

## D. Cognitive Recovery Post-Stroke Educational Supplement

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28 pages

## 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?**

**Answers**

1. Two-thirds of stroke patients experience cognitive impairment or decline following stroke. One-third develop dementia.
2. Almost one-fifth of stroke patients with cognitive impairment post stroke improve.

### D1.1.2 Impact on Rehabilitation Outcomes

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

**Answer**

1. Decreased ADLs.
2. Decreased Instrumental ADLs (IADLs)
3. Greater mortality one year post discharge.

### D1.1.3 Risk of Developing Dementia

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

**Answer**

1. 2-10X greater likelihood of developing dementia following a stroke
2. As many as 25% of stroke survivors are diagnosed with dementia 12 months post stroke.

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

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

**Answers**

The differences between Vascular and Alzheimer's Dementia are listed below:

Characteristic	Vascular Dementia	Alzheimer's Dementia
Onset	Sudden or gradual	Gradual
Progression	Slow, stepwise fluctuation	Constant, insidious decline
Neurological findings	Evidence of focal deficits	Subtle or absent
Memory	Mildly affected	Early and severe deficit
Executive function	Early and severe	Late
Dementia type	Subcortical	Cortical
Neuroimaging	Infarct of white matter lesions	Normal, hippocampal atrophy
Gait	Often disturbed early	Usually normal
Cardiovascular history	TIAs, strokes, vascular risk factors	Less common

### D1.1.5 “Gold Standard” for Diagnosis of Post-Stroke Dementia

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

**Answer**

1. There is no “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.**

**Answers**

1. Brief screening tool of cognitive impairment.
2. Consists of 11 simple questions or tasks, typically grouped into 7 cognitive domains: orientation to time, orientation to place, registration of three words, attention and calculation, recall of three words, language and visual construction.
3. Total score of 30; score of 23 or less indicates cognitive impairment.
4. Advantages are it is brief, inexpensive, simple to administer and widely accepted.
5. Disadvantages are it is affected by age, education and sociocultural background and may be less sensitive to mild cognitive impairment and right hemispheric strokes.

### D1.2.2 The Clock-Drawing Test

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

**Answers**

1. Patient asked to draw a clock with numbers and the hand of the clock placed at a requested time.
2. Provides quick assessment of visuospatial and praxis abilities and may detect deficits in attention and executive function.
3. Strengths are it is brief, inexpensive and easy to administer; correlates well with other cognitive screening methods.
4. Weaknesses are it is negatively influenced by increasing age, less education and depression.

### D1.2.3 The Montreal Cognitive Assessment

**Q1. Describe the MOCA including its strengths and limitations.**

**Answers**

1. Screening tool to detect mild cognitive impairment.
2. Uses tasks such as picture naming, clock drawing and recall to assess the following domains: attention and concentration, executive functions, memory, language, visuocstructional skills, conceptual thinking, calculations, and orientation.
3. Less than 26/30 indicates cognitive impairment.
4. Strengths are it can detect mild forms of impairment when MMSE is normal.
5. Weaknesses are its reliability and validity have not been fully tested and it has not been evaluated in stroke patients.

## 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?**

**Answers**

1. Yes.
2. Cholinesterase inhibitors, in particular Donepezil, have been shown to improve cognitive function.
3. Nimodipine, Memantine and Pentoxifyline have all been shown to have some benefit.

