Sample Case Study

Relevant History

XX, a 78-year-old, right-handed female, was hospitalized in early February of 2014 due to a possible ischemic stroke. Per review of the medical record, she awoke at 4 a.m. with left facial, perioral and left hand numbness and tingling. She also reported weakness in her left upper and lower extremity, and decreased left-sided peripheral vision in her left eye. She presented to a community hospital where the initial CT scan was reportedly negative for acute processes. Symptoms reportedly progressed to include difficulty with ambulation, and XX was transferred to a JCAHO-certified stroke center for continued care.

Magnetic resonance imaging completed upon admission to the stroke center revealed a right posterior cerebral infarction greater than 8 hours of age. Areas of involvement included the right occipitotemporal gyrus, the right occipital lobe, the posterior body and tail of the right hippocampus, and the right thalamus within the distribution of the right posterior cerebral artery, resulting from thrombosis at the P1-P2 juncture. Images are included for consideration in Appendix A. A computerized tomography angiogram (CTA) was completed, confirming occlusion of the P1 segment of the posterior cerebral artery. Medical workup revealed left-sided paresthesia and diminished strength, without "aphasia or facial droop", and cranial nerve (CN) examination revealed functions for CNs II – XII to be grossly intact. XX was reported to be oriented, with congruent mood and affect. No acute cardiac, respiratory or gastrointestinal processes were identified. XX was placed on deep vein thrombosis prophylaxis of aspirin and Lovenox® injections daily, along with the statin medication, Lipitor® for management of hyperlipidemia, and Ambien® for insomnia. Referrals for physical, occupational and speech therapy were initiated in the acute care setting, but service was limited to completion of evaluations only, as XX met criteria for transfer to the comprehensive inpatient rehabilitation (IRF) setting. She was admitted to the IRF only two days following hospitalization, and rehabilitation care continued in that setting for a period of 21 days.

XX was a high school graduate, with English as her only language. Her occupation was listed as homemaker. Prior to hospitalization for this medical event, XX lived independently, drove and volunteered in her church. She had two supportive daughters. Her prior medical history was limited to diagnoses of

hyperlipidemia and back pain, and family history was positive for cerebrovascular accident in both parents. The only medication taken at home was Allegra-D®.

2) Assessment Methods/Tests & Results

The standardized assessment selected for use during XX's evaluation in the inpatient rehabilitation setting was the Burns Brief Inventory of Communication and Cognition: Right Hemisphere Inventory. This is a criterion-referenced tool designed to provide a profile of strengths and challenges across a range of skills and behaviors associated with injury to the right, cerebral hemisphere (Burns, 1997), which is generally considered the non-dominant hemisphere with respect to speech and language functioning (Bhatnager, 2012). The tool had the ability to efficiently provide a measure of non-linguistic attentional functioning and visual-perception, and the extralinguistic skills of prosody and abstract language, all of which are frequently targets of intervention by speech-language pathology for individuals who experience right hemisphere lesions (Myers and Blake, 2008). The scoring summary for this assessment tool is designed to aid in the selection of relevant treatment activities, as plotting of raw scores provides a way to quickly identify skills which are relatively intact and not in need of intervention, as well as skills which are limited to a severe degree, such that focused intervention may be a less efficient use of resources. Tasks on which performance falls in the range between these two extremes as indicated by shading or diagonal lines are described as potentially relevant selections for impairment-based therapy (Burns, 1997).

XX's performance on the initial administration of this tool is shown in Appendix B. Examination of the scores indicated the presence of moderate to severe difficulties with all activities which required leftward visual scanning, sustained and/or alternating attention to the left side of table top activities, facial recognition, and visual-spatial constructional and graphomotor abilities. When confronted with a picture of a mealtime place setting, she stated that it appeared to her to be "a ball of yarn". Of the 5 items included on this subtest, she was only able to locate the one situated farthest to the right side of the scene. Another subtest presented a visual

closure activity in which XX was asked to name an item drawn in a degraded fashion with dashed lines, such that pieces were missing. She was able to successfully name only 2 of the 5 items, and verbal responses reflected significant perceptual difficulties such as referring to a pair of scissors as, “a wooden toy bear leaping in the air”, and to a desk as “a hairdo”. XX’s initial clock drawing received 10% of available credit on this item as shown in Appendix C. The drawing reflects multiple errors of omission for numbers typically found on the left side of a clock, and the “11” and “12” are placed outside the circle. Vague and extraneous placement of hands is also apparent.

XX’s scores on all items in the Prosody and Abstract Language cluster reveal performance in these areas to be a relative strength. XX’s discourse reflected generally appropriate rhythm, and intonation, and she exhibited only mild difficulty in recognizing emotional tone in the speech of others, as assessed by this tool.

The Burns Brief Inventory of Communication and Cognition: Complex Neuropathology Form (Burns, 1997) was also administered in efforts to further determine the quality of XX’s declarative and working memory functioning. Results are shown below (Figure 1). While XX performed well on tasks which probed declarative memory abilities, auditory attention and auditory memory, scores on subtests examining attention and memory in a way that relies on visual processing confirm the deficits of perception and attention previously discussed.

