Cognitive Rehabilitation Therapy

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Line(s) of Business: HMO; PPO; QUEST Integration
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Section: Rehabilitative Therapy (PT; OT; Speech)
Place(s) of Service: Outpatient

I. Description
Cognitive rehabilitation is a therapeutic approach to improve cognitive functioning after central nervous system insult. It includes an assembly of therapy methods that retrain or alleviate problems caused by deficits in attention, visual processing, language, memory, reasoning, problem solving, and executive functions. Cognitive rehabilitation consists of tasks designed to reinforce or reestablish previously learned patterns of behavior or to establish new compensatory mechanisms for impaired neurological systems. Cognitive rehabilitation may be performed by a physician, psychologist, or a physical, occupational, or speech therapist.

For individuals who have cognitive deficits due to traumatic brain injury who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes randomized controlled trials (RCTs), nonrandomized comparison studies, case series, and systematic reviews. Relevant outcomes are functional outcomes and quality of life. The trials have methodologic limitations and report mixed results, indicating there is no uniform or consistent evidence base supporting the efficacy of this technique. Systematic reviews generally conclude that efficacy of cognitive rehabilitation is uncertain. The evidence is insufficient to determine the effect of the technology on health outcomes.

Clinical input provided strongest support for use of cognitive rehabilitation as part of the treatment of those traumatic brain injury. Cognitive rehabilitation may be considered medically necessary for traumatic brain injury based on this additional information.

For individuals who have cognitive deficits due to dementia who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs, nonrandomized comparison studies, case series, and systematic reviews. Relevant outcomes are functional outcomes and quality of life. Systematic reviews of RCTs have generally shown no benefit of cognitive rehabilitation or effects that were not clinically important. One large RCT with a goal-oriented cognitive rehabilitation program reported significantly less functional decline in 1 of 2 functional scales and lower rates of institutionalization in the cognitive rehabilitation group compared to usual
care at 24 months. These results need replication. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to stroke who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs and systematic reviews. Relevant outcomes are functional outcomes and quality of life. Four systematic reviews evaluating 3 separate domains of cognitive function showed no benefit of cognitive rehabilitation or effects that were not clinically important. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to multiple sclerosis who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs and systematic reviews. Relevant outcomes are functional outcomes and quality of life. Systematic reviews of RCTs have shown no significant effects of cognitive rehabilitation on cognitive outcomes. Although numerous RCTs have investigated cognitive rehabilitation in multiple sclerosis, high-quality trials are lacking. The ability to make conclusions based on the overall body of evidence is limited by heterogeneity of patient samples, interventions, and outcome measures. Further, results of the available RCTs are mixed, with positive studies mostly reporting short-term benefits. Evidence for clinically significant, durable improvements in cognition is currently lacking. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to other conditions (eg, epilepsy, autism spectrum disorder, postencephalopathy, cancer) who receive cognitive rehabilitation delivered by a qualified professional the evidence includes RCTs, nonrandomized comparison studies, and case series. Relevant outcomes are functional outcomes and quality of life. The quantity of studies for these conditions is much less than that for the other cognitive rehabilitation indications. Systematic reviews generally have not supported the efficacy of cognitive rehabilitation for these conditions. The RCTs have methodologic limitations, most often very short lengths of follow-up, that do not permit strong conclusions about the efficacy. The evidence is insufficient to determine the effect of the technology on health outcomes.

Background

Cognitive rehabilitation is a structured set of therapeutic activities designed to retrain an individual’s ability to think, use judgment, and make decisions. The focus is on improving deficits in memory, attention, perception, learning, planning, and judgment. The term cognitive rehabilitation is applied to various intervention strategies or techniques that attempt to help patients reduce, manage, or cope with cognitive deficits caused by brain injury. The desired outcome is improved quality of life or improved ability to function in home and community life. The term rehabilitation broadly encompasses reentry into familial, social, educational, and working environments, the reduction of dependence on assistive devices or services, and general enrichment of quality of life. Patients recuperating from traumatic brain injury have traditionally been treated with some combination of physical therapy, occupational therapy, and psychological services as indicated.
Cognitive rehabilitation is considered a separate service from other rehabilitative therapies, with its own specific procedures.

II. Criteria/Guidelines
   A. Cognitive rehabilitation (as a distinct and definable component of the rehabilitation process) is covered when provided by a qualified licensed professional such as a physician, licensed psychologist, speech therapist or occupational therapist (subject to Limitations and Administrative Guidelines) in the rehabilitation of patients with traumatic brain injury when the following criteria are met:
      1. Therapy must be prescribed by the attending physician as part of a written care plan
      2. Patient must show potential for improvement (based on pre-injury function), and patient must be able to actively participate in the program. Active participation requires sufficient cognitive function to understand and participate in the program as well as adequate language expression and comprehension, i.e., participants should not have severe aphasia; AND
      3. The patient is expected to show measurable and meaningful functional improvement within a predetermined timeframe (depending on the underlying diagnosis/medical condition) from the start of cognitive rehabilitation therapy. Goals and expected timeframes should be addressed prior to the onset of treatment; AND
      4. The treating physician should review the treatment plan at regular intervals to assess the continued need for participation and documented objective evidence of progress.

   B. Ongoing services are considered necessary only when there is demonstrated continued objective improvement in function.

III. Limitations

   Cognitive rehabilitation (as a distinct and definable component of the rehabilitation process) is not covered for all other applications, including, but not limited to, stroke, postencephalitic or postencephalopathy patients, autism spectrum disorders, seizure disorders, multiple sclerosis, the aging population, including patients with Alzheimer disease, and patients with cognitive deficits due to brain tumor or previous treatment for cancer because it is not known to be effective in improving health outcomes.