### D1.3.2 Cognitive Rehabilitation

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

**Answers**

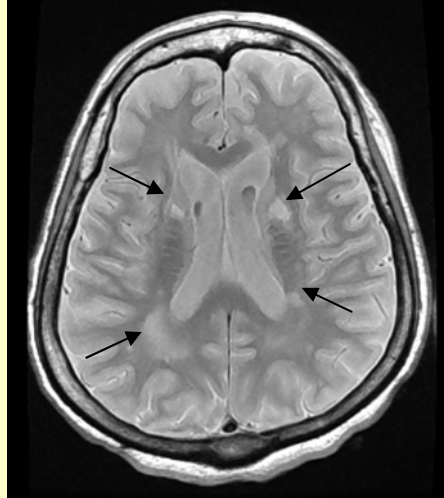
1. Cognitive rehabilitation focuses on: 1) re-establishing previously learned patterns of behavior; 2) learning new compensatory patterns of cognitive activity; 3) using external compensatory mechanisms; 4) enabling adaptation to cognitive disability.
2. Attention training has been shown to be beneficial in mixed populations of TBI with or without stroke patients.
3. Compensatory strategies are useful in remediation of memory deficits.
4. Remediation of executive function and problem solving post stroke has not been studied.

### 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). The patient 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 made of multiple embolic strokes from aortic atheroma; risk factors included hypertension and type 2 diabetes from which he had suffered 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.**

**Answer**

1. Multiple embolic strokes from aortic atheroma
2. Multiple subcortical strokes
3. Hypertension
4. Type II diabetes
5. Chronic renal dysfunction
6. Dysphagia with G-J tube
7. Maximal assist with ADLs
8. Incontinence of bowel and bladder
9. Severe dysarthria
10. Requiring physical restraints
11. MMSE 13/30 – indicative of severe cognitive impairment

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

**Answer**

This is most likely a vascular dementia because of the focal neurological findings, the multiple subcortical infarcts and the step-wise progression.

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

**Answers**

1. An MMSE of 13/30 suggests severe cognitive impairment.
2. MMSE is influenced by age, educational level and cultural background, all of which can result in misclassification.

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

**Answer**

1. The patient has physical focal deficits which may respond to rehabilitation training.
2. Severe cognitive deficits, as indicated by the MMSE and supported by the multiple subcortical strokes would suggest that his response to rehabilitation will be slow and limited because of difficulties with learning.

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

*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?**

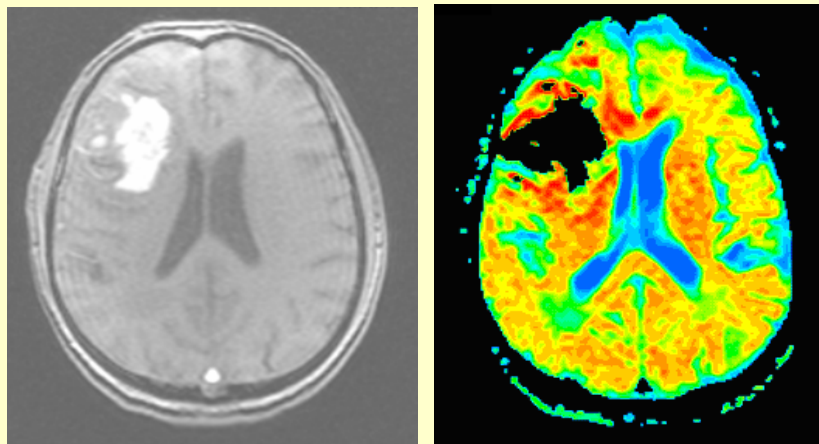
**Answer**

1. Methylphenidate (0.25 -.30 mg/kg bid) is recommended in adults to enhance attentional function and speed of cognitive processing in the adult population.
2. Would tend to treat patients who have difficulty focusing or paying attention.

## 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.**

**Answer**

1. Congophilic angiopathy with right frontal intracerebral hematoma.
2. Unsteady gait, variable performance.
3. Distractibility, perseveration, slow responses with some short-term memory loss.
4. Able to do basic ADLs with set-up and stand-by assistance.
5. Required supervision for his transfers and a walker for ambulation; ambulating 45 meters with one-person assistance.
6. Tendency to wander to the point of needing to be restrained.
7. Distractible and impulsive.
8. MMSE 11/30; not oriented to time or place.
9. Not following simple instructions.
10. Hands-on cueing needed to perform simple familiar tasks.