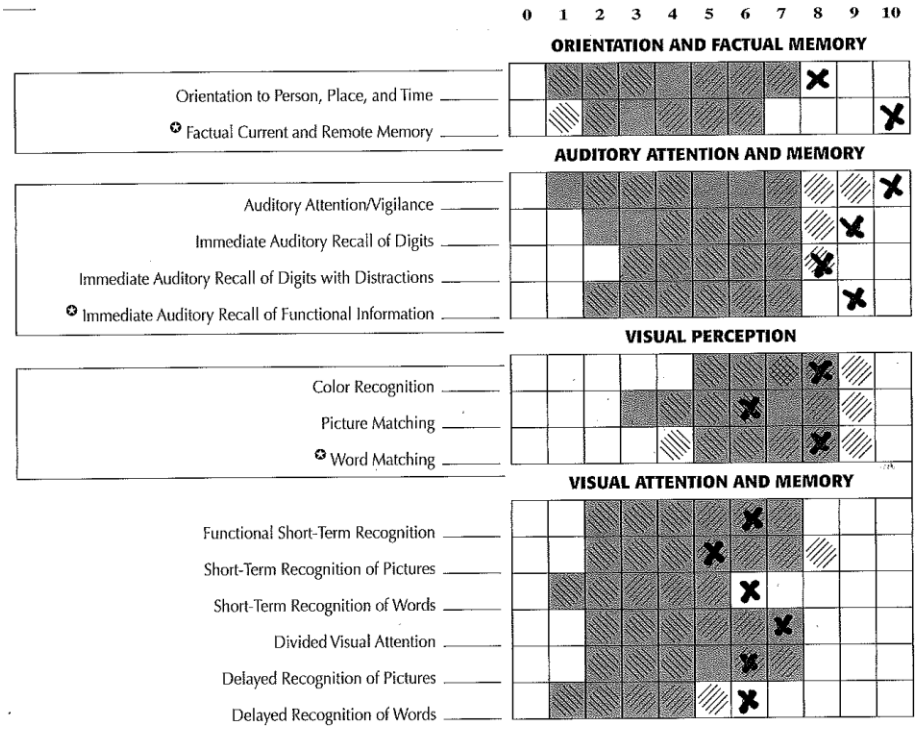


Figure 1. Burns Brief Inventory of Communication and Cognition: Complex Neuropathology Form results

In conversation, XX did not demonstrate overt verbosity, tangential content or over-personalization frequently associated with right hemisphere damage (Blake, 2006); however, moderately structured observation of cognitive-communication functioning conducted during interview did reveal one of the more unusual aspects of XX's clinical presentation, this being significantly distorted interpretation of visually-based situations. XX interpreted the hand-held medication scanner device used by nursing staff to be some type of camera which was recording her activity. On another occasion, XX reported, "there was a duplicate of this (pointed to her left thumb) that fell off. I left it on the table. I was afraid to throw it away." Later, she was found to be sitting in her wheelchair with a towel wrapped carefully on her lap. She explained that her hands kept falling off, and she had them collected in the towel. She also reported that "a hand" was grabbing and pinching her, and at first wondered if it was some kind of "voodoo". XX's perceptions regarding her affected left hand and arm may also

be revealed by the self-portrait drawn during evaluation by the occupational therapist, in which the person depicted appears to have more than one left hand. (Figure 2).

Figure 2. Self portrait

Lastly, it was noted that oral mechanism examination was unremarkable. No dysphagia was identified during clinical swallowing examination. XX had no prior history of hearing loss, and hearing acuity in conversation was judged to be within functional limits.

3) Diagnostic and Prognostic Conclusions

Prognosis for improvement in cognitive-communication function was judged to be good in light of several factors. XX had relatively limited health concerns prior to hospitalization, as well as with an active, independent lifestyle, and XX's family denied any concerns regarding cognitive functioning prior to the CVA. Another factor in support of a positive prognosis was the fact that XX was still within the two-month window of

time often referred to as a period of spontaneous recovery (Estabrooks, Martin & Nicholas, 2014). Furthermore, XX did not deny the presence of deficits once they were explained by the clinician, and she was stimulable for improved performance on tasks requiring attention to the left hemispace, given visual and verbal cues. Finally, despite significant changes in her functional ability, XX demonstrated a fairly upbeat, positive outlook. At one point, when complimented on her sense of humor, she quoted a favorite verse, stating, "A merry heart doeth good like a medicine."

Potentially limiting factors were felt to be advanced age, along with the generous size and multilobar distribution of the cerebrovascular accident. XX's NIH Stroke Scale Score (NIHSS) upon admission to the hospital was 9, reflecting the potential for moderately severe impairment (Adams, et al., 1999). Because XX awoke with stroke symptoms, the time of onset for her CVA could not be determined. For this reason, she did not meet the criteria to receive thrombolytic treatment (Lansberg, et al., 2012). Thrombolytic treatment has been shown to improve long-term outcomes for individuals with ischemic stroke (González, et al., 2013; Lindsberg, et al., 2004), so the fact that XX did not receive this medication may have contributed unfavorably to her outcome. In terms of prognosis specific to cognitive-communication performance, Cherney and colleagues (2001) found that the presence and severity of unilateral spatial neglect contributes negatively to outcomes for people recovering from right hemisphere injury , so the fact that neglect behaviors were present in this case should be considered in this light.

