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# METHODS AND INTENSITY OF HOLISTIC POST-ACUTE BRAIN INJURY REHABILITATION

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## *SUMMARY*

*Critical elements, specific methods, and outcomes of holistic post-acute brain injury rehabilitation are reviewed. Defining aspects of the holistic approach include: (1) a cognitive and behavioral approach, (2) emphasis on self-awareness, adjustment, compensation and social skills, (3) individualized goal setting, (4) group therapies within a therapeutic milieu, (5) transdisciplinary team specializing in brain injury rehabilitation, (6) low staff-to-patient ratio, (7) family/significant other involvement, (8) community-based vocational and independent living trials, and (9) systematic outcome assessment. In addition, more specific and evidence-based practices are typically included in a holistc treatment program. If initiated soon after initial hospitalization, the majority of people with moderate-severe brain injury can achieve rehabilitation goals and re-enter family and community life with the help of relatively limited and focused outpatient rehabilitation. A minority of patients, however, will require an intensive Comprehensive Day Treatment Program for successful rehabilitation. Severity of disability, self-awareness, chronicity, depression and substance abuse are among the factors that should be considered in making initial recommendations for the intensity and structure of post-acute rehabilitation. Of those patients who require intensive day treatment, about 70% sustain employment in the community with or without support. Of patients who are appropriately treated with a more limited and focused outpatient rehabilitation program, over 50% work in the community with complete independence and another 30% sustain community-based employment with support.*

# THE HOLISTIC APPROACH

The holistic approach to postacute brain injury rehabilitation was introduced by Yehuda Ben-Yishay and elaborated by George Prigatano (Ben-Yishay & Prigatano 1990, Prigatano et al. 1984). As the name implies, this approach aims to include the whole person in a rehabilitative process. Even beyond the boundaries of the person, the holistic approach seeks to include and develop the person's social and physical environment. In this style of rehabilitation, not only are the patient's weaknesses identified for targeted intervention, but the patient's strengths are also highlighted for further development in advancing toward the goal of a return to a normal life in the community. Family and friends are included in the process, and social and community agency support systems are secured with the patient to sustain the process of community re-integration.

Consistent with the mission of assisting patients with brain injury to re-integrate their sense of personal identity and re-integrate with their communities, treatment is itself integrated. Emotional issues are addressed in the context of cognitive rehabilitation procedures and vice-versa. Accomplishing this type of integrated treatment requires a transdisciplinary team. Members of a transdisciplinary team are able to step into each other's roles at appropriate times. For example, if an emotional issue arises for the patient with brain injury during a cognitive rehabilitation session, it is essential that the issue be addressed immediately by the therapist. Because of memory and higher-order cognitive impairments, the patient often is unable to carry over the issue to a session later in the day with a psychologist. Conversely, when situations arise in which cognitive rehabilitation techniques may be reinforced during psychotherapeutic sessions with the psychologist, the team psychologist must be prepared to step into the role of cognitive rehabilitation therapist. Almost daily patient reviews with the entire team are required for team members to effectively step into each other's roles in a way that is consistent with the overall rehabilitation plan and is informed by the disciplinary expertise of individual team members.

Real life trials of work and independent living skills, ideally in community settings, are another essential part of this approach. Patients not infrequently experience failure in their initial attempts at return to work or more independent living. Trials of these activities, while patients are still involved in the rehabilitation program, allow the rehabilitation team to work to turn these into learning experiences rather than demoralizing experiences of failure for patients. Finally, ongoing review of outcome is important for continuous quality improvement of program effectiveness.

In 1994, Trexler convened a group in Zionsville, Indiana that included Yehuda Ben-Yishay, Anne-Lise Christensen and other pioneers of holistic brain injury day rehabilitation. This group identified the essential elements of holistic brain injury rehabilitation. These are presented in Table 1 and described in greater detail by Trexler (2000).

Table 1. Defining elements of holistic brain injury rehabilitation

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| – A cognitive and behavioral approach |
| – Emphasis on self-awareness, adjustment, compensation and social skills |
| – Individualized goal setting |
| – Group therapies within a therapeutic milieu |
| – Transdisciplinary team specializing in brain injury rehabilitation |
| – Low staff-to-patient ratio |
| – Family/significant other involvement |
| – Community-based vocational and independent living trials |
| – Systematic outcome assessment |

# INTENSITY OF TREATMENT

The holistic approach to postacute brain injury rehabilitation was developed through comprehensive day treatment (CDT) rehabilitation programs. These programs typically involve patients in group and individual rehabilitation sessions for the better part of the day five days a week. Although length of treatment may vary with individual needs, it is typical for patients to be involved in such programs for 4 to 6 months, and not uncommon for patients to continue in CDT for 8 to 10 months. These CDT programs are thus costly to provide. Nonetheless, this type of program is required for the successful community re-integration of patients with moderate to severe brain injuries who lack self-awareness and have pervasive cognitive and behavioral disabilities.

