

## D. Cognitive Recovery Post-Stroke Educational Supplement

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## **D1.1 Cognitive Disorders: General Information**

### **D1.1.1 Prevalence and Natural History**

***Q1. What is the prevalence and natural history of cognitive impairment post stroke?***

### **D1.1.2 Impact on Rehabilitation Outcomes**

***Q2. What is the impact of cognitive impairment on rehabilitation outcomes?***

### **D1.1.3 Risk of Developing Dementia**

***Q3. What is the likelihood that stroke survivors will develop dementia?***

### **D1.1.4 Distinguishing Between Vascular and Alzheimer's Dementia**

***Q4. Describe the difference between Vascular vs. Alzheimer's Dementia.***

### **D1.1.5 "Gold Standard" for Diagnosis of Post-Stroke Dementia**

***Q5. What is the "gold standard" for the diagnosis of post-stroke dementia?***

## **D1.2 Assessment of Cognitive Disorders Post-Stroke**

### **D1.2.1 Mini Mental State Examination**

***Q1. Discuss the Mini Mental State Examination in terms of describing the test and noting its strengths and weaknesses.***

### D1.2.2 The Clock-Drawing Test

**Q2. Describe the Clock-Drawing Test including its strengths and weaknesses.**

### D1.2.3 The Montreal Cognitive Assessment

**Q3. Describe the MOCA including its strengths and limitations.**

## D1.3 Treatment of Cognitive Disorders Post Stroke

### D1.3.1 Medications in Treatment of Vascular Cognitive Impairment

**Q1. Assuming depression has been ruled out, can medications be used in the treatment of vascular cognitive impairment?**

### D1.3.2 Cognitive Rehabilitation

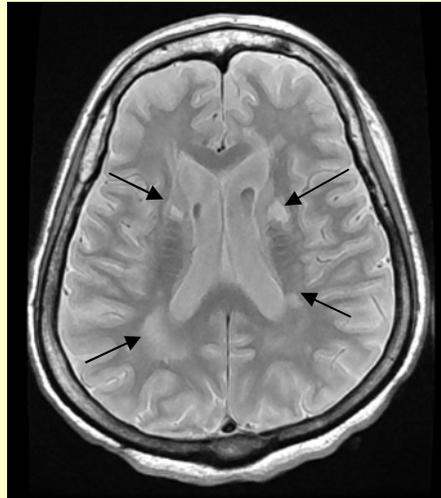
**Q2. Describe Cognitive Rehabilitation. What evidence is there that it is helpful for stroke patients?**

## D1.4 Vascular Dementia and Rehabilitation Case Study

### **Case Study**

*72 year old male living independently with a very supportive family. He presented to acute neurology with aphasia and hypertensive crisis (264/100 mmHg). He remained in the acute care hospital for 8 weeks, undergoing investigations for multiple strokes and suffering several more strokes while in hospital. MRI revealed multiple areas of bilateral subcortical infarctions. Diagnosis was multiple embolic strokes from aortic atheroma; risk factors included hypertension and type 2 diabetes from which she had suffered from for 10 years. He also had a history of chronic renal dysfunction.*

*The patient was subsequently admitted to the stroke rehabilitation unit. At the time of admission to the stroke rehabilitation unit, ASA (81 mg daily) had been initiated. A GJ tube had been inserted to assist with feeding. He required maximal assistance to total dependence to manage his ADLs. He was incontinent of bowel and bladder. He had a severe dysarthria and was essentially nonverbal. He required physical restraints when not being directly supervised and frequently refused to attend therapy sessions, although he was not combative or threatening to staff. Mini-Mental Standard Examination (MMSE) score was 13/30 while on rehabilitation.*



**Q1. Provide a problem list.**

**Q2. The family wants to know if this is Alzheimer's dementia. How would you respond?**

**Q3. What does a MMSE score of 13/30 mean? What other information would you want to know when interpreting the MMSE?**

**Q4. How do you think she will respond to rehabilitation?**

**Case Study (continued)**

He remained on the stroke rehabilitation unit for 7 weeks. During that time he made good physical gains. Initially he was ambulating with a walker, albeit not safely, as he tended to forget to use the brakes and it would often become an obstacle for him. At discharge he was ambulating with no aids.