A differential diagnosis of moderate cognitive-communication deficit of the right hemisphere type was given at the time of admission to the inpatient rehabilitation setting. The condition is also referred to as "right-hemisphere syndrome" (Hegde, 2006), and "right hemisphere disorder (RHD)" (Blake, 2008). XX exhibited greater limitation of non-linguistic than extralinguistic abilities at the time of her initial assessment. This diagnosis is felt to be supported by site of lesion evidence as well as quantitative and qualitative results from assessment by the speech-language pathologist. Based on behavioral examination, XX was also believed to

present with posterior-variant alien hand syndrome (AHS) (Pack, Stewart, Diamond, & Gale, 2002) based on diminished recognition of ownership of her left hand without the presence of visual cues, and a perception that her hand acted in ways outside of her control (Ventura, Goldman & Hildebrand, 1995). Alien hand syndrome differs from somatoparaphrenia, also common in people with right hemisphere damage, in that somatoparaphrenia causes a person to deny ownership of the affected limb, even with visual cues. (Gandola, et al., 2012) An interesting finding relevant to alien hand variants is the report that prognosis for recovery from posterior variant AHS is believed by some to be better than the prognosis for other variants (Pack, Stewart, Diamond & Gale, 2002).

4) Management Recommendations and Procedures

Following dynamic assessment of cognitive-communication skills completed within the first 3 days of admission to the IRF setting, direct intervention by speech-language pathology services addressing cognitive-communication abilities was recommended for a minimum of 1.0 hours daily on 5 of 7 days each week, for the remainder of the inpatient rehabilitation stay. XX's stated goal was to return to her home if at all possible. She also expressed the desire to be able to read her Bible. Long and short-term goals were developed as follows, with a focus on establishing skills XX would need in order to return to her home setting with intermittent supervision from a family member. This level of functioning would allow XX to remain safely in her home alone for periods of up to 4 hours, but preclude driving or staying in her home alone during nighttime hours.

Long-Term Goals: XX will manage cognitive-communication aspects of her daily routine with intermittent supervision.

Short-Term Goals:

1) XX will utilize environmental cues and self-initiated strategies to be fully oriented on 3 consecutive dates.
2) XX will demonstrate improved quality of left attention as demonstrated by comparison of work samples.

3) XX will punch-dial telephone numbers successfully in 5/5 trials on 3 consecutive dates.
4) XX will complete mock medication management tasks with at least 90% accuracy given extra time and use of compensatory strategies.
5) XX will be able to read short paragraphs of enlarged print with at least 90% accuracy of comprehension.
6) XX will complete basic route finding activities successfully on at least 2 occasions, given extra time and assistance upon request.
7) XX will verbalize increased confidence in her cognitive-communicative abilities by date of discharge, as shown by comparison of responses on a basic visual analog scale.
8) XX's family will verbalize and demonstrate understanding of XX's cognitive status and related needs by the date of discharge from the IRF setting.

The initial session following assessment was designed as an opportunity for XX to learn a bit about the results of her assessment, and to provide her with a basic summary of brain functioning relative to her stroke. XX was also told that she was free to question the rationale for any therapy activity, and to request occasional rest breaks during therapy.

Environmental modifications are described by Barrett (2000) as beneficial in reducing sensory deprivation in individuals with RHD; therefore, early management activities in this case also included recommendations regarding XX's room arrangement in order to facilitate safety and ease of access to information. Her room was selected so that the doorway would be to her right side when she was in bed, in order to prevent staff and visitors from surprising her when they entered her room. A clock and calendar were also placed in a location visible to her right. In the experience of this clinician, mirrors have been observed to contribute to visual misperception by individuals with RHD, so the full-length mirrored doors in XX's room were covered for the duration of her stay. Signs were posted to remind staff to place call light within reach to her left side, and XX was engaged in practice of call light use until she gave successful and efficient return demonstration. XX was instructed to treat her affected left arm and hand gently, and to keep her limb in a place where she could see that it was not vulnerable to being pinched, twisted or otherwise injured.

Treatment interventions were typically provided in 30 minute sessions scheduled twice to three times daily. Activities focused heavily on the development of improved visual scanning, with emphasis on the left peripersonal and extrapersonal space (Warren, 2013; Ward, 2015), and included cancellation, tracing and copying activities of increasing length and complexity (Warren, 1996). As a precursor, or warm up to these activities, XX was encouraged to use her left hand to trace the left margin of each array prior to beginning each graphomotor task. Blake (2007) suggests that such voluntary motor activity with the left hand may increase right hemisphere activation, resulting in improved attention to the left peripersonal space, and Hillis (2006) describes this strategy as a way to expand the "window of attention" around a particular stimulus or group of stimuli. The level of difficulty for these activities was increased by decreasing font size, resulting in an increased number of potential targets, and by increasing the relative similarity of the visual targets; for example, Ws and Vs appear more visually similar than Ks and Ts. Computer-assisted activities, including use of the Visual Attention Therapy app (Tactus Software Solutions, 2012) for iPad®, were incorporated into treatment sessions, with difficulty level advanced once performance at the 80% accuracy level was achieved. Visual trails, constructed by placing neon sticky notes with numbers and/or letters, were also used to promote improved efficiency and accuracy of scanning in the extrapersonal space, similar to the scanning patterns needed for route finding and driving (Warren, 2013).

