Cognitive Rehabilitation:

The Evidence, Funding and Case for Advocacy in Brain Injury

A Position Paper of the Brain Injury Association of America

November 2006

Brain Injury Association of America

Acknowledgements

The Brain Injury Association of America gratefully acknowledges the authors of this position paper: Douglas I. Katz, MD; Mark J. Ashley, ScD; Gregory J. O'Shanick, MD; and Susan H. Connors. The authors thank Caroline Feller, OTR, for her assistance.

Volunteer reviewers provided unique insight and thoughtful comments. The Association is deeply appreciative of their expertise and effort:

Keith D. Cicerone, PhD, ABPP/Cn
JFK-Johnson Rehabilitation Institute

Cindy Dahlberg, MA, CCC, CPHQ
Craig Hospital

Roberta DePompei, PhD
University of Akron

Wayne A. Gordon, PhD, ABPP/Cn
Mount Sinai School of Medicine

Tessa Hart, PhD
Moss Rehabilitation Research Institute

Donna Langenbahn, PhD
NYU Medical Center

Ronald C. Savage, EdD
North American Brain Injury Society

The Board of Directors of the Brain Injury Association of America adopted this position statement in November 2006. The Association will continue to review the topic of cognitive dysfunction and cognitive rehabilitation following brain injury as scientific and public policy progress dictates.

Electronic copies of this statement may be obtained from the Brain Injury Association of America's website: http://www.biausa.org/policyissues.htm.

The paper may be cited as follows:
Katz, DI; Ashley MJ, O'Shanick GJ, Connors, SH. *Cognitive rehabilitation: the evidence, funding and case for advocacy in brain injury.* McLean, VA: Brain Injury Association of America, 2006.

Executive Summary

Individuals who sustain brain injuries frequently acquire cognitive impairments, or thinking problems, that interfere with their safety, productivity, independence and interpersonal relationships. These impairments create lifelong burdens for the individuals who are injured and their caregivers. Physicians, scientists and allied health professionals have developed a systematically applied set of medical and therapeutic services to improve cognitive functioning. These treatment methods, known as cognitive rehabilitation, are designed to reduce cognitive dysfunction and/or assist individuals in compensating for its impact on daily living.

The need for cognitive rehabilitation should be identified and therapeutic services should be delivered by clinicians who have fulfilled the requirements for professional training and certification in their respective disciplines. Such diagnosis and treatment should be initiated when the individual is capable of benefiting from the intervention and may be performed in a variety of settings where there is effective quality control and adequate supervision by trained professionals.

The benefits of cognitive rehabilitation have been discussed in more than 700 published research studies and are evident in positron emission tomography (PET) scans and other neuroimaging techniques in both human beings and animal models. Numerous scientific organizations and professional associations have adopted treatment guidelines or position statements in support of cognitive rehabilitation for individuals with brain injury. Federal and state governments have acknowledged the value of cognitive rehabilitation by allocating taxpayer funds for services. Lawmakers in selected states have required private insurance companies to include cognitive rehabilitation and related therapies in their accident and health insurance policies.

Despite individual testimonials, evidence-based literature and public sector endorsement, only a small number of private insurers include cognitive rehabilitation as a covered service. Most often, these payers have long-term responsibility for the health and welfare of the individual who has been injured. Many third-party payers as well as Medicare and Medicaid restrict scope, duration, timing and intensity of service and make no provision for cognitive treatment as life circumstances change. Some insurers disallow claims for cognitive rehabilitation while others have specifically excluded such treatment from their policies.

The Brain Injury Association of America (BIAA) adopted this position paper in November 2006 to call attention to the need for treatment of cognitive dysfunction. The paper provides definitions and principles for the application of cognitive rehabilitation, discusses research evidence for the efficacy of treatment and highlights the burden on individuals and their caregivers resulting from limitations and denials of service coverage.

BIAA acknowledges the need for additional research, further development of clinical guidelines and modification to public systems of care and private sector insurance policies. The fact that research questions remain about cognitive rehabilitation and that techniques are constantly being improved should not be an excuse to withhold payer support for treatment. Individuals with brain injury must have access to cognitive rehabilitation that is of sufficient scope, duration and intensity and is available as cognitive skills and related problems change over time. Availability, accessibility and ease of movement among services in systems of care for persons with brain injury must be improved.

The Brain Injury Association of America offers ten recommendations to reduce the barriers in accessing and delivering cognitive rehabilitation treatments as follows:

1. Cognitive rehabilitation should be a covered benefit for persons with brain injury, supported by all public and private payers.

2. Cognitive rehabilitation should be based on sound scientific theoretical constructs and, when available, evidence for best practices, with clearly stated goals and quantifiable outcomes.

3. Cognitive rehabilitation should be provided by qualified practitioners. Qualified practitioners are clinicians who have fulfilled the requirements for professional certification and licensure in their respective medical and allied health disciplines.

4. Cognitive rehabilitation treatment strategies and goals, and the duration, scope, intensity, and interval of treatment should be determined based on appropriate diagnosis and prognosis, the individual functional needs of the person with brain injury and reasonable expectations of continued progress with treatment.

5. Treatment planning, case management and health insurance coverage for cognitive rehabilitation should respect the long-term scope and changing needs of persons with brain injury. Necessary treatment for cognitive problems should not be constrained by arbitrary time limits or caps on the number of treatment sessions. Improved longer-term systems of treatment should be developed, supported by public and private payers, employing disease management models, to support persons with brain injury with extended needs.

6. There should be an increase in priority for public and private research funding of questions related to cognitive rehabilitation to achieve better understanding of cognitive disorders after brain injury and how cognitive rehabilitation interventions improve recovery and functioning. Specific priorities should include questions about what interventions are effective for what particular problems, at what intensities and intervals post-injury.