	<b>Admission</b>	<b>Discharge</b>
10 meter walk	21 seconds	16 seconds
2 minute walk test	45 meters	70 meters
Greatest distance walked before requiring a rest	85 meters	135 meters
Assistance required	Minimal	None
Berg Balance Score	7/56	47/56
COVS	53/91	73/91
Right Leg CMS	3/7	6/7
Right Foot CMS	3/7	4/7

In hospital, treatment was initiated with Ritalin which appeared to help with short-term memory and initiation. The rehabilitation team met with the family and appraised them of his cognitive impairments including impaired memory, problem-solving, insight, and judgment. The recommendation was made that he receive 24-hour supervision and that he would benefit from a structured and consistent routine.

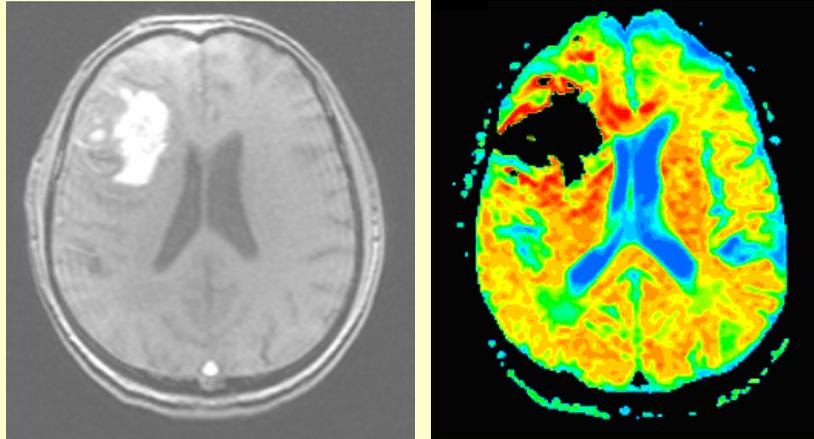
**Q5. Discuss the mechanism of action of Methylphenidate (Ritalin) and when would you give it to a stroke patient with cognitive deficits?**

**D1.5 Moderate Cognitive Impairment and Rehabilitation Case Study**

**Case Study**

74 year old male who suffered a right frontal intracerebral hemorrhage, consistent with congophillic angiopathy. He was admitted to the stroke rehabilitation unit one week after

*the onset of his intracranial hemorrhage. He presented with an unsteady gait, variable performance, distractibility, perseveration, slow responses with some short-term memory loss. He was able to do basic ADLs with set-up and stand-by assistance. He was continent for bowel and bladder. Due to a decrease in attention and cognition, he required supervision for his transfers and a walker for ambulation. He was ambulating 45 meters with one-person assistance. He was mildly confused with some disorientation at nighttime.*



*Premorbidly, he had been living independently in his multi-level home with his spouse; he had 3 children, of whom two lived in the same city. He was driving prior to his stroke.*

*Would become very confused on the rehabilitation unit; was showing signs of sundowning, tendency to wander and needed to be restrained. He was distractible and impulsive at times although he was able to ambulate with gait aids and supervision. His confusion got worse initially after admission to rehabilitation. MMSE performed 2 weeks post stroke was 11/30; he was not oriented to time or place, was not following simple instructions and required hands-on cues to complete simple familiar tasks.*