IV. Administrative Guidelines

   A. Precertification is required.
   B. Providers should submit their precertification request to HMSA’s Medical Management department via mail or fax, or use iExchange as indicated. The following documentation must be submitted from the medical record:
      1. Written care plan
      2. Clinical notes
      3. Imaging studies for initial requests to confirm the diagnosis of traumatic brain injury
   C. Patients requesting services that are not a covered benefit should be informed that they will be responsible to pay for the services. To prevent misunderstandings about financial responsibility,
the provider may ask the patient to sign an **Agreement of Financial Responsibility** prior to performing the services.

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<tr>
<th>CPT</th>
<th>Description</th>
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<tbody>
<tr>
<td>97532</td>
<td>Development of cognitive skills to improve attention, memory, problem solving (include compensatory training), direct (one-on-one) patient contact by the provider, each 15 minutes</td>
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<tr>
<th>ICD-10-CM</th>
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<tr>
<td>S06.0-S06.9x9</td>
<td>Traumatic brain injury, code range</td>
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### V. Scientific Background

This evidence review was originally created in 1997 and has been updated periodically with literature review. The most recent update with literature review covered the period through January 25, 2017. This review evaluates evidence for cognitive rehabilitation delivered by a qualified professional; studies of self-administered computer programs are not considered cognitive rehabilitation for the purposes of this evidence review and are not assessed here. Short-term improvement in cognitive test performance measured postintervention alone will not be considered a health outcome for the purposes of this review. Measurements of daily functioning and quality of life (QOL) are the primary health outcomes of interest. Improvement should be demonstrable after longer term follow-up postintervention, preferably greater than 6 months.

This evidence review was originally based on a 1997 TEC Assessment. The Assessment addressed a broad range of patient indications resulting from neurologic insults, including traumatic brain injury (TBI), stroke, postencephalopathy, and aging (including Alzheimer disease [AD]). Eighteen controlled trials were reviewed, primarily focusing on stroke and TBI. No controlled trials were available that specifically addressed other patient indications. No clear answer on the efficacy of cognitive rehabilitation emerged from the Assessment. The evidence was conflicting either because of study design, low power to detect differences, or variation in treatment. The Assessment concluded that data in the published peer-reviewed literature were inadequate to validate the effectiveness of cognitive rehabilitation as an isolated component or as 1 component of a multimodal rehabilitation program.

In 2013, the Cognitive Rehabilitation Task Force of the American Congress of Rehabilitation Medicine (ACRM) published a systematic review of cognitive rehabilitation on medical conditions affecting cognitive function. Literature was searched through the end of 2008. Of 11 clinical conditions reviewed (anoxia/hypoxia, encephalitis, epilepsy, HIV-AIDS encephalopathy, Huntington disease, systemic lupus erythematosus, Lyme disease and other tick-borne encephalopathy, neoplasms, Parkinson disease, metabolic encephalopathy), there was evidence to support a practice guideline only for children and adolescents with brain tumors who underwent surgical resection and/or radiotherapy (see Practice Guidelines and Position...
Statements section). The evidence for patients with seizure-related cognitive impairments is discussed in a later section herein.

**TRAUMATIC BRAIN INJURY**

**Systematic Reviews**
A 2013 Cochrane review assessed cognitive rehabilitation for executive dysfunction (planning, initiation, organization, inhibition, problem solving, self-monitoring, error correction) in adults with nonprogressive acquired brain damage. Sixteen RCTs (total N=660 patients; 395 TBI, 234 stroke, 31 other acquired brain injury) were included in pooled analyses. No statistically significant effects on measures of global executive function or individual component functions were found.

A 2008 TEC Assessment was completed on cognitive rehabilitation in traumatic brain injury. The objective of this Assessment was to determine whether there is adequate evidence to demonstrate that cognitive rehabilitation results in improved health outcomes.

Eleven RCTs of cognitive rehabilitation for specific cognitive defects showed inconsistent support for cognitive rehabilitation. Out of the 11 studies, 8 reported daily functioning or quality of life (QOL) outcomes. Three of the studies showed statistically significant differences between intervention groups and control groups on one outcome. However, 2 of the studies were extremely small. The findings were not consistent across other outcomes measured in the studies, and in one study, significant findings after the intervention were no longer present at 6 months of follow-up. All 11 studies also reported outcomes of various cognitive tests. These studies had numerous methodologic limitations, such as small sample size, lack of long-term follow-up, minimal interventions, and multiple outcomes.

In summary, the randomized trials considered in the 2008 TEC Assessment did not show strong evidence for efficacy in the treatment of traumatic brain injury.

**Randomized Controlled Trials**
RCTs not included in the Cochrane systematic review or TEC assessment will be described in the following paragraphs. An RCT comparing a comprehensive neuropsychologic rehabilitation program with standard rehabilitation was published in 2008. Sixty-eight patients were randomized to the 2 intervention groups for 16 weeks of treatment. Principal outcomes were the Community Integration Questionnaire (CIQ) and the Perceived Quality of Life scale (PQOL). Treatment effectiveness was evaluated by an interaction between intervention and pre- to post-treatment. Such an interaction was significant for the CIQ (p=0.042) and the PQOL (p=0.049) but not for any of the secondary neuropsychologic outcomes. The proportion of patients having a clinically significant improvement in CIQ (4.2 points) is not reported. Follow-up assessments were also done at 6 months after treatment, but these were not subjected to formal statistical analysis. The standard treatment group had further improvements in the CIQ such that their mean follow-up CIQ score is very similar to the intervention group (12.9 versus 13.2). For the PQOL scores, the differences observed at the end of treatment were maintained or increased by
6 months. This randomized trial, thus, has mixed findings of efficacy of comprehensive neuropsychologic rehabilitation for traumatic brain injury.