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

**Answer**

1. The MMSE of 11/30 indicates severe cognitive impairment.

**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?**

**Answer**

1. MMSE of 20/30 suggests the patient has improved but continues to suffer from cognitive impairment.

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

**Answer**

1. The MOCA is designed for use in individuals with mild cognitive impairment – those that the MMSE could not identify as experiencing cognitive impairment (24/30 or more).
2. The MOCA, although popular remains a screening tool and with the MMSE showing cognitive impairment its use would be considered redundant, particularly in a stroke population where it as of yet remains unproven.

## **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. She lived with her husband in a retirement home prior to her stroke.*

*On admission to the stroke rehabilitation unit 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. During rehabilitation she exhibited minimal gains, requiring continued assistance with transfers and ADLs. Mobility remained wheelchair dependent.*

*The patient identified 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?**

**Answers**

1. Depression is a very important issue that must be kept in mind when you are dealing with cognitive disorders.
2. The presence of depression could affect the results of the cognitive tests (Ruchinskias and Curyto 2003).
3. Depression in patients with amnesic mild cognitive impairment is associated with a risk of developing Alzheimer's type dementia and cognitive deterioration may proceed at more rapid pace (Modergo and Fernandez 2004).

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

**Answer**

1. A significant and independent association between presence of depression and cognitive impairment has been demonstrated in stroke survivors one year following the stroke event (Talelli et al 2004, Kalaria and Ballard 2001).
2. Brodaty et al (2007) demonstrated a greater frequency of dementia among stroke patients with depression (27.8%) when compared to patients without depression (17.3%) at three months post-stroke (though this difference was not significance). By 15 months post-stroke 54.2% of patients with depression were diagnosed with dementia vs. 7.1% of non-depressed with significant difference.
3. Murata et al (2000) concluded that major post-stroke depression leads to cognitive impairment and not vice versa.

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

**Answer**

1. Depression-related cognitive impairment can sometimes mimic the signs of dementia and is referred to as pseudodementia.
2. Pseudodementia tends to be more sudden onset, more rapid progression, with a previous history of depression, more variable, effort-related cognitive deficits with little nocturnal exacerbation.

## 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. She had 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.**

### **Answer**

1. Right sided weakness
2. Expressive language difficulties, possibly transcortical motor aphasia
3. Decreased problem-solving, insight and judgement.

### **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.**

**Answer**

1. The MOCA is a screening tool, used for assessing mild cognitive impairment.
2. Using it in this case may be considered redundant as the patient has already been identified as being significantly cognitively impaired on the MMSE (i.e. 18/30).
3. MOCA is a screening tool and is not necessarily designed to assess patients over time.

## **D1.8 Apraxia**

**Q1. Define apraxia.**

**Answer**

1. Apraxia is a disorder of voluntary movement where one cannot execute a purposeful activity despite the presence of adequate mobility, strength, sensation, coordination and comprehension.

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

**Answers**

1. Ideomotor Apraxia: Patient can automatically perform a movement (e.g. scratch their nose) but cannot repeat it on command.
2. Ideational Apraxia: Patient cannot identify the purpose of common objects and/or cannot coordinate individual steps into an integrated sequence (e.g. uses toothbrush to comb their hair)
3. Functional Apraxias: Constructional, dressing, gait, oculomotor and orofacial.

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

**Answer**

Apraxia can be best tested in the following ways (Caplan 1994):

1. By giving an oral or written command to pretend to do something or pretend to use an object.
2. By using objects placed in front of the patient (e.g., comb, toothbrush, scissors or hammer).
3. By initiating an action (orofacial, limb or trunk) performed by the examiner.
4. For constructional apraxias, copying a geometric shape

### **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?**

#### **Answer**

1. Patient is suffering from an ideomotor and ideational apraxia.

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

### **Q1. Describe neglect.**

#### **Answer**

1. Failure to report, respond, or orient to sensory stimuli presented to the side contralateral to the stroke.
2. Unilateral spatial neglect, when severe, is often characterized by the patient colliding with objects on the affected side, ignoring objects in front of them and attending to only one side of the body.