**Q1. Provide a problem list for this patient.**

**Q2. What does the MMSE suggest about this patient?**

**Case Study (continued)**

*The MMSE was repeated again almost 54 days following stroke onset and with improvements in orientation and attention his MMSE was 20/30. The Montreal Cognitive Assessment (MoCA) was administered 76 days post stroke and he was not able to recall 5 words from memory. Abstract thinking, following patterns and visual-motor skills were impaired. He was fully oriented to date and place. Cognitive abilities continued to fluctuate daily and were noticeably affected by his level of fatigue. Although his attention span had increased he was still easily distracted. He continued to have difficulties with the acquisition of new knowledge/skills. He was told not to drive due to cognitive problems. He was discharged home to the care of his wife and family although his wife still had to assist him with some personal care. He was fully ambulatory in his own home.*

**Q3. What does the MMSE now suggest about this patient?**

**Q4. Was it appropriate to do a MOCA test in this case and why or why not?**

## **D1.6 Depression and Dementia Case Study**

### **Case Study**

*An 80 year old female was admitted to the stroke rehabilitation unit 26 days after suffering a right MCA infarct. Prior to the stroke she had been able to ambulate independently with a walker. As a consequence of the right MCA stroke she experienced left hemiplegia, left neglect and was incontinent of bowel and bladder. Her infarct was a large one involving the right temporal, right parietal and right inferoposterior portion of the frontal lobe. Patient was in atrial fibrillation and Coumadin was initiated.*

*On admission to the stroke rehabilitation unit she was on a pureed diet with honey-thick liquids, using adaptive utensils; she required protein supplements as dietary intake was poor. She still had bowel and bladder incontinence. She could do a pivot transfer with the assist of one and she was wheelchair dependent for mobility. She lived with her husband in a retirement home prior to her stroke.*

*During rehabilitation she exhibited minimal gains, requiring continued assistance with transfers and ADLs. Mobility remained wheelchair dependent. The patient did identify very severe problems with her memory, problem solving and visual perception. She was observed to lose her train of thought in the middle of conversations, had difficulty with problem solving and tasks requiring visual perception. However, her MMSE was 27/30. On testing it was noted that the patient was highly anxious and endorsed many symptoms consistent with depression. Although she did well on formal cognitive testing, the impression on the ward was of severe memory and problem-solving difficulties. The patient refused anti-depressant medications.*

**Q1. The patient's spouse is worried that his wife may be suffering from depression. How would you explain this issue in terms of its relationship with cognitive impairment?**

**Q2. The nurse wants to know more about depression and cognitive disorders. Discuss the association between depression and cognitive impairment after stroke.**

**Q3. Discuss the difference between dementia and depression-related cognitive impairment.**

## **D1.7 Frontal Lobe Hemorrhage Case Study**

### **Case Study**

*A 70 year old single female who suffered a large left frontal intraparenchymal hemorrhage with mass effect was referred to rehabilitation. On assessing her she has some mild right hand weakness. She was ambulating independently on the acute stroke unit. Her speech was unaffected although she appeared to answer questions reasonably well. However, her MMSE was 18/30 and she seemed to have problems with sequential tasks. She lived alone. She was admitted to the stroke rehabilitation unit and presented with visual and perceptual neglect, mild right hand weakness, decreased sequencing and executive functioning. For ADLs she required minimal assistance due to decreased perception and neglect. She was independent for transfers and mobility with episodes of*

*motor apraxia. She had trouble processing information and high level cognitive skills, including impaired memory, problem-solving, insight and judgement. Route-finding difficulties had been observed.*

**Q1. Discuss the potential consequences of a left frontal lesion.**

**Case Study (continued)**

*On initial rehabilitation assessment, 14 days following her stroke, the Montreal Cognitive Assessment (MoCA) score was 8/30 and Mini Mental State Examination was 18/30. The MOCA was readministered 44 days post stroke and she had increased to a score of 22/30. She demonstrated improvement with her memory but continued to demonstrate impairment for the higher level executive cognitive skills such as problem solving, insight and judgement.*

**Q2. Discuss the MOCA and whether its use is appropriate in this setting.**

## **D1.8 Apraxia**

**Q1. Define apraxia.**

**Q2. Some rehabilitation clinicians attempt to categorize apraxias. Describe a categorization of apraxias and provide examples of each.**

**Q3. How would you test for Apraxia?**

### **Case Study**

*A 65 year old male suffered a left hemispheric stroke, involving the MCA with an infarct involving both the frontal and parietal areas. The patient presented to rehabilitation 2 weeks later with a right hemiplegia and an expressive aphasia. Moreover, the patient demonstrated some bizarre behavior, trying to comb his hair with his toothbrush and trying to eat a bar of soap. On clinical testing he was asked to touch his nose, which he accomplished, followed by single commands to touch his ear (which he did successfully) and his chin (which he also accomplished after some thought). However, when asked to touch his nose, ear and chin in sequence, he quickly became confused touching his chin after some hesitation but not being able to proceed any further. Moreover, when asked to perform a salute, a hitchhiker sign or how he would flip a coin he was not able to but was able to wave goodbye to the interviewer at the end of the interview.*

**Q4. What is the diagnosis of this unusual behavior?**

## **D2.1 Visual Perceptual Disorders: General Information**

**Q1. Describe neglect.**

**Q2. Why is left-side neglect more common than right-sided neglect?**

**Q3. What is the impact of the left-sided neglect on his functional (rehabilitation) prognosis?**

**Q4. What is meant by the term anosognosia?**

***Q5. In team rounds the physiotherapist complains that a patient has trouble sustaining attention to an activity; that they are impulsive and can't seem to sustain a task during therapy. What is the term for this deficit and how would you test for it?***

## **D2.2 Visual-Perceptual Disorders: Assessments**

***Q1. What are some of the common tests which can be used to screen for the presence of left-sided neglect?***

***Q2. Describe the Line Bisection Test including its strengths and weaknesses.***

***Q3. Describe the Behavioural Inattention Test including its strengths and weaknesses.***

***Q4. Is the clock-drawing test a good test for visual neglect?***

## **D2.3 Treatment of Visual-Perceptual Disorders**

***Q1. Describe rehabilitation interventions for neglect.***

***Q2. Describe at least two treatments for the treatment of the left neglect.***

## **D2.4 Case Study: Visual Perceptual Disorders**

### **Case Study**

*A 58 year old male is admitted to the stroke rehabilitation unit with a large right hemispheric stroke secondary to complete occlusion of the internal carotid artery. This stroke involved not only the frontal parietal cortex but extended to involve the temporal cortex as well as the subcortical white matter including the basal ganglia. As a consequence he presents with left hemiplegia, significant left neglect to confrontational testing and a left homonymous hemianopsia.*

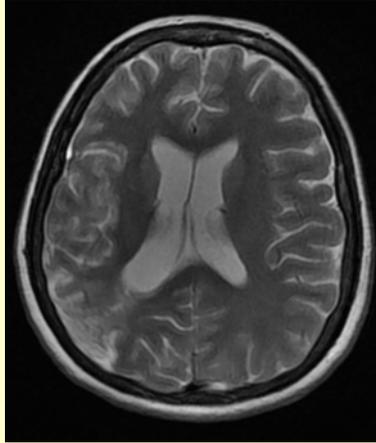
**Q1. Describe how one would assess her neglect.**

**Q2. Assuming she has severe left neglect how would you treat it?**

## **D2.5 Case Study: Use of Prisms**

### **Case Study**

*A 56 year old male was admitted to rehabilitation 11 days post stroke. Initially he presented with progressively more severe headache and developed left hemiparesis (arm > leg), ataxia, visual and sensory abnormalities. CT scan demonstrated a right posterior/parietal infarct, a right-sided subdural hemorrhage as well as a right frontal and a left occipital subarachnoid/parenchymal hematoma. MVPT during rehabilitation was 23/36 with an average processing time of 6.6 seconds. Visual assessment demonstrated a left homonymous hemianopsia treated with Fresnel prism lenses. During rehabilitation he improved in his scanning abilities*