Chiaravalloti et al (2016) conducted an RCT of the Story Memory Technique to improve learning and memory in subjects with TBI. Sixty-nine subjects were randomized to treatment or control. Assessments were performed at the end of treatment (5 weeks) and at 6 months posttreatment. Outcomes were statistically significant in favor of the treatment group for several measures assessing memory at 5 weeks. Results at 6 months were less definitive.

Section Summary: Traumatic Brain Injury
Although some randomized trials have shown improvement in some outcomes with cognitive rehabilitation, systematic reviews have provided mixed findings, with no consistent evidence of efficacy in patients with TBI.

DEMENTIA INCLUDING AD

Systematic Reviews
In 2015, Huntley et al performed a meta-analysis of cognitive interventions in dementia. Thirty-three studies were included. Interventions were divided into categories such as cognitive training, cognitive stimulation, and cognitive rehabilitation. Studies classified as cognitive stimulation had a significant effect as measured on the Mini-Mental State Examination (MMSE) and the Alzheimer’s Disease Assessment Scale–Cognition (ADAS-Cog). The authors concluded that benefit measured on the ADAS-Cog was generally not clinically significant.

In a 2013 Cochrane review, Bahar-Fuchs evaluated the use of cognitive training (task-focused) or rehabilitation (strategy-focused) in AD and vascular dementia. Evidence from 11 RCTs did not demonstrate improved cognitive function, mood, or activities of daily living in patients with mild to moderate AD or vascular dementia with cognitive training. One high-quality RCT of cognitive rehabilitation in 69 patients with early-stage AD (Mini-Mental Status Exam [MMSE] score, ≥18) showed short-term improvements in patient-rated outcomes. A 2011 Cochrane review of interventions for persons with mild cognitive impairment concluded that there was little evidence on the effectiveness and specificity of such interventions, because improvements observed were similar to effects seen with active control interventions.

Randomized Controlled Trials
Ameiva et al (2016) reported results of the ETNA3 multicenter RCT comparing 4 therapies strategies: standardized programs of cognitive training (group sessions), reminiscence therapy (group sessions), individualized cognitive rehabilitation program (individual sessions), and usual care. Six hundred fifty-three patients with mild-to-moderate AD were randomized in a 1:1:1:1 ratio at 40 French clinical sites. This summary will focus on the cognitive rehabilitation program and usual care arms. The primary outcome was the rate of survival without moderately severe to severe dementia at 2 years. Secondary outcomes were cognitive impairment, functional disability, behavioral disturbance, apathy, QOL, depression, caregiver burden, and resource
utilization. Participants and clinical staff were not blinded to treatment assignment but outcome assessments were done by blinded physicians and psychologists. The cognitive rehabilitation therapy consisted of a “made-to-measure” program and conducted in individual sessions and adapted to the patients’ cognitive abilities with goals selected to be personally relevant to the patient. Intention-to-treat analyses were performed using “missing equal failure” to replace missing values. Approximately 90% of participants had the 3-month follow-up visit and 72% had the 24 month visit. There was no difference between the cognitive rehabilitation group and the usual care group with respect to the primary outcome. However, the patients who received the cognitive rehabilitation therapy had less functional decline at 24 months compared to the usual care group as measured by 1 of the 2 scales assessing functional abilities: AGGIR scale (p=0.02). The rate of institutionalization was lower in the cognitive rehabilitation therapy group than in the usual care group (27% vs 19%). These results are promising but given the lack of consistency in benefit on the 2 functional scales, replication is needed to confirm positive findings.

Regan et al (2017) reported an RCT of a home-based, 4-session, goal-oriented cognitive rehabilitation program versus usual care in 55 patients with mild cognitive impairment (MCI) and early AD. Patients were community-dwelling with a diagnosis of MCI or AD within 6 months of enrollment and a MMSE score greater than 20. The intervention group received 4 weekly 1-hour therapy sessions delivered by experienced therapists with a focus on addressing personally meaningful goals. All participants identified at least 1 goal for improvement. The usual care group had no contact with the research team between their initial and final assessments. The primary outcome measures were goal performance and satisfaction scores on the Canadian Occupational Performance Measure (COPM). Twelve participants in the intervention group and 3 participants in the control group discontinued study participation and were excluded from the final, per-protocol analysis. For the first identified goal, the intervention group had significantly higher improvement in performance and satisfaction on the COPM compared to the control group. There were no differences in secondary measures of QOL or anxiety and depression. The per-protocol results are biased due to high rate of missing data.

Thivierge et al (2014) in Canada reported a small (N=20), assessor-blinded, block-randomized, crossover trial of an individualized memory rehabilitation program in patients with mild to moderate AD. The Memory Rehabilitation Program comprised 4 weeks of training by a patient’s caregiver to improve performance of 1 instrumental activity of daily living (IADL) selected by the patient and caregiver. Errorless learning (assistance provided to minimize errors) and spaced retrieval (expanded delays, from 30 seconds to 8 minutes, between each correct performance of the task) were used to facilitate learning at each patient’s own pace. The primary outcome was a measure of assistance required to perform the task correctly at 1, 4, and 8 weeks after training. In comparison with untrained (in period 1) or previously trained (in period 2) controls, statistically significant improvements in performance were observed immediately after training (ie, at posttreatment week 1) in both periods and at posttreatment week 4 in period 2. A statistically significant (compared with baseline) improvement in performance occurred in period 1 controls. Performance of the target IADL declined within 2 to 3 months after completion of training. Improvements in other outcomes (general memory and cognitive ability, overall function, quality of life, and behavioral/psychological symptoms) were not observed.
Individual randomized trials have shown variable outcomes of cognitive rehabilitation. Kurz et al (2012) conducted an RCT of patients with Alzheimer disease and early dementia. The population comprised 201 patients with clinical evidence of dementia and a MMSE score of at least 21 out of 30 points who were randomized to a 12-week cognitive rehabilitation program or standard medical management (site-specific). There were no between-group differences on any outcome measure. There also were no group differences on subgroup analyses by age, gender, education level, or baseline cognitive ability, except that depression scores improved significantly for females, but not males, in the intervention group.