3. Milder neglect involves various degrees of ignoring the affected side when faced with stimulation on the unaffected side (extinction).

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

**Answer**

1. The right hemisphere regulates attention more than the left hemisphere.
2. The left hemisphere is responsible for modulating attention and arousal for the right visual field only, while the right hemisphere is responsible for controlling these processes in both the right and left hemispheres.
3. Hence the right hemisphere is more able to compensate for the left hemisphere, when it suffers a stroke, while the left hemisphere is not able to compensate for the right hemisphere if it is injured in a stroke.

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

**Answer**

1. Left-sided neglect tends to have a poorer prognosis in terms of functional recovery on rehabilitation

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

**Answer**

1. Refers to unawareness of loss of an important bodily function, primarily hemiplegia.
2. Involves primarily large right hemispheric strokes which involve the parietal region.

**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?**

**Answer**

1. Motor impersistence.
2. Tends to occur with right hemispheric strokes.
3. Ask the patient to keep their eyes closed or their arms upraised and they are unable to persist with the activity.

## 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?**

**Answers**

1. Line bisection test
2. Single letter cancellation test
3. Behaviour inattention test

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

**Answers**

1. Asked to find the midline on a number of horizontal lines.
2. Test is scored by measuring distance from their line to the actual center of the line.
3. Deviation of 6 mm or more is considered diagnostic of USN.
4. Simple test.
5. Screening tool only.

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

**Answers**

1. Screens for unilateral visual neglect.
2. Conventional testing (6 subtests) and 9 behavioral tests.
3. Comprehensive test with cutoff scores.
4. Reliable and valid test.
5. Takes a lot of time for therapist and patient.

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

**Answer**

1. No. CDT is not that sensitive to the diagnosis of visual neglect and is influenced by a number of other cognitive problems such as attention and executive dysfunction.

## D2.3 Treatment of Visual-Perceptual Disorders



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

**Answer**

1. Interventions which attempt to improve awareness of or attention to neglected space, i.e. visual scanning retraining.
2. Interventions that improve neglect by targeting deficits with a specific intervention, i.e prisms (more compensatory).

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

**Answer**

1. Visual scanning; training the patient to consistently scan to the involved side (usually the left side).
2. Limb activation therapies, i.e. spatiomotor cueing: involves limb activation +/- application of a sensory stimulation.
3. Sensory stimulation: application of an external sensory stimulus.
4. Feedback strategies: can involve auditory and visual stimuli.
5. Prisms: optical deviation of the visual field to the affected side.
6. Bilateral half-field patches: increase eye movements to contralateral space.
7. Transcutaneous electrical nerve stimulation (TENS): form of sensory stimulation.

## **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.**

**Answers**

1. Initial screening tool (i.e. line bisection test)
2. More comprehensive testing would involve the Behavioural Inattention Test (BIT)

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

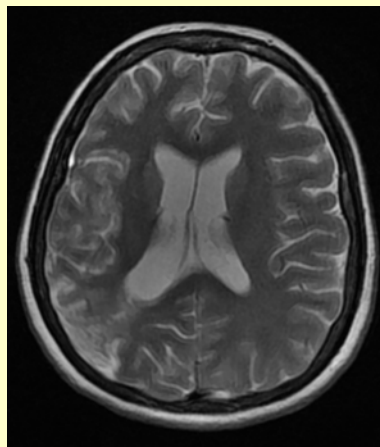
**Answers**

1. Can use interventions which target awareness of or attention to neglected space, i.e. visual scanning retraining, limb activation treatments.
2. Interventions that improve neglect by targeting deficits with a specific intervention, i.e. prisms, hemi-field eye patching (more compensatory).

## 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?**

**Answers**

1. Prisms bend the visual field input and increase visual fields by 5-10 degrees.
2. Associated with improvements in visuospatial tasks in stroke patients with homonymous hemianopsia and neglect.

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

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

**Answer**

1. Homonymous hemianopsia can involve the optic tract from the optic chiasma to the lateral geniculate body and the optic radiation from the lateral geniculate body to the occipital visual cortex.