On the other hand, experience suggests that only a minority of patients with moderate-severe brain injury require this level of intensity in post-acute rehabilitation. The majority of patients with moderate-severe brain injury develop sufficient self-awareness during the initial months after injury to participate effectively in more focused and limited rehabilitative treatment. Such treatment yields similar, if not superior, results to CDT for appropriate patients and can be provided at much lower cost. In limited intervention, the holistic perspective can be maintained, with the strengths and weaknesses of the whole person in their social environment addressed in the rehabilitation plan. However, the treatment plan is not as extensive, since the needs of the patient who is appropriate for limited intervention are not as extensive or complex as those for whom CDT is required. These limited and focused rehabilitation programs typically involve the patient 3 to 6 hours per week in a small set of therapies. Most frequently, the program includes:

– cognitive rehabilitation;
– individual, group, relationship, or family psychotherapy;
– specialized vocational rehabilitation services.

A wide variety of other therapies, including speech and physical therapy, may be recommended in specific cases.

In the remainder of this article, specific methods that may be used both in CDT and limited holistic brain injury rehabilitation will be reviewed, as well as key factors for determining treatment intensity. As these specific methods are described, it should be kept in mind that holistic brain injury rehabilitation, particularly as provided through CDT, is a process that is greater than the sum of its parts. Group process, team function and the milieu that these provide are integral and arguably the most powerful components of this approach. The therapeutic alliance of staff with patients and their significant others has come to increasing attention as a critical element of successful brain rehabilitation (Schonberger et al. 2006, Klonoff et al. 1998).

# SPECIFIC METHODS

### *Group treatment*

Particularly in CDT, clinical experience suggests that group process is a powerful tool for improving self-awareness and managing depression and distress during postacute rehabilitation. People seem to accept feedback most readily from those whom they identify as their peers, that is, other people whom they feel share their experience and can understand what they are going through. In a group treatment setting that is skillfully managed by a clinical facilitator, regularly occurring feedback about participants' behaviors and inaccuracies of self-perception from their peers will begin to assist these patients in developing a more accurate sense of self. Videotape feedback may further enhance these experiences.

As participants develop a more accurate awareness of their disabilities after brain injury, impaired self-awareness often gives way to depression. As this process evolves, support from the group will assist depressed patients in managing their distress. The group will also play an important role in challenging depressogenic cognitions and reinforcing positive self-statements and participation in rewarding activities. Interpersonal communication and social skills training is effectively conducted in group treatment settings. Group work provides opportunities for analysis of spontaneously occurring interactions among group members and, following analysis, for rehearsal of more effective and satisfying ways of interacting and communicating.

### *Supported peer feedback*

Feedback from peers is essential to the development of self-awareness, as well as to the improvement of cognitive, behavioral, and social skills, in CDT. As mentioned previously, people with TBI receive feedback most constructively from people whom they feel, not only understand, but have experienced their situation. It may be quire humbling to accomplished professionals to find that

their patients will often listen with rapt attention to the same coaching or advice given by a peer that was previously dismissed when received from the professional. However, this is indeed often the case. The professional group leader's role is often less to provide coaching or advice and more to facilitate the communication of constructive feedback among participants in the group.

The professional also has an important role in assuring the feedback is ultimately supportive. Confrontation by peers of ineffective or inappropriate behavior or of denial is essential to developing self-awareness and behavioral self-control. The group leader must take an active role, however, in assuring that the confrontation does not have a chronically demoralizing effect on the patient. In these types of encounters, the goal is always for patients receiving feedback to feel that, while changes in their behavior are desirable, they continue to be valued by the group.

### *Attention process training*

Evidence-based reviews of cognitive rehabilitation (CR, Cicerone et al. 2000, 2005) have recorded strong evidence for the effectiveness of attention training exercises. Effective exercises include instruction and practice of strategies for optimizing attention (Sohlberg & Mateer 2001, 1987, Niemann, Ruff & Baser 1990, Gray et al. 1992). Recommended exercises gradually increase stimulus complexity in multiple modalities to systematically reinforce the patient's attentional capacity.