**Q1. What is the purpose of Prisms placed on eye glasses and do they improve outcomes?**

## **D2.6 Left Homonymous Hemianopsia**

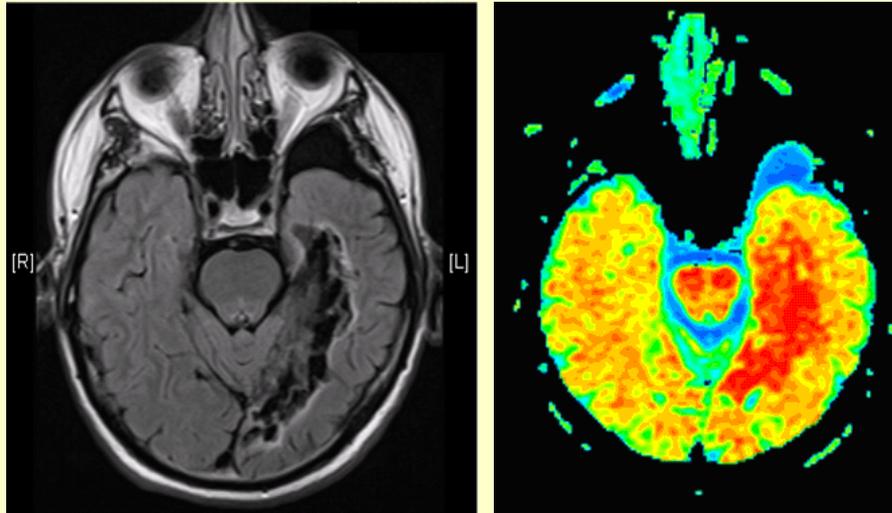
**Q1. Describe the neuropathways which are affected in homonymous hemianopsia post stroke.**

**Q2. Describe the functional impact of homonymous hemianopsia.**

### **Case Study**

*60 year old male underwent CABG bypass surgery at acute care hospital and several days later developed a left posterior cerebral artery territory infarction involving the left thalamus and left perihippocampal gyrus. He was admitted to stroke rehabilitation where he presented with right sided weakness, right ataxia, right neglect, dysphagia, and right homonymous hemianopsia. He was oriented and had some difficulty following motor commands and was slow in processing information. He was independent in his mobility, functional transfers and transitional movements without aids. On admission he required cueing to organize and sequence ADL tasks. He was limited by visual, perceptual and*

*cognitive (memory) deficits but improved at time of discharge from rehabilitation although he still required supervision for community mobility. Initially right upper extremity function was compromised by a mild right hemiparesis, incoordination, ataxia, apraxia, inattention and a right field cut.*



**Q3. In this case what part of the visual pathway is affected to give a right homonymous hemianopsia or field cut?**

**Q4. Why would he have memory problems?**

### **D3.1 Aphasia: General Information**

**Q1. What is aphasia?**

**Q2. Describe a Framework for Classifying Aphasia Post Stroke.**

**Q3. Define the following terms: Paraphasias, Neologisms, Telegraphic Speech, Echolalia and Word-Finding Difficulties.**

**Q4. What are the most common types of aphasias seen following a stroke?**

**Q5. Describe how you would conduct a language assessment.**

**Q6. Describe the type of aphasia in each of the following cases.**

<b>Case Study</b>	<b>Type of Aphasia</b>
<i>72 year old male with left cardioembolic stroke. Language assessment revealed labored speech, primarily nouns and verbs, with poor repetition. Was able to follow simple commands.</i>	
<i>68 year old female with left stroke following cardiac surgery. Language assessment revealed slow, labored speech with good repetition. Able to follow simple commands.</i>	
<i>59 year old male with left subcortical stroke. Language assessment revealed word-finding difficulty with good repetition. Able to follow simple commands.</i>	
<i>82 year old male with large left stroke. Language assessment reveals the patient is unable to follow commands and is unable to speak apart from occasional automatic words.</i>	
<i>74 year old female with left stroke related to carotid stenosis. Speech was fluent but there were many errors with many nonsensical words. Patient often repeated the questions of the assessor and repetition was done well. Not able to consistently follow commands.</i>	
<i>76 year old male with left intracerebral hemorrhage secondary to congophillic angiopathy. Language assessment revealed normal rate of speech but the words did not make sense. Repetition was done poorly and the patient was unable to follow simple commands.</i>	
<i>48 year old female with left subcortical/cortical hemorrhage. Speech was normal and patient was able to follow commands.</i>	

<i>Repetition was done poorly.</i>	
<i>66 year old female with a left stroke following a cardiac arrest. Language assessment revealed very labored speech, primarily one to two word responses. She was not able to respond to commands. Repetition was done well.</i>	

### **D3.2 Case Study: Broca's Aphasia**

#### **Case Study**

*A 36 year old woman presents with a moderate size left hemispheric stroke. You assess her 5 days post stroke at which time she has a right hemiparesis, with near complete paresis of the right upper extremity and only partial paresis of the right lower extremity (able to move the hip and knee against gravity but not yet able to dorsiflex the ankle). The patient is able to follow commands with little difficulty but is unable to respond verbally, says only a few words repetitively and is unable to repeat phrases. She is admitted to the rehabilitation unit 12 days after her stroke and at the time her MRI is repeated.*



**Q1. What impairments does this patient have?**

**Q2. What type of aphasia is present in this case and describe it?**

**Q3. For the patient described above, the doctor looking after the patient questions the value of aphasia therapy. What evidence is there that aphasia therapy is helpful?**

### **D3.3 Case Study: Wernicke's Aphasia**

#### **Case Study**

*A 74 year old male was admitted to hospital with a left parietal-temporal intracerebral hemorrhage. He had no motor weakness on the right side, a right upper quadrantanopia. The nurses report that he talked a lot but much of what he said did not make sense and he seemed to make up some words they had never heard before. One nurse noted he used the term "you know" and the word "thing" a lot. Some of them thought that he was confused; others wondered if he had a psychiatric history. When asked "Do helicopters in South America eat their young?" he replied with "I would expect so".*



**Q1. What is the name of this patient's communication disorder?**

**Q2. What are the defining features of this communication disorder?**

**Q3. What area of the brain is involved?**

**Q4. Describe the potential impact of this communication disorder on rehabilitation?**

### **D3.4 Case Study: Conduction Aphasia**

#### **Case Study**

*A 48 year old male was admitted to the stroke rehabilitation program on October 24, 2008 and discharged 6 weeks later. 5 weeks previously he suffered a subarachnoid hemorrhage with right sided weakness. CT scan revealed a bleed in the left putamen and both caudate heads with compression of the ventricles. Etiology of the bleed was felt to be related to hypertension. On admission to rehabilitation he presented with right upper extremity weakness, some mild left lower extremity weakness, apraxia, poor balance, dysarthria with word-finding difficulties and some impulsivity.*

*Communication assessment revealed verbal output which was fluent but with dysfluencies noted with sound and word repetitions. Frequently verbal expressions contained jargon and literal as well as semantic paraphasias. Auditory comprehension was judged to be intact for yes/no questions obtained from the Western Aphasia Battery and he was able to follow one and two step commands. Reading comprehension was moderately impaired with multiple step commands but improved. At discharge he did well with sentence formulation to multiple action pictures. Occasionally, during conversational speech at the time of discharge there were circumlocutions, semantic and literal paraphasias and confused language at times.*

**Q1. What type of communication disorder is present?**

**Q2. What are the clinical features of this communication disorder?**

**Q3. What area of the brain is involved?**