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

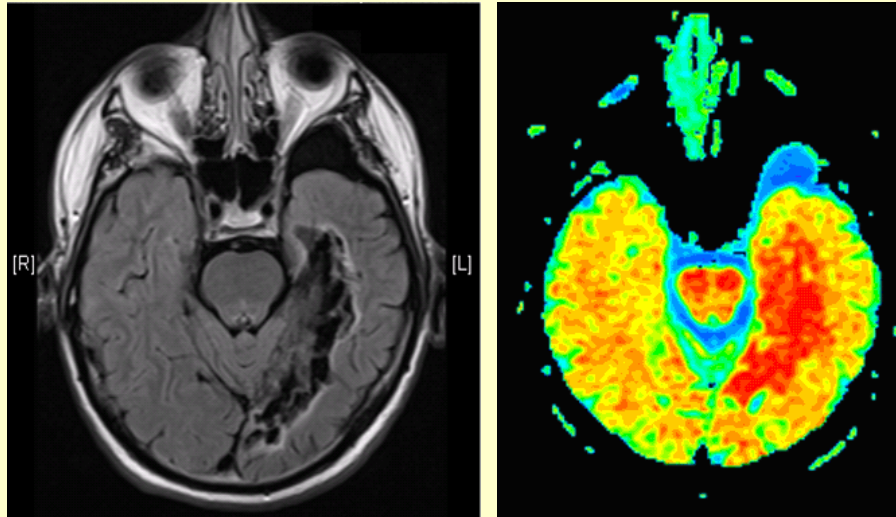
**Answer**

1. Visual field deficits often are unnoticed by the stroke survivor. Impairment of function is often minor.
2. An inability to drive and difficulties with reading remain the greatest functional consequences.

### **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?**

**Answer**

1. The optic radiation extending to the occipital lobes.

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

**Answer**

1. Posterior cerebral artery territory also includes the medial temporal lobes and the hippocampus and hence memory can be negatively affected.

**Q5. What is the typical clinical presentation of a posterior cerebral artery infarction?**

**Answer**

Patients with a posterior cerebral artery infarction present with:

- Homonymous hemianopsia
- Memory loss

- Hemisensory loss
- Alexia without agraphia

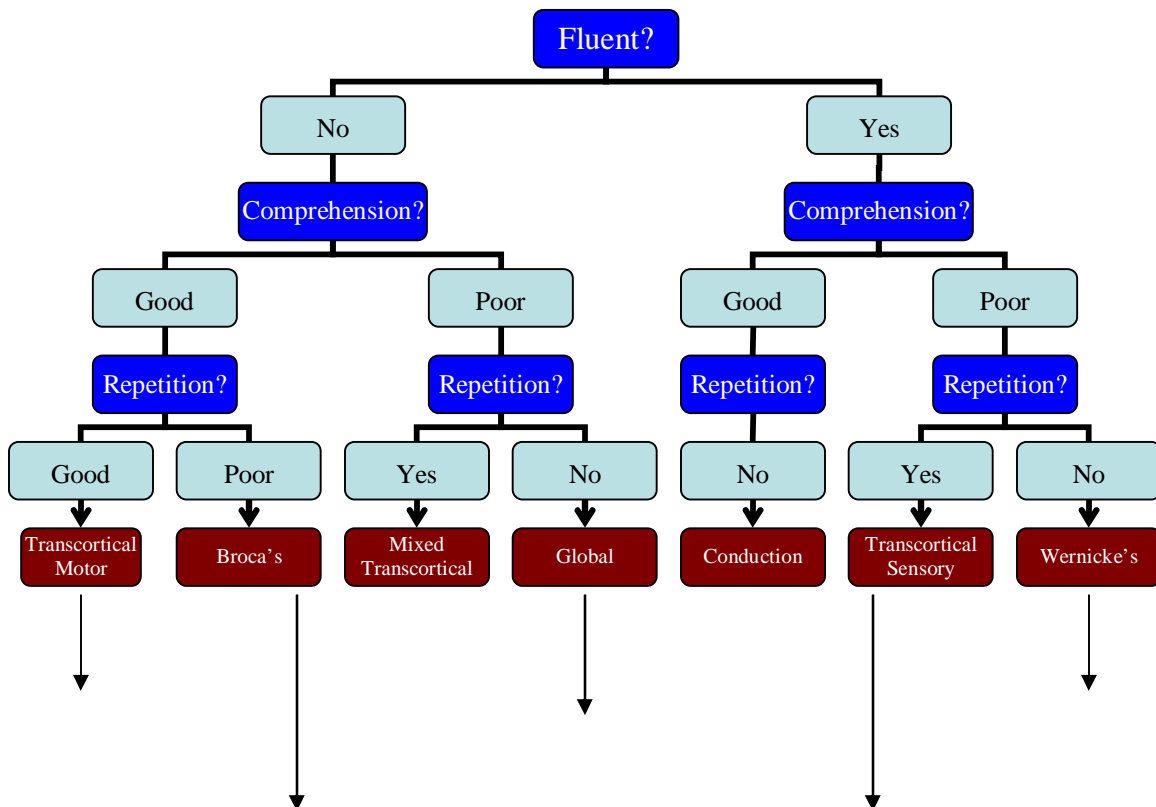
### D3.1 Aphasia: General Information

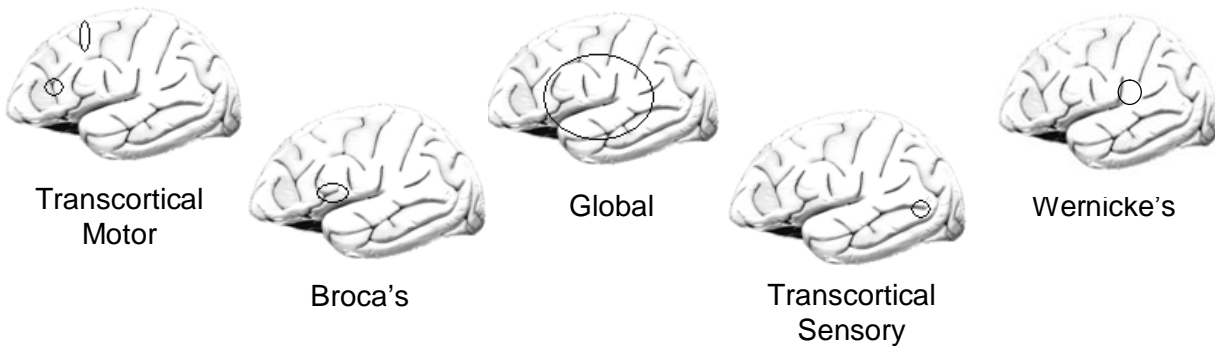
**Q1. What is aphasia?**

**Answer**

Aphasia is an impairment of the ability to use language due to localized brain damage. The AHCPR Post-Stroke Rehabilitation Clinical Practice Guidelines defines aphasia as “the loss of ability to communicate orally, through signs, or in writing, or the inability to communicate orally, through signs, or in writing, or the inability to understand such communications; the loss of language usage ability”.

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





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

**Answers**

**Paraphasias** are incorrect substitutions of words or parts of words. These can be:

- Literal or phonemic paraphasias: similar sounds (e.g., “sound” for “found” or “fen” for “pen”)
- Verbal or semantic paraphasias: word substituted for another form same semantic class (e.g., “fork” for “spoon” or “pen” for “pencil”).

**Neologisms** are newly coined nonsense words.

**Telegraphic speech** refers to a form of speech characterized by simple, yet meaningful sentence structures that contain content words but omit grammatical elements.

**Echolalia** refers to the involuntary repetition of words or phrases which are repeated either immediately after they have been heard or following a delay.

**Word finding difficulties** occur when an individual knows and understands a particular word but has difficulty retrieving it. Some common symptoms associated with word finding difficulties include the use of non-specific replacement words and slowed and hesitant speech.