Reduced success at the activity level, defined as specific skills or task performance, can result in participation level limitations which prevent return to desired, age-appropriate roles (WHO, 2002). Because the ability to obtain help in an emergency situation is one key to being able to live independently, the activity of punch-dialing telephone numbers was included as a target of intervention, utilizing a phone on which brightly colored tape was placed to the left side of the keypad. The tape served as a visual "anchor" to the left margin of the keypad (Meyers, 1999). At baseline, XX performed this activity with less than 50% success, with skill improving to greater than 80% accuracy level by date of discharge.

At the outset of treatment, XX was unable to read an analog clock successfully unless both hands indicated numbers to the right side of the clock, such as “one fifteen”, or “four thirty”. When hands indicated numbers on the left side of the clock face, XX appeared to interpret the very short extensions of the clock hands in the center of the clock, and reading 10:10 as “ten after four”, etc. Rubens (1985) found that a medical treatment, referred to as caloric stimulation, improved visual attention to the neglected side in a group of 18 individuals with hemineglect. This intervention is conducted by irrigating the left ear canal with cold water, or, in some cases, using warm water in a similar fashion in the right ear. The beneficial effects are described as being temporary; however, in an effort to establish an initial successful response and perhaps provide a sensory frame of reference for leftward scanning, this technique was modified by stroking XX’s left ear (helix, anthelix and concha) with an iced applicator swab simultaneously with the request to decode clocks on which one or both hands were pointing to numbers on the left side of the clock. In XX’s case, she was successfully able to read clocks indicating 9:20 and 6:50 during the first session in which this technique was utilized. Verbal cues to “find the nine, and then look for the hands” were then paired with all presentations. Once XX was reading the clocks with 90% success, the iced swab use was discontinued, and XX was instructed to use verbal self-instruction to direct leftward attention during this task.

It is interesting to note that, at the time this case study is being prepared, both the Practice Portal for the American Speech-Language-Hearing Association, and the Evidence-Based Practice Guidelines of the Academy of Neurologic Communication Disorders and Sciences lack specific information relative to the evaluation and management of right hemisphere cognitive-communicative deficits.

5) <u>Data Documenting Outcomes of Treatment</u>

Within the inpatient rehabilitation setting, the tool known as the Inpatient Rehabilitation Facility-Patient Assessment Instrument (IRF-PAI) is utilized as the comprehensive measure of functioning and reporting of outcomes to third-party payers, including the Centers for Medicare and Medicaid Services (UB Foundation

Activities, 2012). Scoring is based on the set of 18 functional abilities often referred to as the FIM™ instrument (UDSMR, 2015). The tool utilizes an 8-point descriptive scale rating system, ranging from 0 = "did not occur" to 7= complete independence. XX's scores on admission to the IRF are shown in dark gray in Figure 3 below. Scores for the discharge assessment are shown in light gray, and the case-based goal scores are reflected by the black line.

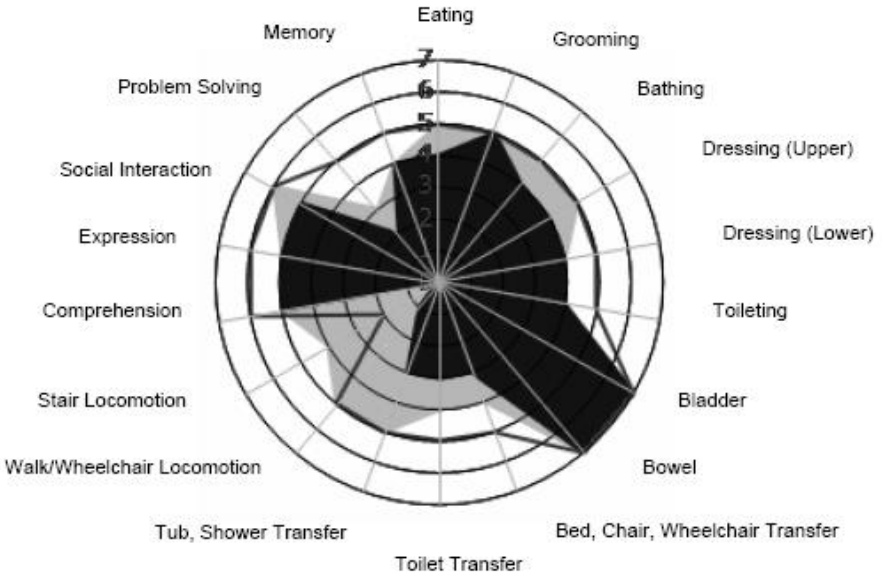


Figure 3. Polar graph reflecting initial, discharge, and benchmark FIM scores

Key: ■ = FIM ratings at admission; ■ = FIM ratings at discharge; line = benchmark at 75th percentile

XX's total FIM gain, calculated by subtracting the total admission FIM score from the total discharge FIM score, was 16 points, and her length of stay efficiency (LSE), calculated by dividing FIM gain by length of stay was 0.76. In comparison, the average overall FIM gain attained by individuals with similar characteristics was 23.5 points, and the average LSE was 1.4. These lower than average scores may reflect the moderately severe impairment predicted by the initial NIHSS administration. XX's score on items in the Cognitive Skills cluster, including receptive and expressive communication, memory, and problem solving, increased by 2 points. This change was much smaller than expected based on observed performance of functional activities. It is the opinion of this clinician that this finding could be related to mis-application of the FIM tool by the rehabilitation