7. There should be an increased emphasis on proper education, training, certification and continuing education for professionals and support staff involved in cognitive rehabilitation.

8. The particular needs of children with brain injury and their families, including developmental and educational implications of cognitive rehabilitation, and issues pertaining to transition to adulthood, have to be addressed by providers, payers and the entire health care system.

9. Cognitive rehabilitation should be integrated into and coordinated with vocational services, special education, and community based programming such as supported living, support networks, and recreation groups so that individuals move seamlessly within a comprehensive, coordinated system of care that is adequately funded.

10. All states should have an external review process for medical claims, and individuals who have been denied coverage for cognitive rehabilitation should fully avail themselves of all internal and external processes.

The Board of Directors of the Brain Injury Association of America adopted this position statement in November 2006. The Association will continue to review the topic of cognitive dysfunction and cognitive rehabilitation following brain injury as scientific and public policy progress dictates.

Cognitive Rehabilitation: The Evidence, Funding and Case for Advocacy in Brain Injury

Impairments of cognitive function are among the most common and important problems that lead to disability after acquired brain injury. Treatment of cognitive dysfunction is central to the treatment and recovery of individuals with brain injury because of the widespread impact of cognitive rehabilitation deficits on safety, functional independence, productive living, and social interaction. Yet, individuals with brain injury often have difficulty obtaining treatment for cognitive dysfunction, termed "cognitive rehabilitation."

The Brain Injury Association of America (BIAA) authored this position paper to address the need for medical and allied health treatment of cognitive dysfunction among persons with brain injury, the limitations and denials of service coverage by payers and the research evidence for the efficacy of treatments. BIAA offers recommendations to reduce the barriers in accessing and delivering cognitive rehabilitation treatments.

INTRODUCTION

Individuals who sustain brain injuries frequently have difficulties in arousal, attention, concentration, memory, problem solving, decision making, insight and other areas of cognition that impede their ability to function in everyday activities. Alterations in perception, motor control, balance, emotional functioning, social interaction and control of behavior are also common after brain injury and are closely linked and intertwined with cognitive issues. Cognitive abilities and disabilities must be considered in addressing all areas of functioning including communication, mobility, self-care, social interaction, recreational pursuits, and productive activities such as school or work.

Cognitive rehabilitation of children with brain injuries presents some additional complications. The cognitive rehabilitation of children with brain injuries is crucial for their ongoing learning and development. Children with brain injuries have a two-fold problem. First, their brains are still developing and new cognitive skills are built upon previously learned cognitive skills (e.g., learning division skills). Thus, a brain injury early in life interrupts the child's learning and development as he or she gets older. Second, injuries to the frontal-temporal regions of the brain, which control many cognitive abilities and new learning will often create new cognitive and behavioral problems for children at each new developmental milestone (i.e., ages 1-6 years, 7-10 years, 11-13 years, 14-17 years, and 18-21 years). Therefore, it is not uncommon to see children with brain injuries worsen cognitively and behaviorally as they grow into the late adolescence and young adulthood unless they receive cognitive rehabilitation therapy throughout their developmental years.

Cognitive problems change over time for adults too. Early in recovery, arousal, attention and memory encoding problems may be the issues that are the most obvious; later, difficulties with divided attention, memory retrieval, and executive functioning (cognitive control mechanisms) may be most prominent. Cognitive recovery evolves at a different pace for each person, with many interacting factors affecting recovery. Some individuals with brain injury recover relatively well and return to previous levels of functioning. After more severe injuries, however, recovery may extend over a long period of time with some cognitive problems persisting and becoming permanent. Even after returning to daily life activities, individuals with brain injury frequently experience reduced cognitive efficiency and inconsistency of performance, and persistent difficulty dealing with novel, complex, or stressful situations. These problems may, in turn, lead to emotional difficulties such as frustration, depression and anxiety disorders. In some cases of cognitive dysfunction, individuals can engage in unsafe activities or unwittingly re-injure themselves. Cognitive disorders make it difficult for some people to monitor changes in their daily health or to reliably comply with medication or medical treatment regimens.

Continuing advances in cognitive neuroscience have broadened our understanding of the anatomy and neurophysiology of cognitive function and its disruption after brain injury. Recent work in basic neuroscience has also enhanced knowledge of learning and brain reorganization after injury, especially in response to the highly structured treatment provided in rehabilitation. Further research will continue to provide the underpinnings for theory and design of effective rehabilitation, including treatment for cognitive dysfunction.

DEFINITIONS AND PRINICPLES OF COGNITIVE REHABILITATION

Cognitive rehabilitation is a systematically applied set of medical and therapeutic services designed to improve cognitive functioning and participation in activities that may be affected by difficulties in one or more cognitive domains. Diagnosis and treatment of cognitive dysfunction may be conducted in a variety of settings throughout the continuum of medical care. Cognitive rehabilitation is often part of comprehensive interdisciplinary programs. When properly applied, it is based upon sound scientific theoretical constructs and strategic approaches drawn from numerous disciplines in neuroscience, neurophysiology, neurobiology, neuropsychology, neurolinguistics and language development, cognitive development and cognitive neuroscience.