Another randomized study published in 2004 of 54 patients by Chapman et al evaluated the combined effect of a cognitive-communication therapy plus an acetylcholinesterase inhibitor versus drug treatment alone. A positive effect for the inhibitor cognitive rehabilitation group was found for discourse abilities, functional abilities, emotional symptoms, and overall global performance. Beneficial effects were reported up to 10 months after active intervention.

In 2003, Spector et al published a randomized trial of 115 patients assigned to a cognitive stimulation program or to a control group. The intervention program ran for 7 weeks, and patients were only evaluated at completion. The treatment group had significantly higher scores on the principal outcome, MMSE, with a group difference of 1.14 points. Differences were also significant for secondary outcomes, a quality-of-life score for Alzheimer disease and an Alzheimer disease assessment scale. The study did not assess any outcomes beyond the 7-week period of treatment, and the authors speculated that the intervention would need to be continued on a regular basis beyond 7 weeks.

Section Summary: Dementia, Including AD
Systematic reviews of RCTs have generally shown no benefit of cognitive rehabilitation or effects that are not clinically important. Most randomized trials either have not showed effects, showed only short-term effects, or did not evaluate long-term outcomes. One large RCT with a goal-oriented cognitive rehabilitation program reported significantly less functional decline in 1 of 2 functional scales and institutionalization in the cognitive rehabilitation group compared to usual care at 24 months.

STROKE

Systematic Reviews
Four Cochrane reviews assessed the effectiveness of cognitive rehabilitation for recovery from stroke. The reviews evaluated spatial neglect, attention deficits, and memory deficits. The most recent updates of these reviews for these 3 domains made the following conclusions:
- Spatial neglect: A 2013 update identified 23 RCTs with 628 patients. There was very limited evidence of short-term improvements on tests of neglect with cognitive rehabilitation. However, for reducing disability due to spatial neglect and increasing independence, effectiveness of cognitive rehabilitation remained unproven.
- Attention deficit: A 2013 update identified 6 RCTs with 223 patients. There was limited evidence of short-term improvement in divided attention (ability to multitask), but no
indication of short-term improvements in other aspects of attention. Evidence for persistent effects of cognitive rehabilitation on attention or functional outcomes was lacking.

- Memory deficit: A 2016 update identified 13 trials with 514 patients. There were statistically significant benefits in subjective measures of memory in the short term (i.e., the first assessment measurement after the intervention) but not in the longer term (i.e., the second assessment measurement after the intervention). The quality of the evidence ranged from very low to moderate; there was poor quality of reporting in many studies, lack of consistency in the choice of outcome measures, and small sample sizes.

In 2015, Gillespie et al published a review of Cochrane reviews and a more recent published RCT assessing rehabilitation for poststroke cognitive impairment. Data from 44 trials involving more than 1500 patients were summarized. In addition to poststroke spatial neglect, attention and memory deficits (addressed in the 3 Cochrane publications previously described), poststroke perceptual disorders, motor apraxia, and executive dysfunction were reviewed. Conclusions were:

- Very little high-quality evidence for the effectiveness of cognitive rehabilitation for poststroke cognitive deficits exists.
- Current evidence indicates that cognitive rehabilitation for spatial neglect, attention deficits, and motor apraxia improve standardized assessments of impairment immediately after treatment. However, durability and clinical significance of these improvements is unclear.
- Evidence for the effectiveness of cognitive rehabilitation for poststroke memory deficits, perceptual disorders, or executive dysfunction was not identified.

A 2001 review of the rehabilitative management of post-stroke visuospatial inattention also concluded that long-term impacts of visual scanning and perceptual retraining techniques on overall recovery and functional outcome were unclear.

Randomized Controlled Trials
Zucchella et al (2014) conducted an assessor-blinded RCT of comprehensive cognitive rehabilitation, combining computer training and metacognitive strategies within 4 weeks after stroke. Of 288 consecutive stroke survivors admitted to a neurorehabilitation unit in Italy, 92 (32%) met inclusion criteria and were randomized to cognitive rehabilitation (n=45) or control (n=47). At the end of treatment (i.e., at week 4), statistically significant differences were found between groups on some measures of memory and visual attention. The clinical significance of these short-term outcomes is unclear.

Section Summary: Stroke
Recent systematic reviews generally report limited effects of cognitive rehabilitation in stroke patients.

MULTIPLE SCLEROSIS

Systematic Reviews
Three Cochrane reviews evaluated cognitive rehabilitation in patients with multiple sclerosis (MS) and cognitive impairments. In a 2016 update, das Nair et al included 15 studies with 989 patients. There were no differences in subjective reports of memory functioning or mood. There was some evidence of a significant effect of intervention on objective assessments of memory in both the immediate and long-term follow-up and QOL in intermediate follow-up. However this effect on objective memory outcomes and quality of life changed from statistically significant to not significant when studies at high risk of bias were excluded.