In the context of CDT, timing the introduction of attentional exercises should be carefully considered. In many cases, addressing barriers to treatment, such as impaired self-awareness and behavioral dyscontrol, will be necessary before the patient is able to benefit from attentional training. For other patients with more circumscribed impairments who are involved in a limited rehabilitation program, unreliability of attention may be a primary disability that contributes to variability in other cognitive functions and consequently becomes a primary target for intervention.

### *Systematized memory notebook*

The effectiveness of a systematized memory notebook to help patients compensate for memory deficits has also been endorsed strongly by the evidence-based reviews (Cicerone et al. 2000, 2005). As described by Sohlberg and Mateer (2001, 1989), effective training requires development of a personalized notebook in which sections are selected that are of specific value to the patient. Then the patient is engaged in gradually expanding practice in using successive sections of the notebook.

Development of a systematized memory notebook is of value not only as a compensation tool for memory impairments, but also to provide a means of compensating for attentional lapses and deficits in personal organization. For this reason, this intervention is of value to most people with any degree of cognitive impairment after brain injury (and most of us without a history of

brain injury). For patients participating in CDT, developing a systematized memory notebook often provides a means for organizing their evolving sense of a more integrated self, as well as organizing and supporting their participation in the program. With this in mind, the memory notebook is typically introduced early in the sequence of CDT.

### *Problem-solving format*

The problem-solving format is a method for developing higher-order cognitive abilities required for planning and problem-solving. While available evidence is not as strong for the use of these types of techniques (Cicerone et al. 2000, 2005), clinical experience suggests that this type of training is helpful to many patients with higher-order cognitive deficits. An example of a problem-solving training method, based on brainstorming, begins by coaching the patient to clearly define the problem. Then the patient develops – with assistance from others if feasible – multiple possible solutions to the problem. The patient (again in consultation with others as possible) rates the potential for a good outcome of each of the solutions. Next the patient tries out the solution that appears to have the greatest potential for success. If successful, the problem is solved. If the attempted solution is not successful or is only partially successful, the next most highly ranked solution is tried. This exercise is enhanced by group process, for instance, in CDT. It is also a technique that can be taught individually to appropriate patients who are receiving more limited and focused rehabilitation.

### *Cues and prompts*

Cues and prompts may be applied in a wide variety of circumstances to compensate for impaired attention and memory as well as to cue self-reflection and behavioral control. The nature of the cue or prompt is as variable as the situations that patients with brain injury encounter and the creativity of the people who work with them. Prompts are usually given by other people. The value of involving other people in prompting behavior must be weighed against the inherent dependency that this type of interaction creates for the patient. Nonetheless, in some cases, recreating a normal level of interdependency between patients and their significant others may in itself be a reasonable goal. Furthermore, prompts delivered by others can be gradually faded or thinned in frequency as the desired behaviors become incorporated in the patient's behavioral repertoire.

Cues usually refer to signals provided by notes, signs, or other objects placed in the environment. Cues may range from a picture of a stop sign placed on a patient's notebook as a reminder to "Stop and Think" rather than react impulsively, to an alarm watch that buzzes every half hour as a reminder to consult the schedule and memory notebook, to an automated paging system that reminds the patient through a telephone call of current appointments and scheduled activities.

### *Pragmatic communication skill training*

Aphasia is relatively uncommon among patients with brain injury. When present, aphasia is a contraindication to group treatment to the degree that it interferes with the patient's ability to communicate and participate in the group process. Most patients who require intensive CDT treatment, however, have impairments in pragmatic communication and social skills that markedly interfere with their ability to interact with other people and to develop and sustain meaningful relationships. Pragmatic communication deficits include difficulty in appropriately taking turns in conversations, talking too much, difficulty initiating conversation and talking too little, poor sequencing in the narrative (i.e., beginning stories in the middle, going to the beginning and never getting to the end), absent or inappropriate use of facial and gestural expressions, inappropriate tone of voice, as well as deficits in more sophisticated social skills, such as asking a favor, making an apology, or asking for a date. There is some evidence (Cicerone et al. 2000, 2005) that interventions designed to train people with brain injury in pragmatic and social skills can be effective, and this is consistent with clinical experience. Such training is best provided in a group setting. Videotape feedback of practice exercises enhances feedback from the group to the individuals involved in the exercise.

### *Guided self-discovery*

People without brain injuries who are being treated with cognitive-behavior therapy are frequently asked to test out their personal beliefs by performing real life personal experiments (Greenberger & Padesky 1995, Padesky & Greenberger 1995). We have found this same technique to be very helpful in working with people with brain injury. For instance, an individual who believes that his memory is as good as it was before the injury might be asked to test this out in a concrete way and report back to the group. The impact of this kind of intervention is maximized to the degree that the individual is involved in planning out the personal experiment. The motivation to do so is often to prove that his or her beliefs are correct. Frequently multiple personal experiments need to be conducted by the individual before there is acceptance that the belief is in error and the failure of the experiment is not due to chance.

The impact of the intervention is also maximized if the experiment is conducted in a supportive way. In the example of the patient with poor awareness of memory impairment, a personal experiment might be set up as an opportunity for the patient to demonstrate the intact aspects of his or her memory to the professionals and other participants in the program. When it becomes obvious through repeated trials that the patient's memory is not as good as the patient had believed, the response of the group leader should be empathetic and supportive, engaging the patient in a process to identify what has been learned from the experiment and how this can be used to develop ways to better compensate for the identified memory problem. When conducted in this way, guided self-discovery is a gentle but very effective method

of confronting inaccurate personal beliefs. As for people without brain injury, this technique can be used to challenge inaccurate beliefs that sustain depression and anxiety as well as deficits in self-awareness.

### *Supported risk-taking*

Bearing some similarity to guided self-discovery are personal experiments that involve a substantial degree of risk. Like guided self-discovery, these experiments can have a powerful impact on challenging blind spots in self-awareness and other inaccurate beliefs. However, supported risk-taking involves situations in which the cost of failure may have very significant emotional consequences for the individual. Such high risk personal experiments are usually conducted with patients with impaired self-awareness with the support of the milieu in CDT.

The most common example of a supported risk in CDT is an attempt by the patient with brain injury to return to a former career or other life role that is likely to be beyond his or her capacity because of the effects of their injury. Before a trial of resumption of a highly valued activity or role is initiated, much time is spent attempting to make the patient aware of the obstacles to return to the activity through discussion, group process, and more limited self-discovery experiments. Clinical experience, however, suggests that a high risk attempt to return to a prior role is often essential for patients with significantly impaired self-awareness to truly engage in rehabilitation and to seriously consider alternative or modified activities and roles.

Even to a larger degree than in guided self-discovery, it is important that these high stakes trials be done in the context of support from other professionals and participants in the program. When patients, for example, who believe that they can return to a previous job fail in that attempt, the response from professional staff is to consider with the patient and their peers in the group what can be learned from the attempt about redesigning the job or life role or about alternative occupations in which success would be optimized.

Failures in these types of high stakes trials can result in significant distress and even depression for patients. Resulting depression may require specific treatment. Because most helping professionals are oriented to take care of people and to attempt to minimize their failures and their distress, supported risk-taking trials may be emotionally difficult for staff as well. It is sometimes helpful to staff to reflect on times in their own lives where they took major personal risks and how they grew as people from both failures and successes in taking these risks. One can argue that personal growth is leveraged on personal risk, and that our patients have as much a right to take risks as we do. An open mind is also required by staff when risk-taking trials are attempted. Occasionally our patients surprise us and succeed in activities that we predicted would be beyond their abilities!

### *Supported work/independent living trials*

Initial trials in work and other important life activities may constitute a substantial emotional risks for patients with impaired self-awareness who tend to overestimate their abilities and attempt a return to activities and roles that are beyond their post-injury abilities. Consequently, emotional support and treatment for depression should be consistently provided, as the sequence of self-discovery continues and more realistic work and independent trials are designed.

Concrete supports are also identified and implemented to maximize success in these activities. The types of supports vary greatly with the needs of the patient and the creativity of the staff. Support for return to work, for instance, may take the form of a professional person or job coach assisting the patient in learning or relearning the necessary skills to accomplish the job. Such support may also be furnished by a concerned fellow employee. Education for employers and fellow employees – provided with the active participation of the patient – about brain injury and the specific compensation techniques used by the patient is essential to support return to work. Additional supports for work may include environmental changes, for example, noise reduction, allowance for more frequent rest periods, gradually increasing time spent on the job, and physical changes in the environment to accommodate physical disabilities. In some cases, support from other people or environmental modifications may be gradually faded out as the person with brain injury assumes increasing independence in the work place. In other cases, these supports and modifications will be required indefinitely by the employee with brain injury to perform satisfactorily on the job. Although the discussion here has focused on work activities, supports and modifications have a role in assisting patients to participate in other life activities including education, family and social roles, and other aspects of independent living and community participation.

### *Training in community resource use*

Prior to and as part of independent living trials, patients involved in CDT usually require training in specific independent living skills. Such skills include cooking, house cleaning, laundry, as well as shopping for food and clothing, using public transportation and finding social and recreational opportunities. To the degree possible, training in these kinds of skills is best done through practice in the community. In some locales, training and support for independent living skills can be provided by community providers, such as the staff of an Independent Living Center. Helping patients develop a list of community services and providers who may be of help to them is an important component of the transition out of CDT.

Interactions with the health care system merit specific consideration and training. Patients with brain injury will not only have continuing medical needs related to their brain injury, but also needs for routine medical care. As part of community integration training, patients are coached about symptoms for

which a physician visit is indicated, for example, severe pain or high fever. They also practice how to communicate with health care providers and to write down symptoms so that they do not forget to mention these when they are seen. While in CDT, a staff member frequently accompanies the patient to doctor visits to assist them and coach them in these interactions.

# CONSISTENT TEAM APPROACH

Because patients in CDT are selected for problems with organization, other executive and higher-order cognitive functions, and behavioral self-management, it is essential that the team working with them be organized and consistent. These patients are frequently challenging. The probability of disagreements among the team about the best approach to particular patients is high. Discussion and resolution of these disagreements can constructively lead to the development of the most effective intervention. However, these disagreements can also lead to splitting within the team, that is, team members becoming at odds with each other. CDT teams must have the time to resolve these inevitable disagreements and conflicts to maintain a consistent approach in addressing specific problems for specific patients.

A number of years ago, the social worker on our team, Walter Stobaugh, LICSW, led an effort to develop a set of communication guidelines for our team (see Table 2). Over the years, these guidelines have helped our team resolve internal disagreements in a constructive way and keep the patient's needs primary.

### *Family involvement*

Inclusion of family members and significant others in treatment assists patients in generalizing learning in rehabilitation to real life. Education of significant others about brain injury assists them in appreciating that many of the patient's undesirable behaviors are not willful, but rather the result of brain

Table 2. Guidelines for effective team work and communication

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| 1. We will periodically review our effectiveness as a Team. |
| 2. We will not judge, challenge, nor evaluate an idea until we hear or understand the whole idea. |
| 3. We will attack problems, not people (each other). |
| 4. We will disagree without becoming disagreeable. |
| 5. Once the Team reaches a decision, and I have had the opportunity to be heard, I will support the team decision 100%. |
| 6. We each participate in discussions, fully and openly. We do not use silence as a weapon nor as a defense. |
| 7. We deal with our conflicts and frustrations directly and promptly. |
| 8. We feel free to bring up problems and invite possible solutions. |
| 9. We say nothing about any third party that we would not say if that person were present. |
| 10. We respect each other's work, tasks, and contributions without regard for titles or status. |

dysfunction. Coaching significant others on how best to respond to these behaviors not only assists the patient in bringing these behavior under better control, but also assists the significant other in feeling less helpless and frustrated. Significant others can become important allies of the clinical team by prompting and reinforcing skills learned in rehabilitation.

Of course inclusion of significant others is always at the discretion of the patient. In some cases, young adults with brain injury may wish to move toward a more independent lifestyle that does not involve frequent interactions with parents. In other cases, relationships may be highly stressed by the brain injury, and specific couple or other relationship counseling will be required to address conflicts and dissatisfactions. Significant others may include not only friends and family, but also professionals employed by the patient to assist them with independent living.

# OUTCOMES

### *Day treatment*

The evidence based reviews (Cicerone et al. 2000, 2005) describe a number of studies showing significant gains for patients involved in CDT. However, because of the complexity and length of intervention, none of these studies have been well controlled. Two recent studies have compared holistic CDT to standard outpatient rehabilitation in controlled trials with unbiased assignment to treatment and control groups. Cicerone and colleagues (2004) reported that 52% of 27 patients participating in holistic CDT demonstrated significant gains on the Community Integration Questionnaire, compared to only 31% of 29 patients involved in standard rehabilitation. Patients in CDT also showed significant improvement in neurocognitive functioning. Sarajuuri and her group (2005) found that 89% of 19 patients who participated in CDT were in productive activities in the community 2 years after the intervention, compared to only 55% of 20 control patients who received standard rehabilitation. Assessments of outcomes were performed at two-year follow-up by two blinded reviewers.

We have reported generally positive outcomes for participants in the Mayo Comprehensive Day Treatment Program (Malec 2001). Of 96 consecutive participants in the program, less than half (47%) were living independently when they entered the program. At program end, 69% were living with complete impendence. This outcome was sustained for at least one year after program graduation with 72% living with complete independence at that point in time. Only 16% were employed in any capacity when they entered the program, and these were failing in employment. Most (53%) graduated to transitional employment placements, that is, work for pay in the community with supports that were expected to be time-limited. Another 10% left the program to work in the community with no support required. At one year follow-up, 67% were working in the community: 39% with complete independence, 18%

with long term support, and 10% with time-limited support. Those in time-limited or transitional placements were usually in extended vocational training programs and expected to graduate to independent employment.

Although these outcomes were assessed in an uncontrolled trial, some of the participants entered the program many years after their injury. Those participants who had a long history of vocational failure prior to entering the program may serve as their own controls. A sustained change in vocational status for those with a long pre-program baseline of vocational failure provides more convincing evidence of the specific effect of the program than return to work for those admitted shortly after their injury who may still be benefiting from spontaneous recovery. Analysis of vocational outcomes for the Mayo CDT program by time since injury shows such a sustained change in vocational status for those with a long pre-program baseline of vocational failure (Malec 2001). Of those admitted to the program 10 or more years post-injury, 67% remained employed in the community one year after program completion. This is almost the same proportion employed in the community at one-year follow-up among those entering the program within one year post-injury (72%).

### *Limited intervention/specialized vocational services*

Outcomes for patients appropriately involved in more limited rehabilitation services are generally a little better than for patients who require CDT. Presumably this is because patients who are appropriate for a limited (generally 3-6 hours per week) and focused rehabilitation are less pervasively disabled as those who require an intensive CDT program. Patients who benefit from limited post-acute rehabilitation have better self-awareness of disability and are more easily engaged in setting specific goals in a rehabilitation program that focuses on a small number of specific disabilities. These patients are typically less chronic.

We have described how, when limited postacute rehabilitation and specialized vocational services begin within the first year post injury, even patients with moderate levels of disability have a high probability of sustaining community-based employment (Malec & Degiorgio 2002). Studies of two different cohorts of patients receiving specialized vocational services at Mayo after brain injury show that about 50% were working with complete independence in the community one year after initial placement, and another approximately 30% were working in the community with long term or time-limited supports (Malec & Moessner 2006, Malec et al. 2000).

## CONSIDERATIONS IN SELECTING TREATMENT INTENSITY

### *Severity of disability and impaired self-awareness*

The severity and pervasiveness of disability is a critical factor for determi-

ning whether limited or comprehensive rehabilitation is most appropriate. The milieu of an intensive CDT program is almost certainly required to improve substantial impairments in self-awareness. In addition to impaired self-awareness, patients who require CDT generally present with an array of cognitive and behavioral impairments and associated disabilities. In contrast, patients with a relatively realistic self-appraisal and a circumscribed set of disabilities generally benefit greatly from a limited and focused rehabilitation program.

Severity of impairment and disability is a better indication of the intensity of post-acute rehabilitation than initial brain injury severity (as measured, for instance, by PTA or Glasgow Coma Scale, cf. Bush et al. 2003, Novak et al. 2001). Although severity of brain injury is positively correlated with eventual disability, the correlation is less than perfect. Some individuals with relatively severe injuries, for largely unknown reasons, demonstrate remarkable recoveries and present to post-acute rehabilitation with only minimal or mild disabilities. On the other hand, a small percentage of individuals have extensive cognitive and behavioral impairments after mild brain injury, often because the mild brain injury is complicated by a history of prior brain injuries or disorders or co-morbid psychiatric and substance abuse disorders. Some of these highly complex cases of mild brain injury may require CDT for successful rehabilitation, whereas patients who have realistic self-awareness and focal disabilities after moderate-severe brain injury may achieve all their rehabilitation goals with only a limited rehabilitation intervention.

### *Chronicity*

Time since injury or chronicity is an important factor in deciding the appropriate intensity of rehabilitation. More chronic cases typically are complicated by a number of factors that have developed through years of neglect and unsuccessful attempts at social re-integration after brain injury. The chronic patient typically has a history of recurrent or sustained depression, often complicated by patterns of substance abuse or dependency. These patients have frequently become socially distanced by family and former friends. They do not have a sense of self-efficacy because of their many failed attempts to re-integrate vocationally and socially after injury. The extent to which these negative, complicating factors are present and are further complicated by longstanding impaired self-awareness increases the probability that a comprehensive program will be necessary for successful rehabilitation.

### *Depression*

Nearly half of patients with moderate-severe brain injury experience a major depressive episode and most experience some degree of depression after injury (Kreutzer, Seel & Gourley 2001, Dikmen et al. 2004). Depression is not only common after brain injury but is also frequently overlooked as professionals focus on other medical problems and impairments. Depression frequently occurs in CDT as self-awareness improves. As participants more

clearly recognize their disabilities and the impact of these disabilities on their lives, they understandably respond with emotional distress, which can develop into persistent depression. Particularly if they have a history of recurrent or persistent psychiatric disorder prior to injury, patients whose recovery from brain injury is complicated by severe depression or other psychiatric co-morbidities are likely to need intensive CDT for successful rehabilitation.

On the other hand, depression usually does not occur in patients with markedly impaired self-awareness, and conversely, patients with depression typically have reasonable awareness of their limitations (Malec et al. in press, Sherer et al. 2003). If depression does not represent a chronic condition that predates the injury and is diagnosed and appropriately treated with medication and cognitive-behavior therapy, it may not be an obstacle to rehabilitation. Patients with satisfactory self-awareness and managed depression can often achieve their goals through focused and limited rehabilitation.

### *Substance abuse*

Substance abuse is another frequent co-morbidity of brain injury (Corrigan 1995)). In all cases, substance abuse and possible dependency should be evaluated and, if appropriate, treated in conjunction with post-acute brain injury rehabilitation. Patients with a history of substance abuse who have not developed patterns of dependency may benefit from a limited rehabilitation program in conjunction with intervention for substance abuse. However, patients who are substance dependent will usually require CDT provided in tandem with treatment for substance dependency. These patients often have deficits in self-awareness associated with patterns of substance dependency that precede the brain injury and that are further complicated by impaired self-awareness resulting from brain injury. They also commonly have other social and vocational liabilities that predate the injury, but must be addressed for successful rehabilitation. Because of the number of factors that must be addressed in rehabilitation in these complex cases, an intensive CDT is typically indicated.

### *Premorbid factors and other co-morbidities*

Novack and his group (Bush et al. 2003, Novack et al. 2001) have made a convincing and statistically elegant case that, while pre-injury deficits and factors contribute to post-injury cognitive and functional impairment, these factors do not directly predict long term outcome. A thorough assessment of impairment and disability after the injury will include pre-injury impairments and disabilities as well as co-morbidities. This holistic assessment of the patient is the best indicator of long term outcome without rehabilitation and of the intensity and structure of rehabilitation of these impairments and disabilities. Attempting to separate pre-injury from injury-related impairments and disabilities may be of academic interest and perhaps of relevance for injury-related litigation. However, a current assessment of the whole person – strengths and liabilities – will be the best guide for planning post-acute rehabilitation.

# SUMMARY

This article has reviewed methods and outcomes of holistic postacute brain injury rehabilitation. The majority of people with moderate-severe brain injury can achieve rehabilitation goals with limited and focused outpatient rehabilitation if rehabilitation is initiated relatively soon after initial hospitalization. On the other hand, a minority of patients will require an intensive CDT for successful rehabilitation. Factors that include severity of disability, self-awareness, chronicity, depression and substance abuse should be considered in making initial recommendations for the intensity and structure of post-acute rehabilitation. Of those patients who require intensive CDT, about 70% sustain employment in the community with or without support. Of patients who are appropriately treated with a more limited and focused outpatient rehabilitation program, over 50% work in the community with complete independence, and another 30% sustain community-based employment with support. Increasingly specific protocols for both limited rehabilitation and CDT need to be further refined through ongoing research, as do methods for determining with greater precision who are the most appropriate patients for each level of rehabilitation intensity. Such efforts to determine and provide necessary and sufficient brain injury rehabilitation – and no more – are critical for good stewardship of funds available for health care.

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