Treatment goals vary depending on the etiology, extent, and severity of injury to the brain, the timing of treatment, individual differences in cognitive capacity and personality, academic and vocational achievement, phase of recovery and prospects for restoration or compensation of a problem with remedial interventions. Diagnosis and treatment of cognitive dysfunction[1] should be undertaken by clinicians who have fulfilled

[1] The Society for Cognitive Rehabilitation recommends a standard battery of assessments sufficient to form hypotheses about the underlying cognitive impairments and deficits that interfere with cognitive

the requirements for professional training and certification in their respective medical or allied health disciplines, such as speech/language pathology, clinical neuropsychology or occupational therapy. Collaboration between disciplines is advised and encouraged.[2] Surveys indicate cognitive rehabilitation is frequently performed by numerous disciplines within the allied health fields, most often by speech pathologists, neuropsychologists, and occupational therapists.[3,4] Wellmark BlueCross BlueShield of Iowa concludes that cognitive rehabilitation may be performed by a physician, psychologist, or a physical, occupational or speech therapist.[5]

Theoretical models of cognitive rehabilitation vary along several different dimensions. Treatments may be process specific, focused on improving a particular cognitive domain such as attention, memory, language, or executive functions. Alternatively, treatments may be skill-based, aimed at improving performance of particular activities. The overall goal may be restoring function in a cognitive domain or set of domains or teaching compensatory strategies to overcome domain specific problems, improving performance of a specific activity, or generalizing to multiple activities.

Some compensatory treatments employ internalized procedures while some require orthotic devices, such as books, pagers, alarms or PDAs. Other treatments involve re-establishing previous skills and behavior patterns and some involve establishing new skills or enabling adaptation to adjust to problems that are not modifiable. Some cognitive rehabilitation treatments are directly applied using actual functional activities in real-world settings while others improve a specific cognitive process or an activity in a clinical setting that is intended to generalize to actual performance in real-life situations.

Persons with brain injury may also engage in services aimed at improving emotional, behavioral and psychosocial functioning because these problems are often closely linked

---

functioning. The battery should be sufficient as to enable decision making about which treatments are necessary. In rehabilitation settings, standardized psychometric assessments, questionnaires, structured interviews and behavioral observations across a range of functional settings with equal emphasis should be used. Results of various measures should be cross-referenced with each other and across environments and testing times and dates. Results should be shared with the person being tested and that person should participate in design of the treatment program where possible. Reassessment should be undertaken at regular intervals to monitor and report progress. Evaluative results and treatment plans should also be reviewed with the caregiver. Evaluative results should be used to make prognostic statements which should also be shared with the brain injured person. Treatment goals should be created arising from the assessment and should include outcome goals, long-term goals and short-term goals. All goals should be shared with and agreed to be the person with a brain injury. {From: Mailia K, Law P, Sidebottom L, Bewick K, Danziger S, Schold-Davis E, Martin-Scull R, Murphy K, & Vaidya A. Recommendations for best practice in cognitive rehabilitation therapy: acquired brain injury. Society for Cognitive Rehabilitation, 2004.}

[2] Paul Brown, D & Ricker, JH. Evaluating and treating communication and cognitive disorders: approaches to referral and collaboration for speech-language pathology and clinical neurospychology. Technical Report. *ASHA Supplement*. 2003; 23:47-57.

[3] Ashley, MJ, Persel, CS, Cognitive rehabilitation for brain injury: A survey of clinical practice. *Journal of Cognitive Rehabilitation.* 2003; 21(2):20-27.

[4] Mazmanian, PE, Kreutzer, JS, Devany, CW, Martin, KO, A survey of accredited and other rehabilitation facilities: Education, training and cognitive rehabilitation in brain injury programmes. *Brain injury.* 1993; 7:319-331.

[5] http://www.wellmark.com/e business/provider/medical policies/policies/cognitive rehabilitation.htm.

to neurocognitive functions. Such services are appropriately delivered by neuropsychologists, speech pathologists and others. Family members and other caregivers also play an important role in reinforcing the consistent use of strategies. Other agents, such as computers, may be useful in supplementing clinical therapies.

BIAA recognizes that a number of different labels and definitions are used to describe the mix of services and supports that assist individuals in overcoming cognitive impairments that interfere with productive living, healthy relationships and functional independence. BIAA supports cognitive evaluation and treatment methods that are driven by proper theoretical models and planned, administered and monitored under the supervision of professionals with recognized expertise in cognitive rehabilitation.

COGNITIVE REHABILITATION AND REALITIES OF THE MARKETPLACE

Americans mistakenly believe that employer health plans, individual insurance policies or Medicare/Medicaid will pay for needed services when serious accidents or illnesses occur. In reality, many of today's health plans are geared toward wellness and routine care. Very few insurance companies bear the full lifetime costs, which are estimated at $600,000 to $1.8 million for an individual with a severe brain injury.[6] Policies that adequately cover acute care and comprehensive rehabilitation for individuals with brain injuries do so to minimize the company's exposure to costly long-term services. More often, payers simply deny coverage for cognitive rehabilitation or enact reimbursement policies that may yield short-term gains, but leave lifelong burdens on injured individuals and their caregivers. In response to consumer demand and the evidence-based literature, public policymakers have begun to acknowledge the value of cognitive rehabilitation and are helping to expand its availability in the public and private sector.

Private Sector Approaches to Cognitive Rehabilitation Coverage

Health insurance companies operate under different legal and contractual obligations as to the inclusion or denial of cognitive rehabilitation benefits. Approaches vary based on the payer's long-term financial responsibility for the individual who is injured. Payers with lifelong responsibility, such as workers' compensation insurers, are highly motivated to invest in treatments that reduce care requirements, promote return to work or school, and restore individuals to the highest level of independence possible.