Rosti-Otajarvi et al (2014) conducted a subsequent Cochrane review of neuropsychological rehabilitation in MS. Twenty RCTs met inclusion criteria (total N=986), including 7 of the 8 trials in the das Nair Cochrane review. Overall quality and comparability of included trials was low due to methodologic limitations and variation in interventions and outcome measures across trials, respectively. In meta-analysis, statistically significant improvements in memory span (based on 2 low-quality trials, total N=150; standardized mean difference [SMD], 0.54 [95% CI, 0.20 to 0.88], p=0.002, I² =0%) and working memory (3 very low-quality trials, total N=288; SMD=0.33 [95% CI, 0.09 to 0.57], p=0.006, I² =0%) were observed with cognitive training compared with controls. Statistically significant improvements in attention, information processing speed, immediate verbal memory, executive functions, or depression were not observed.

**Randomized Controlled Trials**

Chiaravalloti et al conducted 2 RCTs in patients with primarily relapsing remitting MS in the United States (total N=117). In a 2005 RCT that was included in both Cochrane reviews previously described, 29 (67%) of 43 screened patients who met inclusion criteria were randomized to 8 biweekly 45-minute cognitive rehabilitation sessions (n=15) or control sessions with the same therapist at the same frequency, engaging in nontraining tasks (e.g., reading and recalling a story; n=14). All patients demonstrated baseline impairment in new learning ability in the presence of intact attention/concentration and language comprehension. Cognitive rehabilitation comprised training in the Story Memory Technique; during weeks 1 and 2, patients used imagery to facilitate recall, and during weeks 3 and 4, patients used context to aid new learning. Neuropsychologic assessments in 7 domains (attention/concentration, language, intelligence, information processing, emotional functioning, episodic memory, metamemory [self-assessment]) were made at baseline, immediately after treatment (week 5), and 5 weeks later (during week 11). At 5 weeks and 11 weeks, there was no statistical difference between groups in new learning (episodic memory) or emotional functioning. Self-reported improvements in memory were greater in the cognitive rehabilitation group compared with the control group at both time points. Results for other neuropsychological assessments were not reported. Analysis of subgroups defined by level of cognitive impairment (mild vs moderate-severe) showed statistically significant between-group differences in episodic memory, but because patient numbers were very small and there was no correction for multiple testing, this analysis must be considered exploratory.

In a 2013 RCT, Chiaravalloti et al randomized 88 patients with MS to 10 biweekly 45- to 60-minute sessions of modified Story Memory Technique training (mSMT; n=46) or control (n=42). All patients demonstrated new learning impairment on baseline neuropsychological screen. The
mSMT training and the control intervention were carried out as previously described, with the addition of 2 additional sessions for patients in the treatment group to apply mSMT to real-world settings. The primary outcome was learning efficiency (rate of improvement in objective memory) during the first 8 sessions of training at 5 weeks (immediately after treatment) and at 6-month follow-up. At 5 weeks, learning efficiency was greater in the cognitive rehabilitation group compared with controls. Improvements in objective everyday memory, general contentment (subjective everyday cognition and emotional functioning), apathy, and executive dysfunction also were greater in the cognitive rehabilitation group. Between-group differences in awareness level, depression, or anxiety were not statistically significant. At 6-month follow-up, the only persistent between-group difference was in general contentment.

In 2013, Rosti-Otajarvi et al reported 1-year follow-up results of a multicenter RCT that was included in the later 2014 Rosti-Otajarvi Cochrane review previously described. Patients with relapsing remitting MS and attentional deficits (N=102) were randomized 3:2 to receive strategy-oriented neuropsychological rehabilitation (13 weekly 60-minute sessions) or no intervention. In the 2014 trial, neuropsychological rehabilitation did not improve cognitive performance immediately after the intervention (at week 13) or at 6 months, but statistically significant improvements in perceived cognitive deficits were observed at both time points. In the follow-up report, statistically significant differences in perceived cognitive deficits persisted for an additional 6 months (1 year from baseline). However, only 78 (76%) of 102 randomized patients completed 1-year follow-up, and dropout was differential (83% completers in the neuropsychological rehabilitation group vs 67% in the control group). Due to the possibility that dropout was related to the outcome of interest (eg, patients with perceived cognitive decline may have been more likely to drop out), findings should be interpreted cautiously.

In 2016, Hanssen et al carried out an RCT of cognitive rehabilitation in patients with MS. One hundred twenty patients were randomized to 4 weeks of multidisciplinary cognitive rehabilitation or 4 weeks of standard rehabilitation. Outcomes for executive function did not differ significantly between groups at 4 or 7 months after the start of the intervention. Only a health-related QOL measure relating to psychologic health showed a difference between intervention and control favoring intervention.

**Section Summary: Multiple Sclerosis**

Although numerous RCTs have investigated cognitive rehabilitation in MS, large, high-quality trials are lacking. The ability to make conclusions based on the overall body of evidence is limited by heterogeneity of patient samples, interventions, and outcome measures. Further, results of the available RCTs are mixed, with positive studies mostly reporting short-term benefits. Evidence for clinically significant, durable improvements in cognition is currently lacking.

**OTHER CONDITIONS**

**Epilepsy/Seizure Disorders**

Farina et al (2015) in Italy conducted a systematic review of the literature on cognitive rehabilitation in epilepsy. Literature was searched through December 2013, and 18 articles of different types (reviews, methodologic papers, case reports, and experimental studies) were
identified. Studies were heterogeneous in patient characteristics (type of epilepsy, type of previous treatment [surgery, antiepileptic drugs]), intervention modalities (eg, holistic or focused) and duration, and outcome measures. Reviewers considered the overall quality of the body of evidence to be moderate to low, and results inconsistent (eg, not all studies showed benefit; some studies showed greater benefit in left-sided seizures and others showed greater benefit in right-sided seizures).

The 2013 systematic review by ACRM’s Cognitive Rehabilitation Task Force evaluated cognitive rehabilitation in epilepsy. Based on 2 comparative studies (1 randomized; total N=156), the Task Force recommended cognitive rehabilitation for attention and memory deficits as a “possibly effective” practice option for seizure-related attention and memory deficits. The randomized trial prospectively enrolled 50 patients with focal seizures who were receiving carbamazepine monotherapy. Patients were randomized to a retraining method, aimed at retraining impaired cognitive functions (n=19); a compensation method, aimed at teaching compensatory strategies (n=17); or a wait-list control group (n=8). Both interventions focused on divided attention (ability to multi-task). At 6-month follow-up, performance on cognitive tests improved more in both intervention groups compared with control. No difference in inhibitory capacity was observed. Self-reported cognitive complaints, absentmindedness, and quality of life improved more with cognitive rehabilitation. Overall, rehabilitation methods were similarly effective.

The nonrandomized study assessed short-term effects of cognitive rehabilitation on memory deficits in 2 retrospective, matched cohorts of temporal lobe epilepsy surgical patients. Mean age (SD) was 36 (10) years; mean age (SD) at onset of epilepsy was 4 (1) years; and mean IQ was 105. Patients who received cognitive rehabilitation (n=55) participated in a 1-month program comprising educational sessions about brain function and cognitive exercises. A cohort of 57 patients received no cognitive rehabilitation. Statistically significant improvements in verbal learning and recognition were observed in right-resected patients who received cognitive rehabilitation. Cognitive rehabilitation had nonsignificant effects in left-resected patients. Limitations of the study include its retrospective design and baseline imbalances in memory and attention deficits (more severe deficits in the control cohort). The limited evidence base precludes conclusions about cognitive rehabilitation for this indication.

**Autism Spectrum Disorders**

In 2013, Reichow et al reported a systematic review of psychosocial interventions administered by nonspecialists for children and adolescents with intellectual disability (IQ<70) or lower-functioning autism spectrum disorders. Five comparative trials in patients with autism-spectrum disorders (total N=255) who received cognitive rehabilitation, training, and support were included. Improvements in school performance and developmental outcomes were inconsistent across trials.

Wang et al (2013) conducted a pilot study of a novel virtual reality-cognitive rehabilitation intervention in 4 children (mean age, 7.4 years) with autism. Children with autism, who are difficult to engage, may respond better to virtual reality approaches than to traditional cognitive rehabilitation. Mean nonverbal IQ ranged from 93 to 139. Each child viewed training programs on laptop computers equipped with tracking webcams; the child’s image and movements were
Cognitive Rehabilitation

projected into virtual environments where he/she was required to manipulate virtual objects. Outcomes were measures of contextual processing, defined as “the ability to determine an object’s meaning or relevance in a particular context,” and of abstraction and cognitive flexibility, executive functions considered components of contextual processing. After 4 to 6 weeks, all children demonstrated statistically significant improvements in contextual processing and cognitive flexibility. Abstraction scores at baseline were at or close to maximum.

Eack et al (2013) conducted a feasibility study of a comprehensive cognitive rehabilitation intervention, called Cognitive Enhancement Therapy, in 14 “high-functioning” adults (mean age, 25 years) with autism-spectrum disorders. Cognitive Enhancement Therapy, originally developed for schizophrenic patients, provides social interaction and cognitive training focused on attention, memory, and problem solving. Mean full scale IQ of the patient sample was 118 (range, 92-157). Eleven (79%) of 14 patients completed 18 months of treatment. Statistically significant changes from baseline were observed in mean composite measures of neurocognition, cognitive style, social cognition, and social adjustment. All components of neurocognition (e.g., processing speed, working memory) improved statistically except attention/vigilance.

Post-encephalopathy

The 2013 systematic review by ACRM’s Cognitive Rehabilitation Task Force evaluated cognitive rehabilitation for postencephalitis cognitive deficits. Eight identified studies were considered poor quality evidence, insufficient for forming conclusions.

Cancer

Cognitive rehabilitation has been investigated in 2 cancer-related settings: in patients with brain tumors and in cancer survivors whose cognitive deficits are attributed to cancer treatment.

Brain Tumors

The 2013 ACRM systematic evaluated cognitive rehabilitation for adults with brain tumors. In 5 case reports and case series (total N=36), some patients showed benefit with various cognitive rehabilitation interventions. This evidence was considered insufficient to support any recommendation.

Zucchella et al (2013) conducted an RCT of cognitive rehabilitation in postneurosurgical adults at a single rehabilitation facility in Italy. Time since craniotomy was not reported. Adjuvant chemotherapy or radiotherapy was not administered until after the study. Of 109 consecutive patients screened for trial participation, 62 (57%) met minimum cognitive deficit and other criteria and were randomized to usual rehabilitative care with (n=30) or without (n=32) cognitive rehabilitation. Treatment sessions were held 4 times weekly for 4 weeks and comprised 45 minutes of therapist-guided computer exercises in 6 cognitive domains (time and spatial orientation, visual attention, logical reasoning, memory, executive function) and 15 minutes of cognitive strategizing. At the end of treatment (ie, at week 4), statistically significant improvements in visual attention and verbal memory were observed in the treatment group compared with controls. Improvements in logical-executive function were not statistically significant. Because of limited follow-up in this study, clinical significance of the findings is unclear.
Cancer Survivors

Systematic Reviews
Zeng et al (2016) published a systematic review and meta-analysis of neuropsychological intervention for cognitive function in cancer survivors.45 Three case control studies and 7 RCTs with 433 patients (range, 22-98 patients) published between January 2010 and September 2015 were included. Most trials assessed the immediate effects of the intervention at postintervention or with short-term follow-up of 6 months or less. More than half of the trials were conducted in breast cancer survivors. Three trials assessed the effects of cognitive rehabilitation programs and the weighted mean difference for the intervention effect at postintervention follow-up was -0.19 (95% CI, -2.98 to 2.61).

The 2013 systematic review by ACRM’s Cognitive Rehabilitation Task Force evaluated cognitive rehabilitation for cognitive impairments in adult and pediatric cancer survivors. One German RCT showed no benefit with cognitive rehabilitation in 157 adult inpatients who had cognitive impairments after hematopoietic stem cell transplantation. In children and adolescents, 2 prospective, comparative studies (1 RCT) evaluated cognitive rehabilitation in survivors of treatment (resection, cranial radiation, and/or chemotherapy) involving the central nervous system (total N=192 patients). Reviewers concluded that process-based cognitive rehabilitation techniques (eg, strategy acquisition and corrective feedback) are “probably effective” in treating attention and memory deficits in these patients. However, the RCT had several methodologic limitations. Butler et al (2008) randomized 161 pediatric survivors of treatment for brain tumors, leukemia, bone marrow transplant involving total body irradiation, and non-Hodgkin lymphoma 2:1 to a cognitive remediation program (n=108) or waiting-list control (n=53). Documented attentional deficit was required for trial eligibility. The cognitive remediation program comprised 2-hour weekly sessions of practice, strategy acquisition, and cognitive-behavioral interventions for up to 20 sessions. Both groups were assumed to receive special education services if needed; this factor was not evaluated in results analysis. The primary outcome was change from baseline in 5 investigator-developed, multitest indices (academic achievement, brief focused attention, working memory, memory recall, vigilance) at approximately 6 months after baseline assessments. These indices incorporated results from 11 validated scales completed by blinded study assessors and unblinded parents, teachers, and patients. Mean patient age was 11 (3) years. Sixty percent of patients in the cognitive remediation group completed the entire program; 80% completed 75% (15 sessions). Six-month follow-up was differential between groups (83% in the cognitive remediation group vs 98% in the control group). Analysis was intention to treat. Statistically greater improvement was observed in the cognitive remediation group compared with the control group only in academic achievement, although the treatment effect was small (SMD=0.24), and clinical relevance is uncertain. Given the lack of improvement on neurocognitive scales, it does not appear that improved academic achievement was due to improved neurocognitive function. Overall, this RCT did not demonstrate improved outcomes with cognitive rehabilitation.

Randomized Controlled Trials
Cherrier et al (2013) evaluated group cognitive rehabilitation in adult cancer survivors. Patients from the local area who completed cancer treatment 6 or more months previously (median, 3 years) and had subjective concerns about cognitive decline related to their cancer diagnosis or treatment were eligible. Primary cancer diagnoses included breast, bladder, prostate, colon, and uterine. Of 53 patients screened, 28 patients (53%) were randomized to 7 weekly, hour-long workshops focusing on memory and attention techniques, or to a waiting-list control group. Four patients in the treatment group who attended less than 2 group sessions were excluded from analysis. At 1 to 2 weeks after completion of 7 treatment sessions (7-8 weeks after baseline assessments for controls), there were statistically greater improvements in cognition-related quality-of-life measures in the cognitive rehabilitation group compared with controls, but most neurocognitive tests showed no statistical difference between groups.

Ercoli et al (2015) conducted an RCT of cognitive rehabilitation in breast cancer survivors. Patients with subjective concerns about memory or mental abilities were randomized to a 5-week program of group training or a wait-list control. Outcomes were assessed with an instrument evaluating patient self-reported difficulties with mental tasks. At the 2-month follow-up, the cognitive rehabilitation group showed greater improvements in self-reported mental ability and memory scores. Quantitative electroencephalographic findings also showed some significantly different results. The outcomes reported in the study are of uncertain clinical significance.

Section Summary: Other Conditions
Systematic reviews of cognitive rehabilitation for a number of conditions have generally concluded that there is no strong evidence supporting the efficacy of cognitive rehabilitation. Randomized trials of cognitive rehabilitation have numerous methodologic flaws that preclude strong conclusions about its efficacy.

Ongoing and Unpublished Clinical Trials
Some currently unpublished trials that might influence this policy are listed in below in Table 1.

Table 1. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCT02265757</td>
<td>Comparative Effectiveness of Behavioral Interventions to Prevent or Delay Dementia (CEBIPODD)</td>
<td>600</td>
<td>Jun 2017</td>
</tr>
<tr>
<td>NCT01138020</td>
<td>Cognitive Rehabilitation of Blast-induced Traumatic Brain Injury</td>
<td>120</td>
<td>Oct 2018</td>
</tr>
<tr>
<td>NCT01788618</td>
<td>Cancer and Disorders of Cognitive Functions and Quality of Life: &quot;Cognitive Rehabilitation in Patients Suffering From Cancer and Treated With Chemotherapy&quot;</td>
<td>168</td>
<td>Dec 2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unpublished</td>
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</tr>
<tr>
<td>NCT02091453</td>
<td>The Protocol and Design of a Randomized Controlled Study on Attention Training in First Year After Acquired Brain</td>
<td>109</td>
<td>Nov 2014</td>
</tr>
</tbody>
</table>
SUMMARY OF EVIDENCE
For individuals who have cognitive deficits due to traumatic brain injury who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes randomized controlled trials (RCTs), nonrandomized comparison studies, case series, and systematic reviews. Relevant outcomes are functional outcomes and quality of life. The trials have methodologic limitations and report mixed results, indicating there is no uniform or consistent evidence base supporting the efficacy of this technique. Systematic reviews generally conclude that efficacy of cognitive rehabilitation is uncertain. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to dementia who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs, nonrandomized comparison studies, case series, and systematic reviews. Relevant outcomes are functional outcomes and quality of life. Systematic reviews of RCTs have generally shown no benefit of cognitive rehabilitation or effects that were not clinically important. One large RCT with a goal oriented cognitive rehabilitation program reported significantly less functional decline in one of two functional scales and lower rates of institutionalization in the cognitive rehabilitation group compared to usual care at 24 months. These results need replication. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to stroke who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs and systematic reviews. Relevant outcomes are functional outcomes and quality of life. Four systematic reviews evaluating 3 separate domains of cognitive function showed no benefit of cognitive rehabilitation or effects that were not clinically important. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to multiple sclerosis who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs and systematic reviews. Relevant outcomes are functional outcomes and quality of life. Systematic reviews of RCTs have shown no significant effects of cognitive rehabilitation on cognitive outcomes. Although numerous RCTs have investigated cognitive rehabilitation in multiple sclerosis, large, high-quality trials are lacking. The ability to make conclusions based on the overall body of evidence is limited by heterogeneity of patient samples, interventions, and outcome measures. Further, results of the available RCTs are mixed, with positive studies mostly reporting short-term benefits. Evidence for clinically significant, durable improvements in cognition is currently lacking. The evidence is insufficient to determine the effect of the technology on health outcomes.