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

**Answers**

1. The most common types of aphasias are the motor aphasias, in particular Broca’s and anomic aphasias.

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

**Answers**

1. Fluency
2. Comprehension
3. Repetition

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

**Cases and Answers**

<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>	<b>Broca's</b>
<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>	<b>Transcortical Motor</b>
<i>59 year old male with left subcortical stroke. Language assessment revealed word-finding difficulty with good repetition. Able to follow simple commands.</i>	<b>Anomia</b>
<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>	<b>Global</b>
<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>	<b>Transcortical Sensory</b>
<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>	<b>Wernicke's</b>
<i>48 year old female with left subcortical/cortical hemorrhage. Speech was normal and patient was able to follow commands. Repetition was done poorly.</i>	<b>Conduction</b>
<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>	<b>Mixed Transcortical</b>

**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?**

**Answers**

1. Right hemiparesis
2. Broca's or expressive aphasia

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

**Answer**

1. Broca's or expressive/motor aphasia is caused by left hemispheric damage.
2. Characterized by non-fluent, effortful speech with preserved comprehension.



**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?**

**Answers**

1. Aphasia therapy has been shown to be effective, particular if provided at adequate intensity in the subacute phase of stroke rehabilitation.

### **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?**

**Answer**

1. Wernicke's or comprehensive aphasia

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

**Answer**

Wernicke's aphasia is defined by:

- Near normal amount of normal (fluent) speech output
- Comprehension of spoken language is defective although patients may derive meaning from nonverbal cues.
- Lots of empty phrases and circumlocutions
- Usually many paraphasic errors (phonemic paraphasias or sound-alike and semantic paraphasias or mean-alike words), jargon (nonword sounds or fluent, well-articulated, but incomprehensible speech) and neologisms (newly coined words).
- Frequently use "filler" words, such as *thing, it, that, you know*.
- Naming is impaired
- Repetition of spoken language is abnormal.
- Response to nonsense questions asked in an inquisitive manner are inappropriate.

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

**Answer**

1. Left temporal lobe, especially the posterior portion of the superior temporal gyrus.

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

**Answer**

1. Because Wernicke's aphasia does impact on the understanding of language, when it is profound it can have a negative impact on learning which is important to 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?**

**Answer**

1. Conduction aphasia.

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

**Answers**

1. Marked by disproportional impairment in repeating spoken languages.
2. Literal paraphasias with “targeting” of words (until getting the right one).
3. Accounts for 5-10% of all aphasias.

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

**Answer**

1. Stroke of the parietal operculum (**arcuate fasciculus**) or insula or deep to the suramarginal gyrus.

## References

Brodaty H, Withall A, Altendorf A, Sachdev PS. Rates of depression at 3 and 15 months poststroke and their relationship with cognitive decline: the Sydney Stroke Study. *Am J Geriatr Psychiatry* 2007; 15:477-486.

Caplan LR. Neurologic Management Plan. In Ozer MN, Materson RS, and Caplan LR. Management of Persons with Stroke. St. Louis (Missouri): Moseby-Year Book, Inc.; 1994, 61-113.

Kalaria RN, Ballard C. Stroke and cognition. *Curr Atheroscler Rep* 2001; 3(4):334-339.

Modrego PJ, Ferrandez J. Depression in patients with mild cognitive impairment increases the risk of developing dementia of the Alzheimer type. A prospective cohort study. *Arch Neurol* 2004; 61:1290-1293.

Murata Y, Kimura M, Robinson RG. Does cognitive impairment cause poststroke depression? *Am J Geriatr Psychiatry* 2000; 8:310-317.

Ruchinkas RA, Curyto KJ. Cognitive screening in geriatric rehabilitation. *Rehabilitation Psychology* 2003; 48:14-22.

Talelli P, Ellul J, Terzis G, et al. Common carotid artery intima media thickness and poststroke cognitive impairment. *Journal of the Neurological Sciences* 2004; 223:129-134.