Many workers' compensation insurance companies manage lifetime costs by pursuing effective acute medical care and comprehensive rehabilitation for maximal long-term outcomes. For example, personal care attendant (PCA) expenses account for a significant

[6] National Institutes of Health. *Report of the Consensus Development Conference on the Rehabilitation of Persons with Traumatic Brain Injury*. NIH: Bethesda, MD. 1999.

portion of the lifelong costs for individuals who sustain catastrophic brain injuries. Workers' compensation carriers attempt to mitigate PCA expenses by resolving cognitive deficits early thereby reducing disability and dependence in the long term. Liability carriers have a similar motivation for long-term cost management; however, they often have less opportunity to influence the early medical treatment of individuals who sustain brain injuries.

The contractual liability of accident and health carriers is limited to the term during which premiums are being paid or to the period during which COBRA[7] protection is extended. Individuals who sustain moderate or severe brain injuries are often unable to continue paying health insurance premiums. Hence, the long-term contractual liability is more limited, and accident and health carriers have less motivation to minimize permanent disability. In fact, many carriers favor short-term cost containment. One such strategy is the automatic denial of coverage for any cognitive rehabilitation service. The denial may generalize to treatment of cognitive goals even if those goals are imbedded in physical rehabilitation therapies involving ADLs or gait training.

Some accident and health payers restrict coverage by limiting the number of sessions or reducing the time period for treatment. Although the phenomenon of attaining a plateau in functional restoration prior to entering a secondary recovery phase is a well-documented occurrence, reimbursement policies tend to treat recovery as a linear event. In that paradigm, "plateau" is synonymous with termination of benefits, often with no subsequent provision to re-evaluate and reinitiate rehabilitation efforts after a given interval.

A variation on this theme is seen in the context of triaging an individual who fails to meet prerequisites for therapy participation and is consigned to a low intensity program, such as a nursing home, with the implication of returning to aggressive intervention at some future date. Such triaging, however, especially among individuals with severe injuries, often becomes a terminal placement with no further option or hope for comprehensive treatment. The implied promise to family members to re-evaluate the patient is often unrealized due to limitations in available treatment intensity and sometimes expertise in the treatment environment itself. Thus, the individual with brain injury encounters a "Catch-22" when he/she fails to achieve rehabilitative progress thereby making it impossible to meet a requirement for demonstrated improvement to warrant further treatment. In other instances, established financial reserves for such endeavors are

[7] Congress passed the landmark Consolidated Omnibus Budget Reconciliation Act (COBRA) health benefit provisions in 1986. The law amends the Employee Retirement Income Security Act, the Internal Revenue Code and the Public Health Service Act to provide continuation of group health coverage that otherwise might be terminated. COBRA provides certain former employees, retirees, spouses, former spouses, and dependent children the right to temporary continuation of health coverage at group rates. Group health coverage for COBRA participants is usually more expensive than health coverage for active employees, although it tends to be less expensive individual health plans. Generally health benefits may be continued for 18 months or longer depending on the employer's plan and other circumstances. {From: http://www.dol.gov/ebsa/faqs/faq_consumer_cobra.html; May 12, 2006.}

exhausted in the low intensity setting precluding a return to treatment of higher intensity and greater professional expertise.

Occasionally, treatment for cognitive rehabilitation is covered only in acute or post-acute settings. Such policy restrictions are based on the flawed assumption that an individual with brain injury has "recovered" when he or she is discharged from structured treatment. No provisions are made for the dynamic challenges of living with brain injury and the necessity for additional cognitive treatment or strategy development as life circumstances change. Indeed, models from other chronic illnesses, such as diabetes mellitus, are more relevant to brain injury treatment than models based on emergency care, as the former contain contractual provisions for continuing case monitoring, patient education and relapse prevention.

The operational definition of cognitive rehabilitation, whether narrow or broad, affects covered services and can lead to coverage denial depending on how a service is labeled. Moreover, adaptation of rehabilitation policy standards intended for treatment of physically-based disorders has mixed results because recovery periods for such disorders are typically much shorter than for brain injury.

Because of limitations in coverage, professionals are sometimes forced to have basic and limited goals within the time frame allowed and are unable to address restorative approaches or more complex compensatory procedural treatments that have longer-lasting effects. As a consequence, immediate concerns, such as safety awareness, may be alleviated, but learning is seldom generalized to other situations or useful in meeting future needs. While a short-term focus can attain rapid outcomes that satisfy payers, these approaches lack long-term utility and flexibility needed in an evolving chronic condition.

The Blue Cross and Blue Shield Association Technology Evaluation Center (TEC) report[8] concludes that the efficacy of cognitive rehabilitation has not been adequately demonstrated; therefore, cognitive rehabilitation does not meet the TEC criteria for covered services. In many states, the Blue Companies® do not support cognitive rehabilitation. Recently, however, an independent external review organization overturned a BlueCross BlueShield of Montana denial for cognitive rehabilitation services, requiring the company to pay for treatment after a year of denials and appeals.[9,10]

Wellmark BlueCross BlueShield of Iowa revised its policy to include coverage of cognitive rehabilitation. The revised policy states:

---

[8] Blue Cross and Blue Shield Association Technology Evaluation Center. Cognitive rehabilitation for traumatic brain injury in adults. *TEC Assessment Program*. 2002; 17(20).

[9] McCarty, J. Cognitive rehabilitation denial overturned. *The ASHA Leader*. 2006; 11(9):1-22.

[10] Commercial insurance companies have an established protocol for internal appeals and reviews. In 42 states, insurance companies are subject to an external review process; see www.healthinsuranceinfo.net for each state's procedure and contact points.

> "Cognitive rehabilitation may be considered medically necessary following a stroke or brain injury when the plan of care documents specific diagnosis-related goals for a patient who has a reasonable expectation of achieving measurable improvements in a reasonable and predictable period of time."[11]

Aetna also reversed a previously restrictive policy and provides the following language pertaining coverage of cognitive rehabilitation:

> "I. Aetna considers cognitive rehabilitation as adjunctive treatment of cognitive deficits (e.g., attention, language, memory, reasoning, executive functions, problem solving, and visual processing) medically necessary when *all* of the following are met:
>
> A. The cognitive deficits have been acquired as a result of neurological impairment due to trauma, stroke, or encephalopathy, *and*
> B. The member has been seen and evaluated by a neuropsychiatrist or neuropsychologist, *and*
> C. Neuropsychological testing has been performed and neuropsychological results will be used in treatment-planning and directing rehabilitation strategies, *and*
> D. The member is expected to make significant cognitive improvement, e.g., is not in a vegetative or custodial state.[12]

Individual and Family Perspectives

Calls to the Brain Injury Association of America from individuals and family members consistently report frustration and dissatisfaction with delays and denials of coverage for cognitive rehabilitation and other services. Research demonstrates that the emotional disturbances and disorders of executive function contribute distinctively to family burden[13]. The emotional and financial toll of cognitive deficits following brain injury cannot be overstated.

Brain injuries also exact an enormous cost from society at large. The Centers for Disease Control and Prevention reports the annual cost of medical care and lost productivity was nearly $60 billion across the U.S. in 1995.[14] As individuals are left with disabling cognitive impairment following brain injury, they are often unable to return to the workforce, may draw SSI or SSDI, may access public housing or other public assistance benefits, and may require another family member to leave the workforce to provide for their cognitive supervision. The injured person and other family members may become

[11] http://www.wellmark.com/e business/provider/medical policies/policies/cognitive rehabilitation.htm
[12] http://www.aetna.com/cpb/data/CPBA0214.html
[13] Lezak, MD. Brain damage is a family affair. *Journal of Clinical & Experimental Neuropsychology*. 1988; 10(1):111-123.
[14] Thurman D. The epidemiology and economics of head trauma. In: miller L, Hayes R, Editors. Head trauma: basic, preclinical, and clinical directions. New York (NY): Wiley and Sons. 2001.

uninsured/medically indigent. For these reasons, the public has a stake in all aspects of brain injury rehabilitation.

Public Responsibility

Federal, state and territorial governments provide medical assistance to children, individuals who are aged, blind, and/or disabled and those with low incomes through the Medicare, Medicaid and State Children's Health Insurance Programs as authorized by the Social Security Act. Many individuals with brain injury are eligible for medical care and related services under these programs as well as other programs administered by state and local governments.

Using Medicaid Home and Community-Based Services Waivers, states may target services to certain age groups, geographic areas, and/or functional abilities by selecting a mix of services that best meet the needs of the population. As of 2004, 25 states have established brain injury-specific Medicaid Waivers to fund case management, home health care, personal care attendants, respite care and other services for individuals with brain injuries. In 14 of the 25 states, cognitive rehabilitation is included among the menu of services offered. Cognitive rehabilitation is offered in two additional states whose Medicaid Waiver programs are not limited to individuals with brain injury.[15]

Individuals with brain injuries who meet eligibility requirements may access health and other services via public programs financed by income taxes and other fees and fines assessed in the state. As of 2004, 18 states have legislation in place to support funding for brain injury-specific services. Cognitive rehabilitation is funded in 12 of these programs. Legislators in five other states annually appropriate general or special revenue to cover cognitive therapies for individuals with brain injury who meet eligibility criteria.[16] Public payers limit the scope, duration and intensity of cognitive rehabilitation services.

In addition to allocating taxpayer funds, in 2002, policymakers began responding to constituent demands for expanded availability of cognitive rehabilitation. The Texas State Legislature enacted House Bill 1676 to prohibit carriers that write accident and health insurance policies in the state from excluding "coverage for cognitive rehabilitation therapy, cognitive-communication therapy, neurocognitive therapy and rehabilitation neurobehavioral, neuropsychological, and psychophysiological testing or treatment, neurofeedback therapy, remediation, post-acute transition services, or community reintegration services necessary as a result of and related to an acquired brain injury."[17]

In January 2006, Senate Bill 6563 was introduced in the New York State legislature and referred to the committee on insurance. The legislation would require the inclusion of

[15] King, A & Vaughn, S. *Guide to state government brain injury policies, funding and services, 2nd ed.* Bethesda, MD: National Association of State Head Injury Administrators, 2005.
[16] Ibid.
[17] http://www.captital.state.tx.us/cgi-bin/tlo/textframe.cmd?LEG=77&SESS=R&CHAMBER

cognitive rehabilitation in every medical or major medical health policy at a level that meets or exceeds Medicare's standard of care.[18] Given the caps for reimbursement and the cost for treatment by a registered occupational therapist or speech/language pathologist with the highest level of professional certification services, Medicare's standard of care provides a maximum of 18 hours of therapeutic services on annual basis.[19]

EVIDENCE FOR EFFICACY

Inconsistent coverage for cognitive rehabilitation is usually attributed to the paucity of definitive evidence for efficacy. In fact, the body of literature on cognitive rehabilitation has been growing and now includes more than 770 studies of varying quality that support the benefit of various types of cognitive rehabilitation.

In the medical community, treatment guidelines are established through a consensus process that entails a review of relevant literature in peer-reviewed publications. Stringent procedures are used for identification and inclusion of published studies. The search results are scrutinized and relevant studies are then stratified into classes based on the rigor of the methodology, design, and statistical power of the research conducted. Results of the literature review are combined with input from expert peer groups convened for the purpose of subject review. Input from patient advocates groups may also be invited. From this exhaustive process, treatment guidelines emerge and are updated regularly to reflect advances in research and clinical practice. In this manner, both the art and science of medicine are integrated into treatment guidelines.