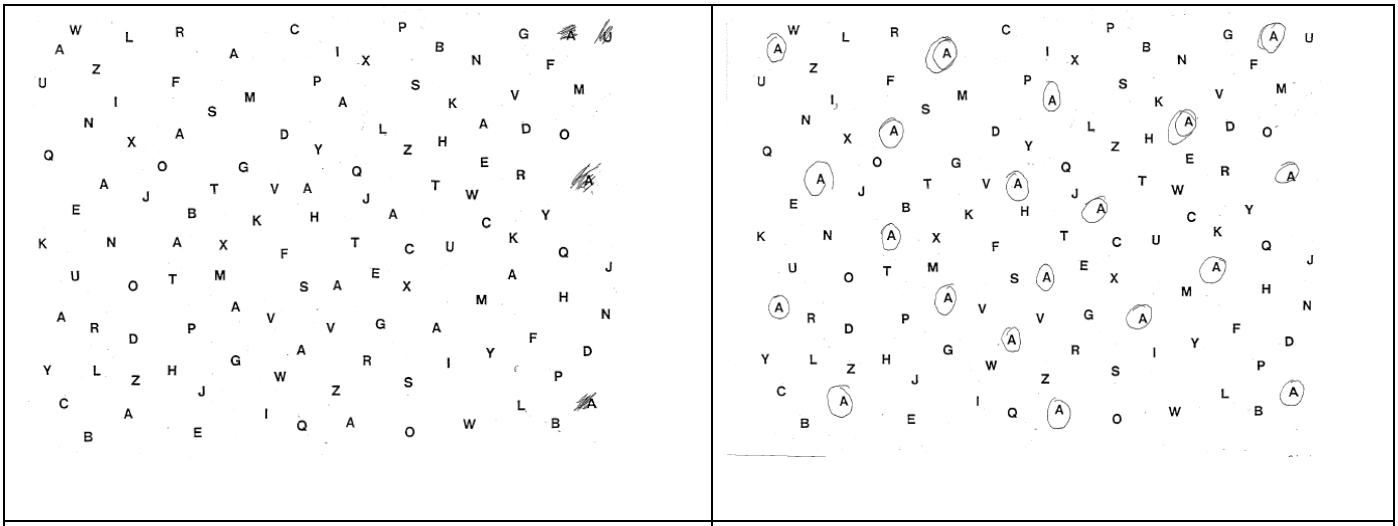
nursing staff. Additional rational for this assertion, and a discussion of the use of the FIM as a measure of cognitive-communication performance, will be included in the oral presentation for this case.

Outcomes and functional changes were also documented by comparison of results on the Burns Brief Inventory of Communication and Cognition: Right Hemisphere Inventory (Burns, 1997) as shown in Appendix B. Results obtained on the reassessment reflect significant improvement on all subtests involving performance of visual attention, scanning, visual perception and visuo-spatial construction ability. Scores on tasks assessing prosody and use of abstract language remained relatively static; however these were initially identified as relative strengths in comparison to other skills, therefore this finding was not surprising.

Comparison of work samples was also conducted as a measure of improvement. Comparison of clock drawings is shown in Appendix C, reflecting somewhat improved spatial construction and ability to attend to the left side of an array during the post-treatment assessment, as shown by placement of the numbers. Although quality of hand placement remained somewhat anomalous and vague, three of three naïve judges (students completing clinical rotations in the rehabilitation department) selected the post-treatment drawing as qualitatively better. It is the opinion of this clinician that the test instructions, "….set the hands at ten minutes after 12", may result in a product which is less sensitive in revealing right hemisphere deficits, since both the 12 and the 2 are situated at, or to the right of midline. Instructions for the clock drawing task on the Cognitive Linguistic Quick Test (Estabrooks, 2001) specify hand placement at ten minutes after eleven, which may be a position more likely to reveal neglect or inattention to the left hemispace.

The scanning subtest from the Arizona Battery for Communication Disorders of Dementia (Bayles & Tomoeda, 1993) was utilized as an additional qualitative measure of outcome. During the baseline attempt of this task, XX located only three targets on the far right of the array, and then stated, "There. That's all." As shown by Figure 4, performance in the post-treatment condition was significantly improved. XX identified all the relevant targets, without any errors of commission; and, although her scanning behavior included a

combination of left to right, and right to left, search patterns, she did initiate self-checking behaviors and the final product does not reflect inattention to the left side of the array.