For individuals who have cognitive deficits due to other conditions (e.g., epilepsy, autism spectrum disorder, postencephalopathy, cancer) who receive cognitive rehabilitation delivered by a qualified professional, the evidence includes RCTs, nonrandomized comparison studies, and case series. Relevant outcomes are functional outcomes and quality of life. The quantity of
studies for these conditions is much less than that for the other cognitive rehabilitation indications. Systematic reviews generally do not support the efficacy of cognitive rehabilitation for these conditions. RCTs have methodologic limitations, most often very short lengths of follow-up, that do not permit strong conclusions about the efficacy. The evidence is insufficient to determine the effect of the technology on health outcomes.

SUPPLEMENTAL INFORMATION

Clinical Input Received through Physician Specialty Societies and Academic Medical Centers
While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

2015 Input
In response to requests, input was received from 3 physician specialty societies and 5 academic medical centers while this policy was under review in 2015. Input was mixed on cognitive rehabilitation for patients with stroke, MS, brain tumors, or cognitive impairments after previous treatments for cancer.

2009/2010
Input In response to requests, input was received from 2 physician specialty societies and 5 academic medical centers while this policy was under review in 2009 and 2010. The strongest support was for use of cognitive rehabilitation as part of the treatment of those with TBIs. The level of support varied for other diagnoses such as use in poststroke patients.

PRACTICE GUIDELINES AND POSITION STATEMENTS

American Congress of Rehabilitation Medicine
Based on a 2013 systematic review, the American Congress of Rehabilitation Medicine’s Cognitive Rehabilitation Task Force recommended process-based cognitive rehabilitation strategies (e.g., attention process training, strategy acquisition and internalization, self-monitoring, and corrective feedback) to treat attention and memory deficits in children and adolescents with brain cancers who undergo surgical resection and/or radiotherapy.

National Institute for Health and Care Excellence
NICE guidance (2013) on stroke rehabilitation recommends cognitive rehabilitation for visual neglect and memory and attention deficits that impact function. Interventions should focus on relevant functional tasks, e.g., errorless learning and elaborative techniques (mnemonics, encoding strategies) for memory impairments.

Institute of Medicine
The Institute of Medicine published a report in October 2011 titled “Cognitive Rehabilitation Therapy for Traumatic Brain Injury” that included a comprehensive review of the literature and recommendations. The report concluded that “current evidence provides limited support for the efficacy of CRT interventions. The evidence varies in both the quality and volume of studies and therefore is not yet sufficient to develop definitive guidelines for health professionals on how
to apply CRT in practice.” The report recommended that standardization of clinical variables, intervention components, and outcome measures was necessary in order to improve the evidence base for this treatment. They also recommended future studies with larger sample sizes and more comprehensive sets of clinical variables and outcome measures.

**Veterans Administration**
The VA/Department of Veterans Affairs published guidelines on the treatment of concussion/mild traumatic brain injury (mTBI) in 2009, which were updated in 2016. These guidelines address cognitive rehabilitation in the setting of persistent symptoms. The 2016 guidelines state:

“Individuals with a history of mTBI who present with symptoms related to memory, attention, and/or executive function problems that do not resolve within 30 to 90 days and have been refractory to treatment for associated symptoms should be referred as appropriate to cognitive rehabilitation therapists with expertise in TBI rehabilitation. The Work Group suggests considering a short-term trial of cognitive rehabilitation treatment to assess the individual patient responsiveness to strategy training, including instruction and practice on use of memory aids, such as cognitive assistive technologies (AT). A prolonged course of therapy in the absence of patient improvement is strongly discouraged.” The strength of the recommendation was rated as “weak.”

**MEDICARE NATIONAL COVERAGE**
There is no national coverage determination (NCD). In the absence of an NCD, coverage decisions are left to the discretion of local Medicare carriers.

**VI. Important Reminder**
The purpose of this Medical Policy is to provide a guide to coverage. This Medical Policy is not intended to dictate to providers how to practice medicine. Nothing in this Medical Policy is intended to discourage or prohibit providing other medical advice or treatment deemed appropriate by the treating physician.

Benefit determinations are subject to applicable member contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control.

This Medical Policy has been developed through consideration of the medical necessity criteria under Hawaii’s Patients’ Bill of Rights and Responsibilities Act (Hawaii Revised Statutes §432E-1.4), generally accepted standards of medical practice and review of medical literature and government approval status. HMSA has determined that services not covered under this Medical Policy will not be medically necessary under Hawaii law in most cases. If a treating physician disagrees with HMSA’s determination as to medical necessity in a given case, the physician may request that HMSA reconsider the application of the medical necessity criteria to the case at issue in light of any supporting documentation.

**VII. References**