As of 2005, more than ten scientific organizations or professional associations[20] had adopted treatment guidelines or position statements that provide strong and convincing support for general rehabilitation of people with brain injury; specific guidelines for general rehabilitation and for cognitive rehabilitation; requisite training and preparation for professionals undertaking cognitive rehabilitation; and specificity pertaining to

[18] State of New York 229th Annual Legislative Session, Senate Bill 6563, Introduced by Sen. Bonacic, January 31, 2006.

[19] Current Medicare reimbursement schedules provide a cap for occupational therapy services at $1,740 per year and a cap of $1,740 per year for physical therapy or speech/language pathology services combined. As both occupational therapists and speech language pathologists with the highest level of professional certification provide cognitive rehabilitation services at the rate of $196 per hour. Therefore, the maximum number of hours per year available for cognitive rehabilitation would be 18 as follows: $3480 divided by $196 equals 18 hours.

[20] Treatment guidelines and position statements have been adopted by the Academy of Neurologic Communication Disorders and Sciences; American Congress of Rehabilitation Medicine; American Speech/Language/Hearing Association in conjunction with Division 40 (Clinical Neuropsychology) of the American Psychological Association; British Society of Rehabilitation Medicine in collaboration with the Royal College of Physicians (2003); European Federation of Neurological Societies; National Academy of Neuropsychology; Society for Cognitive Rehabilitation; and the State of Colorado Department of Labor and Employment's Division of Workers' Compensation (2005). It should be noted that the Cochrane Collaboration Reviews (Cochrane Database of Systematic Reviews), although supportive in the majority, are limited in their scope as cited literature is greater than 5 to 8 years old.

treatment interventions and techniques that have demonstrable efficacy in cognitive rehabilitation.

Evidence from Literature Reviews

The National Institutes of Health (NIH) convened a consensus development conference in 1998 to report on the scientific basis of therapeutic interventions for sequelae of brain injury.[21] An independent panel reviewed the literature for cognitive rehabilitation published through August 1998 and concluded that the data were limited by heterogeneity of the subjects of the studies, the interventions applied and the outcome measures used. These problems point out the exceptional challenges in studying these treatments in this population.

Although comprehensive conclusions about the effectiveness of cognitive rehabilitation could not be reached, the NIH panel noted good evidence for effectiveness of specific interventions using compensatory devices, such as memory books. Further, the panel noted the evidence supported the probable effectiveness of interventions to improve specific cognitive processes, such as attention, memory and executive skills. The consensus report concluded:

> "Evidence supports the use of certain cognitive and behavioral rehabilitation strategies for individuals with brain injury in particular circumstances. These interventions share certain characteristics in that they are structured, systematic, goal-directed, and individualized and they involve learning, practice, social contact, and a relevant context."[22]

As part of the NIH Consensus Development Conference, Chesnut and colleagues reviewed 32 studies based on highly restricted criteria, such as limiting the study participants to individuals with traumatic brain injury. They found limited evidence to support certain forms of cognitive rehabilitation in treating memory and anxiety and in improving self-concept and interpersonal relationships. They cautioned that long-term benefit and clinical relevance were not well established.

Experts from the Brain Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine published an evidence-based review of the cognitive rehabilitation literature in 2000[23] and a comprehensive updated review in 2005 that included articles not available in the 1998 and 2001 Cochrane Reviews.[24] The review encompassed 171 articles in the first report and an additional 87 studies in the update.

---

[21] National Institutes of Health. *Report of the Consensus Development Conference on the Rehabilitation of Persons with Traumatic Brain Injury*. Bethesda, MD. September 1999.
[22] Ibid.
[23] Cicerone KD, Dahlberg C, Kalmar K, et al. Evidence-based cognitive rehabilitation: recommendations for clinical practice. *Arch Phys Med Rehabil*. 2000; 1596-1615.
[24] Cicerone KD, Dahlberg C, Malec JF, et al. Evidence-based cognitive rehabilitation: updated review of the literature from 1998 through 2002. *Arch Phys Med* Rehabil. 2005; 1681-1692.

The reviews were not restricted to traumatic brain injury, but also included treatments studied in stroke survivors. Overall, there were 46 Class I studies (prospective, randomized controlled methodology) and 43 Class II studies (prospective cohort studies, retrospective case-controlled studies or series with well-designed controls). For Class I studies involving both patients with stroke and patients with brain injury, 78.7% of the comparisons demonstrated a benefit of cognitive rehabilitation over the alternative treatment. They concluded that "there is substantial evidence to support cognitive rehabilitation for people with brain injury."[25] An additional 28 studies were reviewed by Gordon et al., 2006,[26] and it was found that the research reviewed provided further evidence for the efficacy of cognitive rehabilitation. Similarly, positive conclusions were drawn in a recent volume devoted to the effectiveness of cognitive rehabilitation that was based on an international conference convened in 2002, which included the world's top researchers in the area of rehabilitation for attention, memory, language and executive deficits.[27]

Clearly a growing body of evidence exists that supports the effectiveness of cognitive rehabilitation for persons with brain injury. Whether more positive or negative in their conclusions, all of these reviews emphasize that more research is needed to strengthen the evidence and better answer specific questions about what methods of rehabilitation are effective, for whom, and at what time post-injury.