Pre-treatment	Post-treatment

Figure 4: Comparison of pre- and post-treatment cancellation task response

6) Rationale for Termination of Treatment and Follow-up Recommendations

Continued direct intervention by speech-language pathology was recommended upon transfer to the skilled nursing (SNF) setting. Handoff of care took place via an exchange of medical records including the report of evaluation, weekly progress notes and a discharge summary. Due to HIPAA guidelines which limit ongoing direct communication with subsequent treating clinicians, it is unknown as to the length of time XX remained in the SNF setting, and whether or not treatment continues on a home care or outpatient basis at the present time. Given the current nature of the healthcare environment, including the capitated payment system in place for outpatient rehabilitation care, and the length of time post-onset, it is believed likely that formal intervention is not continuing at this time. Had XX received ongoing care from this clinician, discharge from direct treatment would have been recommended in any of several circumstances: 1) upon request from XX and/or her caregivers; 2) upon successful completion of the course of care, such that goals were attained; or, 3) evidence that direct treatment was no longer beneficial in supporting progress toward improved function. Use of the ASHA National

Outcome System (NOMS) which is based on performance on up to 15 Functional Communication Measures (FCMs) (ASHA, n.d.) is suggested as an appropriate choice for a tool to track and document progress in a SNF, home care or outpatient setting as it has the ability to track performance across multiple skills targeted in rehabilitation of RHD, including attention, reading, writing and pragmatic skills.

7) Neurologic Considerations

The left cerebral hemisphere is generally considered to be the dominant hemisphere, with respect to language functioning, in the majority of individuals (Bhatnager, 2012). Given that XX was right-handed, and that her conversational language was free of word-finding difficulty and other signs of aphasia, the assessment that the stroke affected her non-language-dominant hemisphere appears to be supported.

The thalamus, a structure involved in XX's stroke, is a large midline subcortical gray matter structure containing various sensory nuclei, including the lateral geniculate nucleus (LGN) which carries visual information, and the ventral posterolateral nucleus, which is associated with somatosensation (Bhatnager, 2012). The thalamus receives its blood supply from the P1 branch of the posterior cerebral artery which was occluded in this individual's stroke. In the absence of damage to the primary somatosensory cortex in the parietal lobe, the involvement of the thalamus within the cerebral territory affected by her stroke would account, at least in part, for XX's identified deficits in somatosensation. Right-sided thalamic lesions have also been associated with the phenomenon of alien hand syndrome (Ventura, Goldman & Hildebrand, 1995; Sarva, Deik & Severt, 2014), providing a physiologic basis for this finding as well. XX presented with left hand movements she perceived were not under her control, sustained grasping of objects, and hyper-extended posturing of her fingers. These behaviors are associated with a posterior variant of alien hand syndrome. (Sarva, Deik, & Severt, 2014; Pack, Stewart, Diamond, & Gale, 2002).

Damage to the LGN, which is also supplied by the posterior cerebral artery, has been associated with the findings of visual field deficit and neglect (Luco, Hope, Schweitzer, Vicuña & Fantin, 1992; Schmahmann, 2003).

The behaviors resulting from field cuts and neglect are similar, often co-exist, and can be challenging to distinguish. (Parton, Malhotra & Husein, 2004) It is the opinion of this clinician that both were likely present to some degree in this case, based on lesion size and locations, along with observed behaviors on tasks of drawing and cancellation, along with failures of leftward attention in basic route finding and basic reading.

The temporal lobes are home to the fusiform face area (FFA), an area also supplied by the P1 branch of the posterior cerebral artery. This region is located on the ventromedial aspect of the temporal lobes, bilaterally. Facial recognition is a skill for which there has been shown to be a functional unilateral difference in cerebral physiology, with heightened activity in the right FFA during tasks of facial recognition (Kanwisher & Yovel, 2006). Disordered facial recognition, referred to as prosopagnosia, is often associated with right-hemisphere damage, and XX's performance on the facial recognition subtest of the Burns Inventory reflected some degree of difficulty with facial recognition skills.

Myers (1999), states that anosognosia is consistently associated with frontal and/or parietal sites of lesion. The fact that XX's stroke spared right frontal and right parietal regions is felt to account for the fact that anosognosia, or denial of deficit, was not an observed behavior. Dysarthria was also an unlikely finding, since XX's lesion did not involve the right frontal lobe, basal ganglia or brainstem.

8) Quality Assessment Statement

A query of the database for the inpatient rehabilitation unit where XX received care showed that 45% of individuals with unilateral CVA on the speech-language pathology caseload presented with right hemisphere CVA, so with regards to the underlying etiologic diagnosis, this case is typical of the caseload seen by this writer. Analysis of the database also shows that this case is fairly typical from the standpoint of the length of stay and discharge disposition. An atypical aspect of this case is the unusual and infrequently encountered finding of alien hand symptoms which raised the curiosity of this writer and invited closer inspection.

In retrospect, and after additional reading related to this particular case, deep testing of various abilities would be informative, and the results could contribute to future treatment decisions. Further testing would include detailed assessment of facial matching and facial identification/naming skills, and comparison of object naming with facial naming. Deeper testing of discourse comprehension (Blake, 2015; Tompkins, 2008), and production (Blake, 2015) would also be appropriate, especially as some of the visual attention challenges with potential to limit safe independence resolved. Blake (2015) suggested several tasks useful for expanded testing, including elicitation of expository speech sample via a response to the Cookie Theft task on the Boston Diagnostic Aphasia Examination (Goodglass, Kaplan & Barresi, 2001) or similar picture, with analysis specific to organization, efficiency, gist, and quantity; and use of the Functional Assessment of Verbal Reasoning and Executive Strategies (FAVRES) (MacDonald, 2005). Assessment using a measure of functional communication such as the Communication Abilities of Daily Living (CADL-2) (Holland, Frattali and Fromm, 1999) could also be informative, especially in determining readiness for return to home or transition to an assisted- living setting.

