, flexibility, and later strength, through the use of gentle progressive exercise. The physical therapist tries to improve all functional tasks, such as gait training (in lower extremity CRPS), and coordinates/collaborates on all OT, recreational, and vocational goals. All PT must be executed within the bounds of the patients' tolerance⁴⁹ and never when the affected limb is insensate (such as after a block) or with CRPS Type II patients who present with pronounced hypoesthesia. Inappropriately aggressive PT can trigger extreme pain, edema, distress, and fatigue, and may in turn exacerbate the inflammation and sympathetic symptoms of CRPS; it is therefore to be avoided. Use of assistive or range of motion devices, prolonged application of ice, and inactivity may also aggravate CRPS. Physical therapists must teach patients with CRPS that they will experience pain both when they exercise too much *and* when they exercise too little. Patients must therefore be taught to seek the "happy medium," and it is the physical therapist's responsibility to help them find that therapeutic ground and help them to steadily advance toward a more functional and active lifestyle. In a series of RCTs, Oerleman's group has shown that PT (and to a lesser extent OT) improves pain scores and "active mobility" versus social work controls in Dutch upper extremity CRPS cohorts.^{17, 25, 50}

In children with CRPS, a single-blind, randomized trial of PT combined with cognitive-behavioral therapy demonstrated significant improvement on five measures of "pain and function," with sustained benefit in "the majority" of subjects.²⁶ In a prospective review of 103 children with CRPS, "intensive PT" (aerobic, hydrotherapy and desensitization) supplemented by "psychological counseling" (in 77%) was "effective in initially treating childhood CRPS and is associated with low rate of long-term symptoms or dysfunction."⁴⁴

The physical therapist should instruct the patient in the avoidance of physical stressors (ie, the stress of extended inactivity and bed rest on one extreme, and the stress of excessive exercise at the other). The goal of the PT exercise program is the gradual increase of strength and flexibility, principally through weight bearing. The therapy program is primarily based on functional goals and achieved through active or active-assisted means; it should encourage pacing and include rest breaks and relaxation techniques as well. PT goals can be achieved with the use of devices, including foam rubber balls succeeded by spring-grip strengtheners for the upper extremity and Swiss balls, foam rolls, and antigavity resistive equipment (such as a Pilates reformer) for the lower extremity. These devices help to gradually introduce a variety of weight-bearing/strengthening techniques.

Mat exercises provide strengthening of both the extremity and the postural muscles in a non-weight-bearing approach. Particularly valuable mat exercises include movement therapies such as the Feldenkrais technique. Feldenkrais teaches and encourages gentle, active motions within the patient's available range to increase body



awareness and promote appropriate movement patterns. A fundamental aspect of mastering proper movement patterns is the relearning of proprioception. The physical therapist can help patients achieve mastery by teaching them neuromuscular proprioception exercises, advancing them as they gain proficiency.

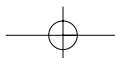
Virtually all patients with advanced CRPS will present with myofascial pain syndrome of the supporting joint. Aggressive treatment of this myofascial pain is a critical component of successful treatment and is principally the purview of the physical therapist. Some schools of thought propone that the myofascial pain syndrome must be treated first, and if successfully treated, the CRPS will often resolve. This would reflect an “autonomic concomitant in the pain reference zone” (of the myofascial referral pattern), with vasoconstriction as a prominent feature.⁵¹

Aquatic therapy can be quite valuable to CRPS patients because of its hydrostatic principles and its buoyancy effect.⁴⁴ Hydrostatic pressure provides a mild compressive force around the extremity that may help decrease the edema that is widespread in CRPS. Aquatic therapy also provides an outstanding opportunity for introducing lower extremity weight bearing, and the buoyancy it provides may be especially useful for early restoration of functional activities such as walking. When conducting aquatic therapy, care must be taken to maintain water temperature, because excessively cold or hot water may temporarily exacerbate the CRPS. Water therapy may allow early participation in progressive PT, as nearly all exercises that are executed on land can be executed in the water, where the water adds resistance without adding full stress/weight to the joints. This of course is groundwork to full weight bearing, particularly in lower extremity.

Hands-on techniques such as massage and myofascial release can sometimes offer effective relief from the myofascial pain. Massage is often mentioned, but although it has not been formally studied (level 4 evidence), it may help decrease edema in certain cases. Electrostimulation modalities have demonstrated some efficacy in our experience, but ultrasound therapy has been less effective in our clinic. Contrast baths are another possible, if slightly controversial, treatment option for CRPS patients. Through the use of the understood principles of alternating heat and cold, contrast baths can be beneficial in mild cases to facilitate improved circulation in the affected extremity by alternating vasodilation with vasoconstriction. However, the vasomotor changes in advanced cases of CRPS do not allow for the desired response, and the immersion in the cold water may exacerbate CRPS symptoms; contrast baths for advanced cases of CRPS are therefore not recommended. (All physical therapies mentioned are level 3-4 evidence.)

RECREATIONAL THERAPY

Because recreational therapy employs enjoyable activities, the recreational therapist is frequently the first clinician to succeed in getting the CRPS patient to initiate increased movement, a primary goal of successful treatment. The incentive of returning to a favorite pastime is often the appropriate tool needed to break through the “kinesiophobia” and bracing that often attend CRPS.⁵² Through the use of modifications, adaptive equipment, and creative problem solving (such as using large handled gardening equipment for gardeners, bowling with the nondominant hand for bowling fans, and substituting biking in place of running for athletes, etc.), a patient can find fulfillment in previously lost or new recreational activities. Recreational therapy reestablishes patients’ ability and freedom to determine their own leisure lifestyle choices. The increased social contact engendered by these activities will, in turn, heighten patients’ chances of remaining active within the community after treatment.



With a bit of advanced planning, recreational therapy can complement PT and OT treatment goals. For instance, a recreational therapist could reinforce an OT scrubbing protocol by instructing a patient to use an affected upper extremity to sand wood in a recreational project. Such planned convergence of goals affords the patient the twofold satisfaction of creating something and simultaneously accomplishing therapy goals.⁵³ For example, a patient who is engaged in a desensitization program and who also enjoys gardening can be assigned horticulture therapy (ie, the use of the hands to work soil).

Additionally, recreational therapy can promote mild activity, thereby increasing flexibility and range of motion. The recreational therapist should plan activities that patients find inherently enjoyable, because patients are more willing to take on fine-motor grasping and releasing tasks for longer periods of time if they are engaged in an enjoyable activity (eg, beading a necklace, holding a watering can, playing a card game, or practicing on a keyboard). A recreational therapist must be creative, because a happily engaged patient will be more inclined to fulfill therapy goals when engaged in fun activities like putting golf balls, playing balloon volleyball, or shooting pool.

In addition to advocating new leisure skills, recreational therapy concentrates on reintroducing the patient to stable community involvement. During structured community outings, the CRPS patient can focus on carrying and loading a bag (ie, “loading”) with the affected limb.^{24,45} This task can be accomplished with a water bottle, shopping bag, or purse. Other tasks can involve weight bearing and follow through with gait training on unlevel surfaces within a realistic community setting. Identified and achieved appropriately, successfully completed tasks can increase patient self-confidence and promote the incorporation of these learned skills both at home and within other therapy sessions.

In summary, recreational therapy effectively combats kinesiophobia and promotes increased movement. Recreational therapists work closely with other disciplines to achieve the therapeutic goals of CRPS patients, and they implement creative tactics that achieve those goals while giving patients more decision-making freedom and more fun. Most significantly, recreational therapy can reintroduce balanced leisure activities into the lives of patients whose conditions may have discouraged such behavior.

VOCATIONAL REHABILITATION (VR)

The vocational rehabilitation (VR) counselor helps prepare the CRPS patient for a possible return to work, or the “ultimate” functional restoration. VR involves restoring patients to their original vocational purpose as expediently and as safely as possible. Counselors use information from medical, occupational, educational, financial, and labor market fields to make return-to-work assessments. Vocational counseling addresses benefits of work and accommodations, as well as job modifications and the utilization of pain management techniques. The VR specialist can also help each patient to identify with the role of worker and assist in creating a plan for a return to work.

If possible, the VR counselor should understand all of the physical demands of the job before addressing return-to-work issues. Review of job description and consultation with employer, supervisor, employee health nurse, or other human resource specialist, and work site visit (when appropriate) are steps recommended to address specific job duties, especially when determining ability to provide a full duty release,⁵⁴ or when recommending specific restrictions and modifications. The VR specialist also provides job and job site analyses, and uses that information to coordinate job-specific reconditioning or work hardening, work capacity evaluation, transferable skills analysis, and a functional

capacities evaluation.⁵⁵ The VR counselor must determine whether or not a client can return to the original job. The counselor must also consider the alternatives of returning the patient to either a modified version of the previous job or an alternate job with the same employer, or whether a new job placement referral will be needed when return-to-work with the previous employer is not an option. The VR counselor and occupational therapist should work closely together when assessing return-to-work goals, especially when assessing the possibility of returning to a specific job.

The VR specialist must possess a thorough understanding of the prior job description, requirements, and, occasionally, the required vocational testing and targeted retraining of the CRPS patient who intends to return to work. Initially working with the occupational therapist, the VR specialist assesses a patient's work activities and provides a simulation of them for the patient in a controlled clinical environment. In the final steps of the VR process, the specialist can provide work capacities, along with functional capacities and targeted work hardening in order for the patient to return to gainful employment. Competent VR requires a proficient specialist capable of maintaining a methodical, informed, and experienced approach in order to grasp and successfully navigate the Byzantine social and medico-legal quagmires in which CRPS patients may find themselves. As with all interdisciplinary specialists, the VR specialist must sustain ongoing communication with the others on the team and keep the team informed of each patient's individual vocational situation.

VR specialists regularly encounter hurdles to appropriate return-to-work functions. Firstly, health factors are often presumed to have the greatest impact on worker disability, but social scientists have argued that the most important determinants of work status for persons with chronic disease are actually age, education, job satisfaction, and job status in the labor force.⁵⁶ Secondly, other factors such as work history, employment in public sector versus private, current work status, lower social class, level of education, and lack of varied work may also predict work disability for patients with chronic pain.⁵⁶ Thirdly, long periods of unemployment or reduced employment activity may impact vocational potential. Chronic pain sufferers are often patients who have been out of work for long periods of time before they are referred to a vocational rehabilitation specialist, and employers are often reluctant to employ persons who have chronic pain, have been unemployed for long periods of time, or who have workers' compensation cases.⁵⁷ Additionally, the ability to modify the work environment in accordance with limitations has major implications in limiting the extent of the disability and/or preventing reinjury or new injuries.⁵⁶

Although VR is frequently the final step of rehabilitation therapy, addressing return-to-work issues early is critical so as to set employment as a long-term goal.⁵⁸ Allowing the patient an opportunity to participate in a trial graduated time/effort work period before providing final release for work is often an excellent way to observe his/her ability to return to work and perform job duties, and it also provides an opportunity to further assess work behaviors and capacity. In addition, the initial graded increase of time and effort spent at work greatly alleviates significant patient anxiety and thus improves chances of successful return-to-work. Return-to-work can be a form of therapy, provided the work activities do not exacerbate the problem or increase long-term pain.

The VR counselor should coordinate the provision of release for work by assembling information from all disciplines. Releases for sedentary or light duty should always list specific physical limitations, and the releases for limited duty should include comprehensive instructions. When preparing a release-for-work form, the VR specialist must take into account the abilities of the patient, including: lifting, pushing, pulling, walking, crouching, using stairs, using tools, bending at the waist, maintaining awkward and/or sustained postures, maintaining a sustained grip, tolerating extended sitting or standing, tolerating extensive data-entry functions and other repetitive motion tasks, tolerating hot and cold environments, and tolerating any severe vibrational factors. Any number of these factors may require modification of the work environment, particularly in chronic or severe CRPS.

OTHER THERAPEUTIC INTERVENTIONS

Hyperbaric oxygen therapy was assessed in a medium-sized randomized control trial (RCT) and produced a significant decrease in pain and edema versus “normal air”⁵⁹ (level 2 evidence). These results should be replicated, but cost benefit considerations will also be important. Although acupuncture is mentioned in many treatment reviews, there is only one very small RCT in CRPS which failed to show a significant difference in outcomes, but this may be due to the small sample size. The authors say they are planning a “definitive trial,” but this has been pending since 1999.⁶⁰ There is no research available supporting the use of chiropractic manipulation in CRPS.⁶¹

SUMMARY

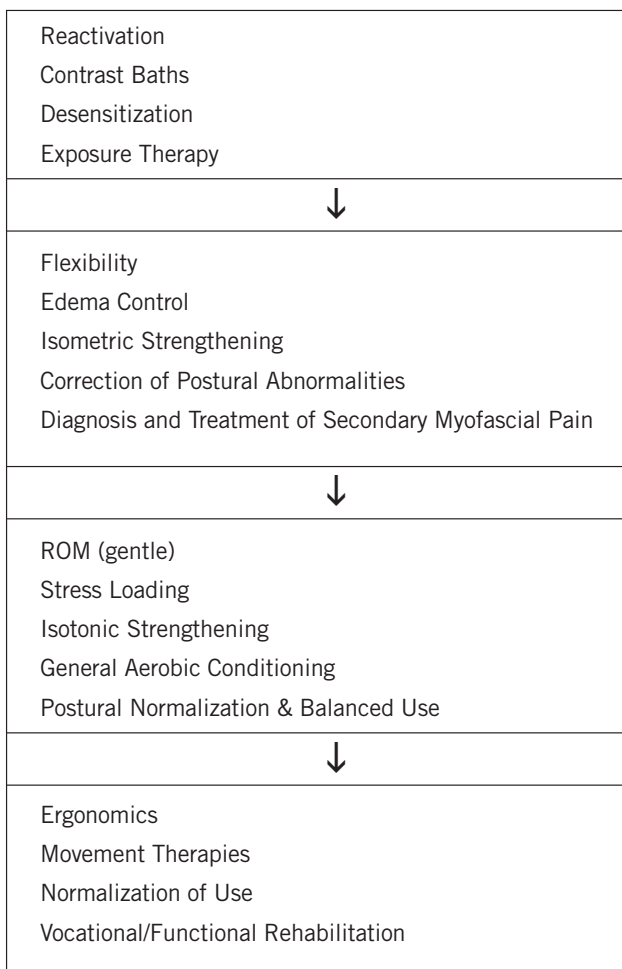
Because the symptoms of CRPS patients encompass all the bio-psycho-social complexities of chronic pain, the best hope of helping our patients is the adoption of a systematic, stable, empathetic and, above all, interdisciplinary approach that addresses those symptoms. Drugs, psychotherapy, and interventions should be efficiently deployed for patients who either cannot begin or fail to progress using the interdisciplinary approach outlined here (see sections three through five). Many patients will require medication and psychotherapy from the beginning to be successful in the pivotal functional restoration algorithm (see Figure 1). Treatment guidelines that center on progressive functional restoration delivered by an interdisciplinary team are traditional, have substantial empiric and anecdotal support, and have been assessed and ultimately codified by three large, expert, consensus-building conferences.^{3,9,11} Although high level evidence supporting the rationale for interdisciplinary treatment of CRPS is fairly sparse (as it is for any treatment of CRPS), much stronger evidence exists for the efficacy of the interdisciplinary approach in other pain conditions, such as chronic low back pain.³⁹ That functional restoration can and should be the central intervention and outcome standard in CRPS is a theory that must be tested. Until then, the interdisciplinary approach for treating patients with CRPS remains the most pragmatic, helpful, and cost-effective therapeutic approach available today.

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FIGURE 1. A SAMPLE, STEPWISE, FUNCTIONAL RESTORATION ALGORITHM



From the outset, in appropriate cases, the patient should have access to medications and/or psychotherapy and/or injections. If the patient cannot begin, or fails to progress, at any step or in any regard, the clinical team should consider starting (or adding) more or stronger medications (section 3) and/or more intensive psychotherapies (section 4) and/or different interventions (section 5). (Extrapolated and modified from the three clinical consensus meetings: Malibu, Minneapolis and Budapest.^{3,9,11})