Evidence from Basic Science

Cognitive function is broadly represented throughout the brain. Cognitive domains, such as attention, memory, language, spatial and executive functions are subserved by widely distributed neural networks with nodal centers in particular cortical and subcortical regions. For instance, executive function is primarily ascribed to frontal lobe cortices and associated subcortical pathways. These pathways are comprised of both open and closed loop circuits that project to subcortical structures, including the striatum, globus pallidus and thalamus, and other parts of the cortex, receiving and modulating neural activity throughout the brain. In all, there are virtually no areas of the brain that do not impact cognitive function.

Brain injuries affect the neural pathways for cognitive functioning in a number of ways.[28] Brain injuries that are focal in nature, such as focal contusions, disrupt relatively localized cortical or subcortical areas when compared to the broadly distributed and multi-focal effects of diffuse injuries, such as diffuse axonal injury. Recent evidence demonstrates that even focal lesions can result in damage to remote structures in the

[25] Ibid.
[26] Gordon WA, Zafonte R, Cicerone K, Cantor J, Brown M, Lombard L, Goldsmith R, Chandna T. Traumatic brain injury rehabilitation state of the science. *Amer J Phys Med Rehabi.* 2006; 85(4):343-82.
[27] Halligan PW, Wade DT, (Eds.) *Effectiveness of rehabilitation for cognitive deficits*. Oxford University Press, 2005.
[28] Povlishock JT, Katz DI. Update of neuropathology and neurological recovery after traumatic brain injury. *J Head Trauma Rehabi.* 2005; 20:76-94.

brain, potentially causing more widespread disruption of cognitive networks. Focal and diffuse brain injury are often combined and usually associated with secondary injury from a variety of other processes, such as nerve cell loss from surges of excitatory neurotransmitters. In general, the degree of cortical and subcortical damage can be expected to correlate with the degree of impairment of cognitive function.

Brain recovery after injury has been ascribed to at least three mechanisms: reduction of diaschisis, compensation and adaptive plasticity.[29] Diaschisis, the reduction in function of remote areas of brain connected to the damaged areas, begins to reverse during early stages of recovery. Compensation, the attempt to use alternate strategies to substitute impaired functions, and adaptive neuroplasticity are mechanisms that begin early and continue long after the injury. Neuroplasticity, use-dependent modulation of the functional organization of cortical brain representations is a normal brain capacity that facilitates learning of motor and cognitive skills over a lifetime. The same capacity that is necessary for experience-based learning in the uninjured brain appears to be an important mechanism for brain reorganization and recovery of function after brain injury. The molecular and cellular mechanisms of neuroplasticity are being intensively investigated.

In the last 20 years, animal models have clearly demonstrated modulation and reorganization of cortical representations of motor, somatosensory and visual functions in response to new behavioral requirements and skill acquisition in normal and injured animals. Similar processes have been demonstrated in humans using functional neuroimaging (see below). These adaptive changes in brain organization do not occur passively but require the individual to be actively engaged in skill acquisition. Repetitive activity alone in the absence of skill acquisition is not sufficient to induce these changes.[30] Further, changes in brain organization do not occur immediately, but improve with longer interactions and require a minimal period of training.[31] There are clear implications of these findings for the role of rehabilitation in cognitive and motor recovery after brain injury. Rehabilitative efforts that lead to improvement in function after brain injury can be associated with lasting changes in brain structure and physiology. Such adaptive plasticity and learned compensations require directed training and practice, and likely have minimal time periods necessary to assure durable improvements.

Evidence from Imaging Studies

Functional neuroimaging techniques are being used to study the normal patterns of brain activity in numerous perceptual, motor and cognitive activities. Evidence from human

[29] Nudo RJ, Dancause N. Neuroscientific basis for occupational and physical therapy interventions. In Zasler ND, Katz DI, Zafonte RD. *Brain injury medicine*. New York: Demos, 2006.

[30] Plautz, EJ, Milliken, GW, and Nudo, RJ. Effects of repetitive motor training on movement representations in adult squirrel monkeys: role of use versus learning, *Neurobiol Learn Mem.* 2000; 74(1):27-55.

[31] Kleim JA, Hogg TM, VandenBerg PM, Cooper NR, Bruneau R, Remple, M. Cortical synaptogenesis and motor map reorganization occur during late, but not early, phase of motor skill learning, *J Neurosci.* 2004; 24(3):628-33.

studies employing functional neuroimaging demonstrates the injured brain is capable of rapid and long-term physiologic and structural reorganization in response to learning and experience. A number of studies using functional neuroimaging of persons with brain injury demonstrate changes in brain activation toward more normal patterns of activity correlated with improving function after rehabilitative treatment. For example, in a study of a visuospatial working memory task, practice led to improvement in performance that was associated with decreasing levels of activation of frontal and parietal cortex as the task was learned.[32]

In a study of patients with left neglect after right hemisphere brain injury, PET scan studies before and after a 2 month rehabilitative intervention showed greater activation of right hemisphere areas associated with attention in conjunction with improvement in tests of neglect and spatial skills.[33] Laastch and colleagues recently demonstrated cortical reorganization following cognitive rehabilitation in five patients who showed marked enhancement in fMRI activity in brain areas related to the tasks being trained.[34]

It is clear that the injured brain can react and can be facilitated through medical and rehabilitative treatment in a variety of ways that contribute to the return of function. Improved function is associated with changes in brain organization that can be tracked with functional imaging. Behavioral interventions and skill-based activities are perhaps the most powerful modulators of post-injury brain plasticity.

SUMMARY AND CONCLUSIONS

Impairments of cognitive function are common and important problems that lead to disability after acquired brain injury. Cognitive rehabilitation is central to the treatment and recovery of individuals with brain injury because it impacts many problems that interfere with productive living, appropriate social interaction and functional independence. Yet, individuals with brain injury often have difficulty obtaining cognitive rehabilitation services and undue burdens are often placed on caregivers to find proper care and support. Cognitive disability following brain injury poses a major public health problem and a serious economic burden to the private and public sectors.

Cognition is a neurophysiologically-based function that is modifiable by medical and rehabilitative treatments. Cognitive rehabilitation has been demonstrated to be effective in reducing cognitive disability following brain injury and should be covered by public and private medical insurance. The Centers for Medicare and Medicaid Services (CMS) should take the lead and incorporate public comment in developing a national standard of care for cognitive dysfunction following brain injury and should provide ongoing

[32] Garavan H, Kelley D, Rosen A, et al. Practice-related functional activation changes in a working memory task. *Microsc Res Tech.* 2000; 51:54-63.
[33] Pizzamiglio L, Perani D, Cappa S, et al. Recovery of neglect after right hemisphere damage. *Arch Neurol.* 1998; 55:561-568.
[34] Laatsch LK, Thulborn KR, Krisky CM, Shobat DM, Sweeney. Investigating the neurobiological basis of cognitive rehabilitation therapy with fMRI. *Brain Injury.* 2004; 18:957-974.

payment for medically necessary services in the treatment of cognitive dysfunction following brain injury.

Systems of care for persons with brain injury must recognize that many persons with brain injury have long-term and, sometimes, lifelong needs because of cognitive dysfunction. The present health care system often only supports the early care of persons with brain injury. Support for cognitive rehabilitation must extend beyond hospitalization and the immediate post-hospitalization period. Cost-effective care and support must be developed for persons with brain injury and their families who have longer-term needs. The disease management models that have been developed for other chronic disorders, such as heart disease, diabetes and kidney disease may offer insights for developing better long-term systems of care for persons with brain injury.

The provision of cognitive rehabilitation should be effective and cost-conscious. In order to achieve these goals, providers must recognize their responsibilities in maintaining professional standards and monitoring delivery of treatment. Cognitive rehabilitation should be provided and supervised by qualified practitioners, and applied in the context of accurate diagnosis of the brain injury and subsequent cognitive impairments. Treatment plans should be formulated with respect to prognosis and natural history, targeting problems that are not expected to resolve spontaneously.

Cognitive rehabilitation should be based upon sound scientific theoretical constructs with clearly stated goals and measurable outcomes. Medical and allied health professional education programs should enhance training in cognitive neuroscience and diagnosis and treatment of cognitive dysfunction. Case management professionals should receive similar training and recognize and exercise the responsibility to advocate for those who are unable to advocate fully for themselves due to cognitive dysfunction.

Federal and private research funding and projects targeting the study of cognitive neuroscience and the diagnosis and treatment of cognitive dysfunction following brain injury should be substantially increased. The public would also be served by development of better standards and systems of care for brain injury and systems to monitor the provision and payment of services.

The fact that research questions remain about cognitive rehabilitation should not be an excuse to withhold payer support for treatment, any more than heart surgery should be withheld because surgical techniques are being continuously refined through clinical research. Persons with brain injury must have treatment services for cognitive problems and best practices must be based on the available body of knowledge at any given time. Persons with brain injury and their families must have available services and payer support for treatment of cognitive and related problems over the time period necessary. Availability, accessibility and ease of movement among services in systems of care for persons with brain injury must be improved.

RECOMMENDATIONS

Based on the foregoing, the Brain Injury Association of America offers the following recommendations:

1. **Cognitive rehabilitation should be a covered benefit for persons with brain injury, supported by all public and private payers.**

2. **Cognitive rehabilitation should be based on sound scientific theoretical constructs and, when available, evidence for best practices, with clearly stated goals and quantifiable outcomes.**

3. **Cognitive rehabilitation should be provided by qualified practitioners. Qualified practitioners are clinicians who have fulfilled the requirements for professional certification and licensure in their respective medical and allied health disciplines.**

4. **Cognitive rehabilitation treatment strategies and goals, and the duration, scope, intensity, and interval of treatment should be determined based on appropriate diagnosis and prognosis, the individual functional needs of the person with brain injury and reasonable expectations of continued progress with treatment.**

5. **Treatment planning, case management and health insurance coverage for cognitive rehabilitation should respect the long-term scope and changing needs of persons with brain injury. Necessary treatment for cognitive problems should not be constrained by arbitrary time limits or caps on the number of treatment sessions. Improved longer-term systems of treatment should be developed, supported by public and private payers, employing disease management models, to support persons with brain injury with extended needs.**

6. **There should be an increase in priority for public and private research funding of questions related to cognitive rehabilitation to achieve better understanding of cognitive disorders after brain injury and how cognitive rehabilitation interventions improve recovery and functioning. Specific priorities should include questions about what interventions are effective for what particular problems, at what intensities and intervals post-injury.**

7. **There should be an increased emphasis on proper education, training, certification and continuing education for professionals and support staff involved in cognitive rehabilitation.**

8. **The particular needs of children with brain injury and their families, including developmental and educational implications of cognitive rehabilitation, and issues pertaining to transition to adulthood, have to be addressed by providers, payers and the entire health care system.**

9. **Cognitive rehabilitation should be integrated into and coordinated with vocational services, special education, and community based programming such as supported living, support networks, and recreation groups so that individuals move seamlessly within a comprehensive, coordinated system of care that is adequately funded.**

10. **All states should have an external review process for medical claims, and individuals who have been denied coverage for cognitive rehabilitation should fully avail themselves of all internal and external processes.**

The Board of Directors of the Brain Injury Association of America adopted this position statement in November 2006. The Association will continue to review the topic of cognitive dysfunction and cognitive rehabilitation following brain injury as scientific and public policy progress dictates.