A fair evaluation of this case would recognize that XX was receiving care in the early stages of recovery from her CVA, and some might say that improvement in function could be attributed to the natural course of recovery. In the experience of this clinician, families, and even some healthcare providers overlook the cognitive-communicative deficits of people with RHD, due a focus on recovery of mobility skills. Early, individualized and evidence-based intervention can identify deficits and help people move more quickly and safely down the road of recovery, perhaps preventing development of counterproductive behaviors along the way.

It is the opinion of this writer that treatment contributed to favorable improvement in activities relevant to safe independence such as survival skill reading and way-finding in living surroundings. Qualitative and quantitative measures support this claim. Additionally, XX verbalized increased confidence related to her performance over the course of her care. The visual analog tool used to document this finding will be shared

during the oral presentation of this case. Although interventions by this discipline should not be considered as treatment for alien hand syndrome, XX reported gradual reduction in the frequency and intensity of these uncomfortable perceptions over the course of her stay in the IRF setting. While XX was not immediately able to return home following her IRF stay due to family circumstances which prevented supervision at least during nighttime hours, improvements in mobility and visual perceptual functioning lessened her burden of care and increased the likelihood of an eventual return to her home.

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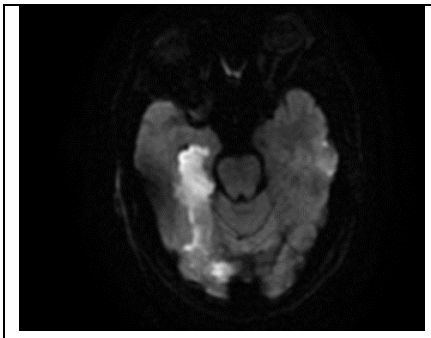
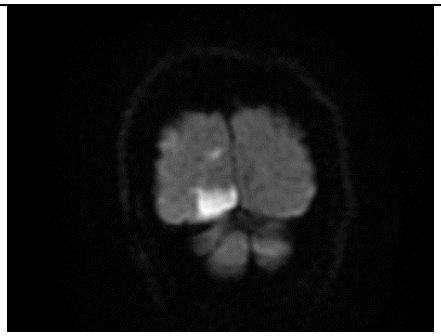
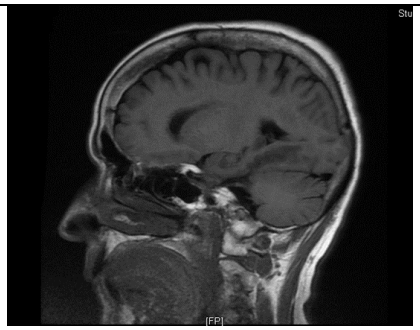
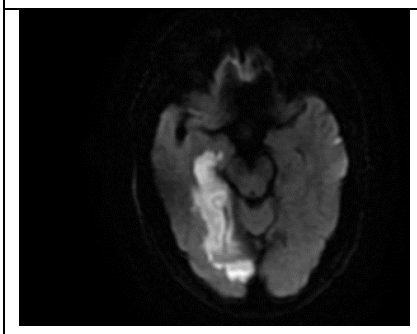
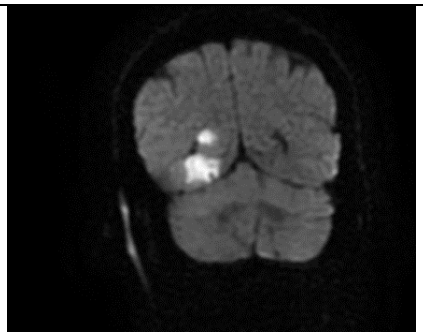
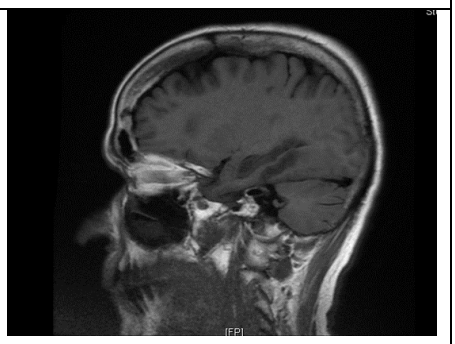
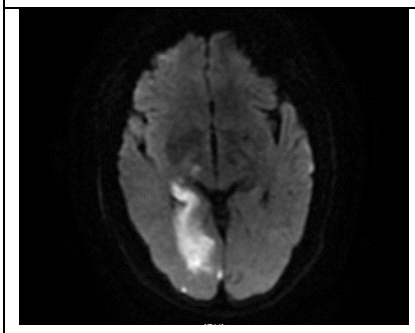
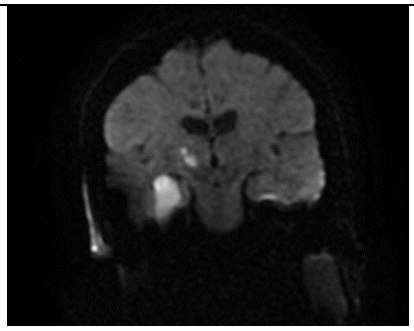
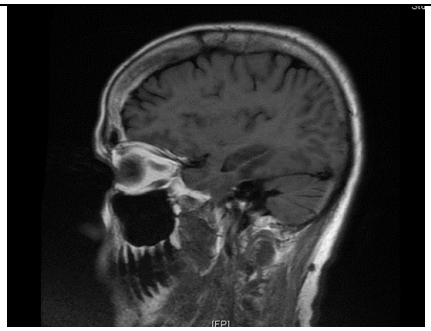
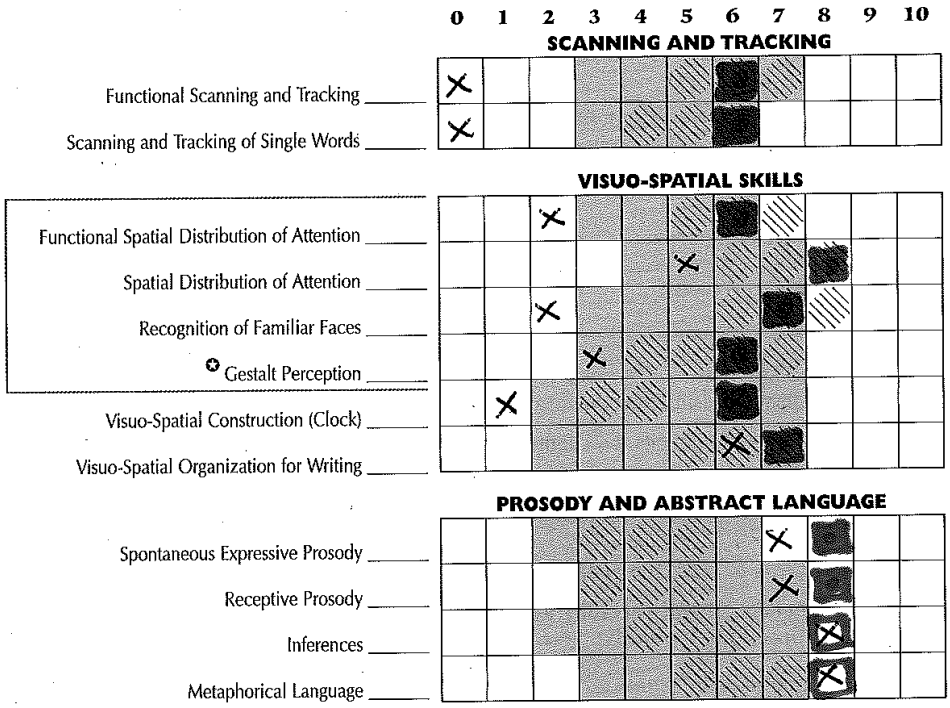
Appendix A: Radiographic images

		
Axial 14 DWI	Coronal 5 DWI	15 Sagittal T1 FLAIR
		
Axial 15 DWI	Coronal 11 DWI	16 Sagittal T1 FLAIR
		
Axial 17 DWI	Coronal 18 DWI	18 Sagittal T1 FLAIR

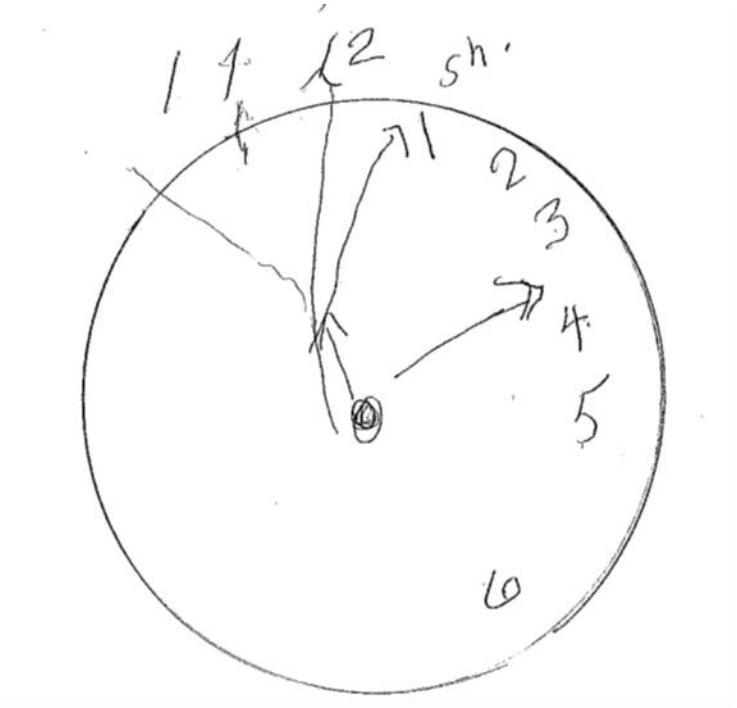
Appendix B: Comparison of pre- and post-treatment scores on the Burns Brief Inventory of Communication and Cognition: Right Hemisphere Inventory



Key: X = score on initial IRF assessment; ■ = score at discharge from IRF setting

Appendix C: Comparison of pre- and post-treatment clock drawings on the Burns Brief Inventory of Communication and Cognition: Right Hemisphere Inventory

Clock drawing during initial assessment:



Clock drawing during discharge assessment: