The Role of Neuropsychology in Acute and Chronic Brain Damage: A diagnostic and therapeutic approach.

Joseph T. Giacino, PhD
Spaulding Rehabilitation Hospital
Harvard Medical School
Boston, MA USA

Scientific Conference on
Brain Damage II
Madrid
March 11, 2013

Department of Physical Medicine & Rehabilitation
Harvard Medical School

Spaulding Rehabilitation Hospital
Massachusetts General Hospital
Brigham & Women's Hospital

Disorders of Consciousness Program Framework

	LEVEL I **Prior to Recovery of Consciousness**	**LEVEL II** **Prior to Recovery of Functional Communication**	**LEVEL III** **Prior to Recovery of Orientation**
DIAGNOSIS	**Coma/Vegetative State**	**Minimally Conscious State**	**Acute Confusional State**
CLINICAL STATUS	▪Unarousable/Fluctuating arousal ▪No command-following ▪No purposeful movement ▪No communication ability ▪Fully dependent for basic care	▪Normal/Fluctuating arousal/attention ▪Inconsistent command-following ▪Automatic/purposeful motor behavior ▪Unreliable communication ▪Mod-max assist for basic care	▪Alert/distractible ▪Sleep disturbance ▪Confusion ▪Impulsive/agitated behavior ▪Reliable communication ▪Min-mod assist for basic care
ASSESSMENT METHODS	Coma Recovery Scale- Revised (CRS-R)	CRS-R	Confusion Assessment Protocol
	Arousal Monitoring Protocol	Individualized Quantitative Behavioral Assessment (IQBA)	Galveston Orientation and Assessment Test (GOAT)
	Sensor-based technologies for detection of volitional behavior	Sensor-based technologies for detection of volitional behavior and yes-no communication	Functional Limb Movement Protocol
	Structural and Functional Neuroimaging	Structural and Functional Neuroimaging	Structural and Functional Neuroimaging
TREATMENT INTERVENTIONS	Medication Trials	Behavior-Enhancing Medication Trials	Cognition-Enhancing Medication Trials
	Arousal Facilitation Protocol	Augmentative Communication Training	Environmental Regulation
	Sensory Modulation	Environmental Control Training	Response-Contingent Sensory Feedback Training

DoC Program Framework

	LEVEL I Prior to Recovery of Consciousness	LEVEL II Prior to Recovery of Functional Communication	LEVEL III Prior to Recovery of Orientation
TRANSITION CRITERIA	At least one feature of MCS demonstrated on 3 consecutive exams	At least three consecutive exams in which reliable yes-no responses are demonstrated	At least three consecutive exams in which consistent command-following and reliable yes-no responses are demonstrated.
DISCHARGE CRITERIA	▪ If Level III is attained within the 8-week timeframe, the case manager will request authorization for "admission" to the general inpatient ABI Program, pending medical stability. ▪ If Level III is not attained within 8 weeks, but there is evidence of significant recovery (ie defined as average weekly CRS-R change score >/= 1 point or emergence of at least 1 new feature of MCS [present on at least 3 exams] from week 3 to week 6), the case manager will request an extension (ie 4 weeks per request). ▪ If Level III is not attained within 8 weeks, and the rate of improvement from week 1 to week 6 is less than 1 point per week (on average), discharge planning activities will be completed in concert with family members between weeks 6 and 8. *If pt experiences a complication during the program, the case manager will advocate to extend the stay if the rate of improvement approximates the level noted above.		

A Comprehensive Evidence-Based Approach to Assessment and Treatment of Persons with Disorders of Consciousness

Schedule of Core Metrics

VS & MCS	DISCIPLINE	FREQUENCY
Coma Recovery Scale – Revised (CRS-R)	PT, OT, SLP	At least 2x/wk
Chedoke-McMaster Stroke Assessment	PT	1x/week
Limb Movement Protocol	OT	1x/week
Functional Communication Measures	SLP	Admission, 4 weeks, 8 weeks
Medical Complications Checklist	MD	1x/week
Disability Rating Scale	Research Assistants	1x/week
EMCS	**DISCIPLINE**	**FREQUENCY**
Confusion Assessment Protocol (CAP)	SLP & Nursing	1x/week
Chedoke-McMaster Stroke Assessment	PT	1x/week
Limb Movement Protocol	OT	1x/week
Functional Communication Measures	SLP	Admission, 4 weeks, 8 weeks
Medical Complications Checklist	MD	1x/week
Disability Rating Scale	Research Assistants	1x/week
Word Fluency	SLP	1x/week

Standardized Core Metrics

JFK COMA RECOVERY SCALE - REVISED ©2004

Record Form

This form should only be used in association with the "CRS-R ADMINISTRATION AND SCORING GUIDELINES" which provide instructions for standardized administration of the scale.

Patient:	Diagnosis:	Etiology:
Date of Onset:	Date of Admission:	

	Date															
	Week	ADM	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
AUDITORY FUNCTION SCALE																	
4 - Consistent Movement to Command *																	
3 - Reproducible Movement to Command *																	
2 - Localization to Sound																	
1 - Auditory Startle																	
0 - None																	
VISUAL FUNCTION SCALE																	
5 - Object Recognition *																	
4 - Object Localization: Reaching *																	
3 - Visual Pursuit *																	
2 - Fixation *																	
1 - Visual Startle																	
0 - None																	
MOTOR FUNCTION SCALE																	
6 - Functional Object Use †																	
5 - Automatic Motor Response *																	
4 - Object Manipulation *																	
3 - Localization to Noxious Stimulation *																	
2 - Flexion Withdrawal																	
1 - Abnormal Posturing																	
0 - None/Flaccid																	
OROMOTOR/VERBAL FUNCTION SCALE																	
3 - Intelligible Verbalization *																	
2 - Vocalization/Oral Movement																	
1 - Oral Reflexive Movement																	
0 - None																	
COMMUNICATION SCALE																	
2 - Functional: Accurate †																	
1 - Non-Functional: Intentional *																	
0 - None																	
AROUSAL SCALE																	
3 - Attention																	
2 - Eye Opening w/o Stimulation																	
1 - Eye Opening with Stimulation																	
0 - Unarousable																	
TOTAL SCORE																	

Denotes emergence from MCS†

Denotes MCS *

CAP Scoring Criteria

Name:_____ **Date:**_____

CAP#_____

1. Cognitive Impairment (CI): CAP Score

	Correct	Incorrect	CI Score
TOTART Counting to 20 forward	2	0	_____
TOTART Counting to 20 backward	4	0	_____
TOTART Reciting months forward	2	0	_____
TOTART Reciting months backward	6	0	_____

	36	30-35	≤30	
CTD Vigilance (hits X 2) - commissions	4	2	0	_____
	4	3	2, 1, 0	
CTC Comprehension	4	2	0	_____
	10 / 9	8 – 7	6 – 0	
CTD Recognition	6 / 4	2	0	_____
TOTAL SCORE				_____

Cognitive Impairment (Total possible score = 28. Scores ≤ 18 indicate substantial impairment and count as one symptom of post-traumatic confusion. _____

2. Disorientation: _____
(Measured with the GOAT. GOAT error scores > 24 indicate disorientation and count as one symptom of post-traumatic confusion.)

3. Agitation: _____
(Measured with the ABS. ABS scores > 17 indicate increased restlessness and count as one symptom of post-traumatic confusion.)

4. Fluctuation of Symptoms (DRS-R): _____
(Clinician Rated Item 1. Scores of 1 or 2 indicate significant fluctuation and count as one symptom of post-traumatic confusion.)

5. Sleep Disturbance: _____
(Clinician Rated Item 2 as informed by sleep charts and other information. Scores of 2 or 3 indicate significant sleep disturbance and count as one symptom of post-traumatic confusion.)

6. Decreased Daytime Arousal: _____
(Clinician Rated Item 3. Scores of 2 or 3 indicate significantly decreased daytime arousal and count as one symptom of post-traumatic confusion.)

7. **Psychotic Type Symptoms (DRS-R)**: _____
(Clinician Rated Items 4, 5, and 6. Scores of 1, 2, or 3 on item 4 or scores of 1, 2, or 3 on item 5, or scores of 2 or 3 on item 6 indicate psychotic type symptoms and count as one symptom of post-traumatic confusion.

CAP TOTAL SCORE _____
(Patients showing 4 or more symptoms are confused and patients showing 3 or more symptoms are confused if 1 of the symptoms is disorientation.)

Circle one: **Non-confused** **Confused**

Disability Rating Scale (DRS)

Patient Name: _____ Date of Rating: _____

Name of Person Completing Form: _____

DISABILITY RATING SCALE:

A. EYE OPENING:

- ☐ (0) Spontaneous
- ☐ (1) To Speech
- ☐ (2) To Pain
- ☐ (3) None

0-SPONTANEOUS: eyes open with sleep/wake rhythms indicating active arousal mechanisms, does not assume awareness.
1-TO SPEECH AND/OR SENSORY STIMULATION: a response to any verbal approach, whether spoken or shouted, not necessarily the command to open the eyes. Also, response to touch, mild pressure.
2-TO PAIN: tested by a painful stimulus.
3-NONE: no eye opening even to painful stimulation.

B. COMMUNICATION ABILITY:

- ☐ (0) Oriented
- ☐ (1) Confused
- ☐ (2) Inappropriate
- ☐ (3) Incomprehensible
- ☐ (4) None

0-ORIENTED: implies awareness of self and the environment. Patient able to tell you a) who he is; b) where he is; c) why he is there; d) year; e) season; f) month; g) day; h) time of day.
1-CONFUSED: attention can be held and patient responds to questions but responses are delayed and/or indicate varying degrees of disorientation and confusion.
2-INAPPROPRIATE: intelligible articulation but speech is used only in an exclamatory or random way (such as shouting and swearing); no sustained communication exchange is possible.
3-INCOMPREHENSIBLE: moaning, groaning or sounds without recognizable words, no consistent communication signs.
4-NONE: no sounds or communications signs from patient.

C. MOTOR RESPONSE:

- ☐ (0) Obeying
- ☐ (1) Localizing
- ☐ (2) Withdrawing
- ☐ (3) Flexing
- ☐ (4) Extending
- ☐ (5) None

0-OBEYING: obeying command to move finger on best side. If no response or not suitable try another command such as "move lips," "blink eyes," etc. Do not include grasp or other reflex responses.
1-LOCALIZING: a painful stimulus at more than one site causes limb to move (even slightly) in an attempt to remove it. It is a deliberate motor act to move away from or remove the source of noxious stimulation. If there is doubt as to whether withdrawal or localization has occurred after 3 or 4 painful stimulations, rate as localization.
2-WITHDRAWING: any generalized movement away from a noxious stimulus that is more than a simple reflex response
3-FLEXING: painful stimulation results in either flexion at the elbow, rapid withdrawal with abduction of the shoulder or a slow withdrawal with adduction of the shoulder. If there is confusion between flexing and withdrawing, then use pinprick on hands.
4-EXTENDING: painful stimulation results in extension of the limb.
5-NONE: no response can be elicited. Usually associated with hypotonia. Exclude spinal transection as an explanation of lack of response; be satisfied that an adequate stimulus has been applied.

D.FEEDING (COGNITIVE ABILITY ONLY)

- ☐ (0.0) Complete
- ☐ (0.5) Btw.Compl/partial
- ☐ (1.0) Partial
- ☐ (1.5) Btw.partial / minimal
- ☐ (2.0) Minimal
- ☐ (2.5) Btw.min/none
- ☐ (3.0) None

Does the patient show awareness of how and when to perform this activity? Ignore motor disabilities that interfere with carrying out this function. (This is rated under Level of Functioning described below.)
0-COMPLETE: continuously shows awareness that he knows how to feed and can convey unambiguous information that he knows when this activity should occur.
1-PARTIAL: intermittently shows awareness that he knows how to feed and/or can intermittently convey reasonably clearly information that he knows when the activity should occur.
2-MINIMAL: shows questionable or infrequent awareness that he knows in a primitive way how to feed and/or shows infrequently by certain signs, sounds, or activities that he is vaguely aware when the activity should occur.
3-NONE: shows virtually no awareness at any time that he knows how to feed and cannot convey information by signs, sounds, or activity that he knows when the activity should occur.

E.TOILETING (COGNITIVE ABILITY ONLY)

- ☐ (0.0) Complete
- ☐ (0.5) Btw.Complete/partial
- ☐ (1.0) Partial
- ☐ (1.5) Btw.partial / minimal
- ☐ (2.0) Minimal
- ☐ (2.5) Btw.minimal / none
- ☐ (3.0) None

Does the patient show awareness of how and when to perform this activity? Ignore motor disabilities that interfere with carrying out this function. (This is rated under Level of Functioning described below.) Rate best response for toileting based on bowel and bladder behavior
0-COMPLETE: continuously shows awareness that he knows how to toilet and can convey unambiguous information that he knows when this activity should occur.
1-PARTIAL: intermittently shows awareness that he knows how to toilet and/or can intermittently convey reasonably clearly information that he knows when the activity should occur.
2-MINIMAL: shows questionable or infrequent awareness that he knows in a primitive way how to toilet and/or shows infrequently by certain signs, sounds, or activities that he is vaguely aware when the activity should occur.
3-NONE: shows virtually no awareness at any time that he knows how to toilet and cannot convey information by signs, sounds, or activity that he knows when the activity should occur.

Measures degree of cognitive and functional disability. Lower scores on the DRS indicate ***less*** disability, whereas higher scores indicate greater disability.

Confusion Assessment Protocol (CAP)

CAP Scoring Criteria

Name:_____ **Date:**_____

CAP#_____

1. Cognitive Impairment (CI): CAP Score

	Correct	Incorrect		CI Score
TOTART Counting to 20 forward	2	0		_____
TOTART Counting to 20 backward	4	0		_____
TOTART Reciting months forward	2	0		_____
TOTART Reciting months backward	6	0		_____
	36	30-35	≤30	
CTD Vigilance (hits X 2) - commissions	4	2	0	_____
	4	3	2, 1, 0	
CTC Comprehension	4	2	0	_____
	10 / 9	8 – 7	6 – 0	
CTD Recognition	6 / 4	2	0	_____
TOTAL SCORE				_____

Cognitive Impairment (Total possible score = 28. Scores ≤ 18 indicate substantial impairment and count as one symptom of post-traumatic confusion. _____

2. Disorientation: _____
(Measured with the GOAT. GOAT error scores > 24 indicate disorientation and count as one symptom of post-traumatic confusion.)

3. Agitation: _____
(Measured with the ABS. ABS scores > 17 indicate increased restlessness and count as one symptom of post-traumatic confusion.)

4. Fluctuation of Symptoms (DRS-R): _____
(Clinician Rated Item 1. Scores of 1 or 2 indicate significant fluctuation and count as one symptom of post-traumatic confusion.)

5. Sleep Disturbance: _____
(Clinician Rated Item 2 as informed by sleep charts and other information. Scores of 2 or 3 indicate significant sleep disturbance and count as one symptom of post-traumatic confusion.)

6. Decreased Daytime Arousal: _____
(Clinician Rated Item 3. Scores of 2 or 3 indicate significantly decreased daytime arousal and count as one symptom of post-traumatic confusion.)

7. **Psychotic Type Symptoms (DRS-R)**: _____
(Clinician Rated Items 4, 5, and 6. Scores of 1, 2, or 3 on item 4 or scores of 1, 2, or 3 on item 5, or scores of 2 or 3 on item 6 indicate psychotic type symptoms and count as one symptom of post-traumatic confusion.

CAP TOTAL SCORE _____
(Patients showing 4 or more symptoms are confused and patients showing 3 or more symptoms are confused if 1 of the symptoms is disorientation.)

Circle one: **Non-confused** **Confused**

Purpose: Monitor resolution of post-traumatic confusional state.

Examines 7 features of confusion:

- Cognitive Impairment
- Disorientation
- Agitation
- Sleep disturbance
- Symptom fluctuation
- Psychotic symptoms

Sherer *et al.*, Arch Phys Med Rehabil, 2005.

Galveston Orientation & Amnesia Test (GOAT)

Galveston Orientation and Amnesia Test (GOAT)

Type of Administration: Standard_____ Modified_____

_____ 1. ***What is your name?*** (2)_____; ***When were you born?*** (4)_____

Where do you live? (4) _____

_____ 2. ***Where are you now?*** (unnecessary to state name of hospital) city (5) _____

hospital (5) _____

_____ 3. ***On what date were you admitted to the hospital?*** (5) _____; ***How did you get to the hospital?***

(5) _____

_____ 4. ***What is the first event you can remember after the injury?*** (5) _____;

Can you describe in detail (e.g., date, time, companions) the first event you recall before the injury? (5)

_____

_____ 5 ***What is the last event you can recall before the injury?*** (5) _____;

Can you describe in detail (e.g., date, time, companions) the last event you can recall before the injury?

(5) _____

_____ 6. ***What time is it now?*** _____:_____am pm (1 point for each _ hour off, max of 5 points)

_____ 7. ***What day of the week is it?*** _____ (1 point for each day off, max of 3 points)

_____ 8. ***What day of the month is it?*** _____ (1 point for each day off, max of 5 points)

_____ 9. ***What is the month?*** _____ (5 points for each month off, max of 15 points)

_____ 10. ***What is the year?*** _____ (10 points for each year off, max of 30 points)

_____ Total error points

***GOAT Test Completion Code (circle one):** **0 1 2 3 4 5 6 9**

***Test Completion Codes**: 0=Standard Administration, 1=Arousal Impairment Code – Inability to complete item/test due to inability to stay alert, 2=Motor Impairment Code – Inability to give ANY motor response or patient was restrained, 3=Visual Impairment Code – Inability to see test stimuli (e.g., blind), NOT perceptual impairment, 4=Phonation Impairment Code – Gives NO speech at ANY time, too dysarthric to give intelligible response, or intubated, 5=Aphasia Code – Profound language impairment that COMPLETELY interferes with ability to participate in task, 6=Agitation Code – Patient extremely agitated and thus non-cooperative with test administration, 9=Test Not Administered.
If more than one applies, use the code that interfered most with administration of the test.

Measures resolution of Post Traumatic Amnesia (PTA), focusing on orientation to person, place, and time and on memory for events before injury

Levin *et al*., J Nerv Ment Dis, 1979.

Limb Movement Protocol

Spaulding Rehabilitation Hospital
Limb Movement Scoring Sheet

Name: _____ *Hand Dominance:* _____ *Date:* _____ *Time:* _____
Directions: For each command presented, check boxes that characterize the nature of the patient's motor response. **Score 3 trials** for each command.

Response Characteristics

Command	Full Execution Correct Movement 3	Partial Execution Correct Movement 2	Incorrect Movement 1	Perseverative (V)	No Response 0	Not Assessed 00	Comments	Total for each of the 8 items (x/9)
Touch my hand								
Touch your nose								
Take the ball								
Comb your hair								
Brush teeth								
Drink from cup								
Shake hands								
Wave goodbye								

Physical/Visual Modifications: _____ Total (__/72)

Purpose:
Assessment of instrumental praxis (e.g., brushing teeth) and social gestures (e.g., waving).

Functional Communication Measures

Functional Communication Measures

Introduction

The Functional Communication Measures (FCMs) are a series of seven-point rating scales, ranging from least functional (Level 1) to most functional (Level 7). They have been developed by ASHA to describe the different aspects of a patient's functional communication and swallowing abilities over the course of speech-language pathology intervention.

In 2008, eight of the 15 Functional Communication Measures (FCM) from the Adult National Outcomes Measurement System (NOMS) were submitted to the National Quality Forum (www.qualityforum.org) for review. All eight were endorsed and subsequently became part of the public domain. It is important to note that the FCMs are one component of NOMS. To receive access to all of the components of NOMS - national database of treatment outcomes and customized data reports - you must become a registered NOMS user. Additional information pertaining to becoming a registered NOMS user is available at www.asha.org/members/research/NOMS.

The following are the 15 FCMs used with the Adult Healthcare component of NOMS:

- Alaryngeal Communication
- Attention
- Augmentative-Alternative Communication
- Fluency
- Memory
- Motor Speech
- Pragmatics
- Problem Solving
- Reading
- Spoken Language Comprehension
- Spoken Language Expression
- Swallowing
- Voice
- Voice Following Tracheostomy
- Writing

Purpose: Rates basic attention, spoken language comprehension, spoken language expression, and communication via augmentative measures.

Medical Complications Weekly Checklist

Cardiac	Neurological	Urological	Infectious
Dysautomonmia	Seizure	retention	Urine
tachycardia	change MS	other	Stool
Orthostatic Hypotension	hydrocephalus		Blood
Other	Bleed/Infarct	Orthopedic	Sputum
	Spasticity	fracture	CNS
Pulmonary	peripheral nerve injury	dislocation	Skin
Pneumonia	(central) fever	heterotopic ossification	Other
Atelecstatis	Other	other	
Stridor/Stricture			Gastrointestinal
Mucus Plugging	Endocrine	Pain	emesis
Other	SIADH	type	constipation/diarrhea
	Cerebral Salt Wasting	location	bleed
Fluid/Electrolytes/Nutrition	DI		other
hyponatremia	Other	Neurobehavioral	
hypercalcemia		depression	Skin
dehydration	Hematological	lability	decub
malnutrition (hypoalbuminia)	Anemia	anxietry	cellultis/infection
Other	transfusion	psychomotor (aggression)	
	Leukopenia/Thrombocytopenia	refusal	HEENT
	other	other	cranial site changes
			ear/eye infection
			otorhrea
			rhinorhrea
			other

Specialized Assessment Protocols

Arousal Monitoring Protocol

Patient:_____ Therapist:_____
Date:_____ Therapy:_____
Time:_____ Medication/Dose:_____

Behavior	First 5 mins of tx session (0-5 mins) Duration of eyelid closure	Middle 5 mins of tx session (25-30 mins) Duration of eyelid closure	Last 5 mins of tx session (55-60 mins) Duration of eyelid closure	Total duration of eyelid closure
Position				
1-60 seconds				
61-120 seconds				
121-180 seconds				
181-240 seconds				
241-300 seconds				
Total duration of eyelid closure				

Purpose: To determine the length of time arousal is maintained over a specific time interval.

Arousal Monitoring Protocol Instructions

Procedure: This protocol is designed to determine the length of time arousal is maintained over a specific time interval. Arousal level should be monitored during the first and last five minutes of each therapy session. Routine therapeutic activities should be conducted during the monitoring intervals, however, the Arousal Facilitation Protocol (AFP) should not be administered during these time periods.

Operational Definition of Arousal: An episode of arousal begins when the upper eyelid of either eye opens sufficiently to expose the pupil for a minimum of three seconds and ends when the pupil is at least partially obscured by the upper eyelid.

Instructions: During the first and last 5 minutes of the treatment session, observe the status of the eyelids. Any time the eyelid of at least one eye opens sufficiently and exposes the pupil for at least 3 seconds, begin timing the length of time the pupil remains fully exposed. Stop timing when the pupil becomes at least partially obscured for at least three seconds. Continue recording episodes of sustained eye opening in this manner during the first and last 5 minutes of the session. At the end of each 5 minute interval, record the *total length of time* the eyelids were open during that period and enter it in the appropriate time block. Next, record the *total length of time* the eyes remained open within and across each 5 minute interval.

Response Consistency Tracking
Yes/No Comprehension

Directions: Administer runs of 6 paired yes/no questions, as outlined below, within the domains of personal information, orientation information and/or general knowledge. Please attempt administration of at least *one set* per tx session. Record pt's arousal as noted below, and record response (if any) occurring within 10 seconds of auditory stimulus.

Date: _____
Positioning during administration: _____
Did eyes remain open throughout administration (circle): YES / NO
Was deep pressure stimulation provided (circle): YES / NO
Did pt benefit from deep pressure (circle): YES / NO / NA

Personal Information Questions:

Stimulus:	Response? (+/-)	Accurate? (+/-)
Are you a man/male?		
Are you 44 years old?		
Are you a mechanic?		
Are you 32 years old?		
Are you a woman/female?		
Are you a college professor?		
TOTAL:	/ 6	/ 6

Orientation Information Questions:

Stimulus:	Response? (+/-)	Accurate? (+/-)
Are we at a shopping mall?		
Is the year 2002?		
Are we in a hospital?		
Are you sitting in a bathtub?		
Is the year 2011?		
Are you sitting in a chair?		
TOTAL:	/ 6	/ 6

General Knowledge Questions:

Stimulus:	Response? (+/-)	Accurate? (+/-)
Is grass green?		
Is ice hot?		
Is a rock hard?		
Is grass red?		
Is ice cold?		
Is a rock soft?		
TOTAL:	/ 6	/ 6

Yes/No Response Consistency and Accuracy Protocol

Purpose: To monitor behavioral response consistency and accuracy, individualized to patient and question.

Environmental Control Response Consistency Protocol

Response Consistency Tracking Record

Patient_____ **Date**_____

Therapy_____

Description of Activity: Administer 5 trials of each command defined below in the order specified on the record form. Record, a) whether the switch was activated by a head turn and b) whether the correct response occurred (i.e., "yes" is switch-activated in response to a "yes" question). Demonstrate switch activation before initiating trials. Administer this protocol once per treatment session.

Command 1: "Turn your head to the right so it hits the switch."
Command 2: "Turn your head to the left so it hits the switch."

Trial	Did Switch Activate within 10 Seconds of Command? (+/-)	Was Behavioral Response Accurate? (+/-)
1 Command 1		
2 Command 1		
3 Command 2		
4 Command 1		
5 Command 2		
6 Command 1		
7 Command 1		
8 Command 2		
9 Command 2		
10 Command 2		
Total # Response Occurrences		
Total # Accurate Responses		

Specialized Treatment Protocols

Specialized Protocols

Response Consistency Tracking Record

Patient_____ **Date**_____

Therapy_____

Description of Activity: Administer 5 trials of each command defined below in the order specified on the record form. Record, a) whether the switch was activated by a head turn and b) whether the correct response occurred (i.e., "yes" is switch-activated in response to a "yes" question). Demonstrate switch activation before initiating trials. Administer this protocol once per treatment session.

Command 1: "Turn your head to the right so it hits the switch."
Command 2: "Turn your head to the left so it hits the switch."

Trial	Did Switch Activate within 10 Seconds of Command? (+/-)	Was Behavioral Response Accurate? (+/-)
1 Command 1		
2 Command 1		
3 Command 2		
4 Command 1		
5 Command 2		
6 Command 1		
7 Command 1		
8 Command 2		
9 Command 2		
10 Command 2		
Total # Response Occurrences		
Total # Accurate Responses		

Demographic Information | SRH-B Weekly Data | SRH-B Daily Data | Overview

Weeks 1-8 | Weeks 9-16 | Weeks 17-24 | Weeks 25-32

Spaulding Rehabiliation Network- Disorders of Consciousness Program Neurobehavioral E-Profile

Patient Name: John Doe
MRN: MXXXXXX
Date of Injury: 07/02/12

Date of Admission: 10/15/12
Hospital: Spaulding Rehabilitation Hospital

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
First Day of the Week:	10/15/12	10/22/12	10/29/12	11/05/12	11/12/12	11/19/12	11/26/12	12/03/12
Disability Rating Scale								
Administered?	☑	☑	☑	☑	☑	☑	☑	☑
Eye Opening	0	0	0	0	0	0	0	0
Communication Ability	2	2	2	2	2	1	1	1
Motor Response	0	0	0	0	0	0	0	0
Feeding	3	3	2	2	1	1	0	0
Toileting	2	2	2	1	1	0	0	0
Grooming	3	2	2	2	1	1	1	1
Level of Functioning	5	4	4	4	4	4	3	3
Employability	3	3	3	3	3	3	3	3
TOTAL	**18**	**16**	**15**	**14**	**12**	**10**	**8**	**8**
Limb Movement Protocol								
Administered?	☑	☑	☑	☑	☑	☐	☐	☐
Touch my hand	3	5	9	9	9	[redacted]		
Touch your nose	3	3	4	8	9			
Take the ball	9	9	9	9	9			
Comb your hair	3	1	9	9	9			
Brush teeth	3	3	3	6	9			
Drink from cup	4	3	9	9	9			
Shake hands	6	6	6	7	9			
Wave goodbye	2	3	2	4	9			
TOTAL Score	**33**	**33**	**51**	**61**	**72**			
TOTAL # of Full Execution	5	5	12	18	24			
TOTAL # of Partial Execution	1	1	5	3	0			
TOTAL # of Incorrect Movement	16	16	5	2	0			
TOTAL # of No Response	2	2	2	1	0			
Confusion Assessment Protocol								
Administered?	☐	☐	☐	☐	☑	☑	☑	☑
Cognitive Impairment	[redacted]				3	8	9	11
Disorientation					75	68	69	54
Agitation					15	22	24	18
Fluctuation of Symptoms					2	2	2	1
Sleep Disturbance					2	2	2	1
Decreased Daytime Arousal					1	0	0	0
Perceptual Disturbances/ Hallucinations					0	0	0	0
Delusions					0	0	0	0
Thought Process Abnormalities					0	1	1	0
TOTAL CAP Symptoms Score					4	5	5	4

Microsoft Excel - Mock Patient_EProfile3.0Beta [Shared] [Compatibility Mode]

Demographic Information | SHC Weekly Data | SRH-B Weekly Data | Overview

Page 1 | Page 2 | Page 3 | Status Report

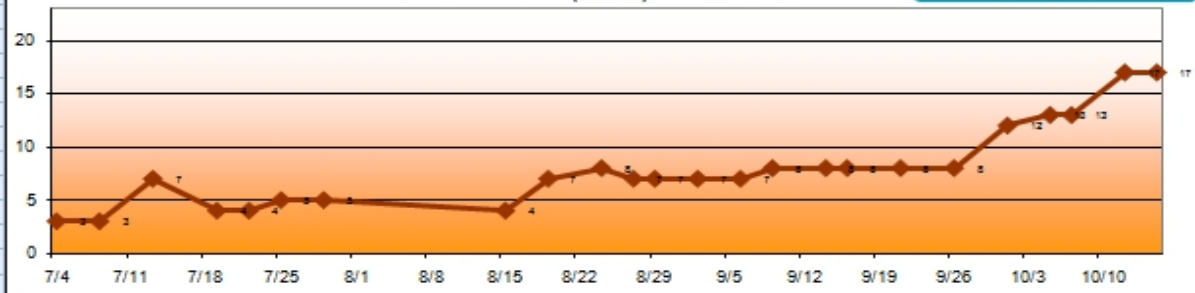
Spaulding Rehabiliation Network- Disorders of Consciousness Program Neurobehavioral E-Profile

Patient Name: John Doe
MRN: MXXXXXX
Date of Injury: 07/02/12
Date of Admission: 07/04/12
Hospital: Spaulding Cambridge Hospital

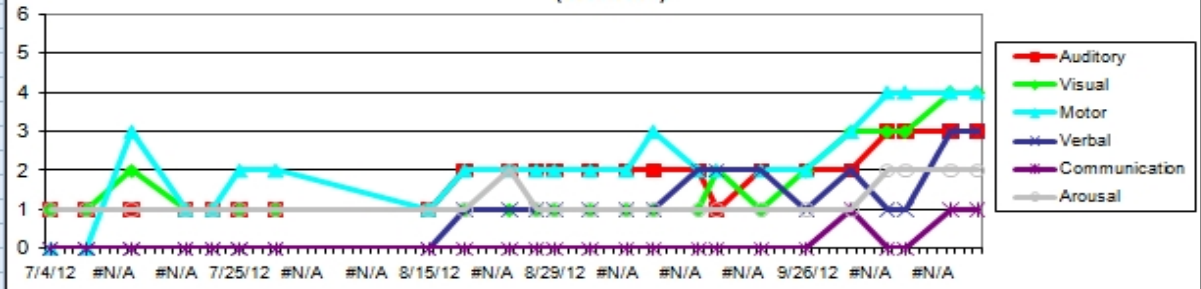
Conference Room | Spaulding Cambridge Hospital

Coma Recovery Scale-Revised (CRS-R)
(max: 23)

CRS-R Info

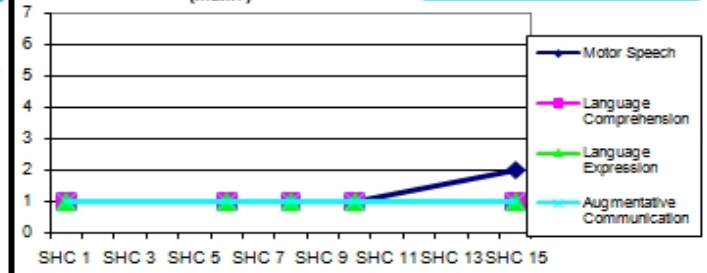


CRS-R Subscale Scores
(max: varies)

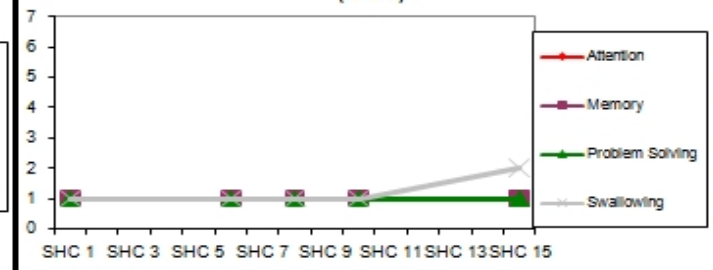


Functional Communication Measures 1
(max:7)

FCM Info



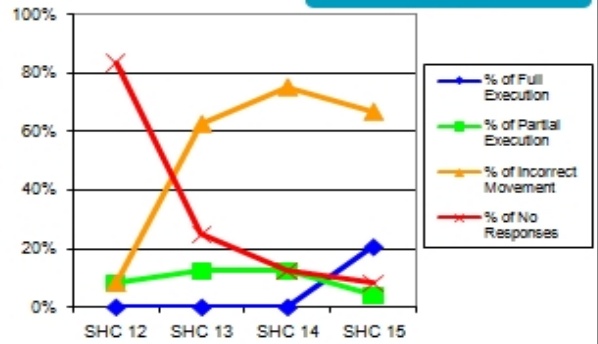
Functional Communication Measures 2
(max: 7)



Limb Movement Protocol (LMP) Total
(max: 72)

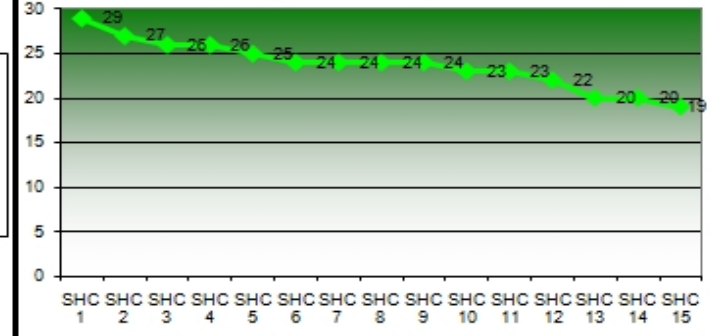
LMP Info

LMP Movement Breakdown



Disability Ratings Scale
(max: 30)

DRS Info



Demographic Information | SHC Weekly Data | SRH-B Weekly Data | Overview

Page 1 | Page 2 | Page 3 | Status Report

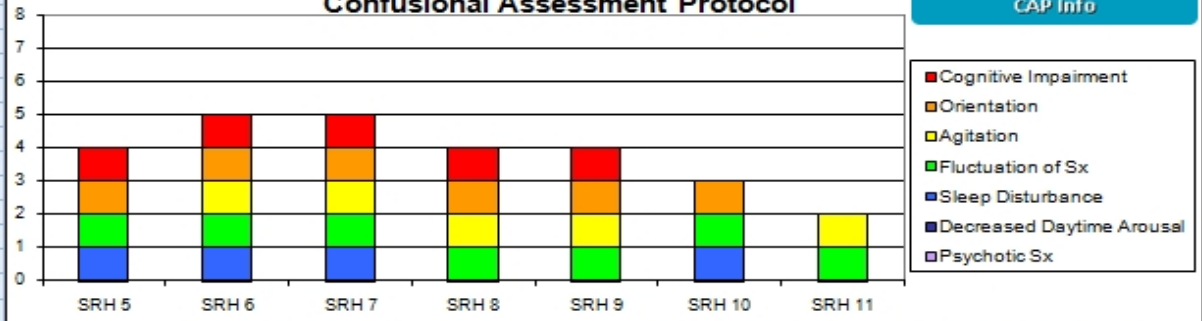
Spaulding Rehabiliation Network- Disorders of Consciousness Program Neurobehavioral E-Profile

Patient Name: John Doe
MRN: MXXXXXX + MXXXXXX
Date of Injury: 07/02/12
Date of Admission: 07/04/12
Hospital: SHC + SRH-B Combined

Conference Room | SHC + SRH-B Combined

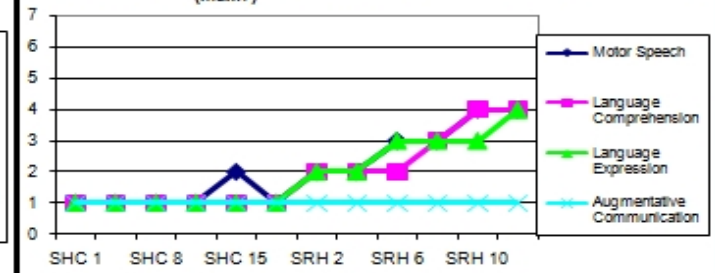
Confusional Assessment Protocol

CAP Info

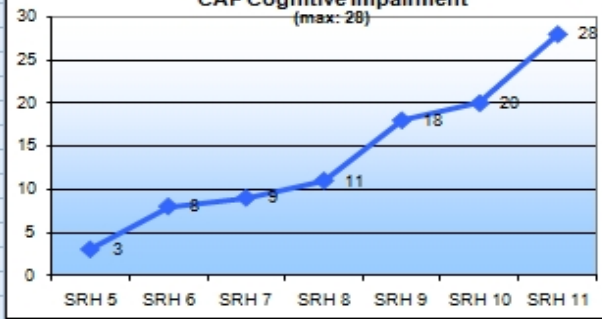


Functional Communication Measures 1 (max:7)

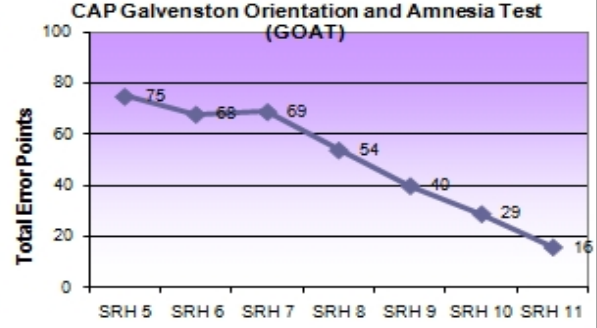
FCM Info



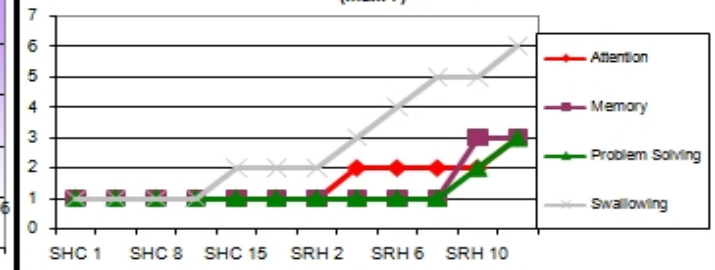
CAP Cognitive Impairment (max: 28)



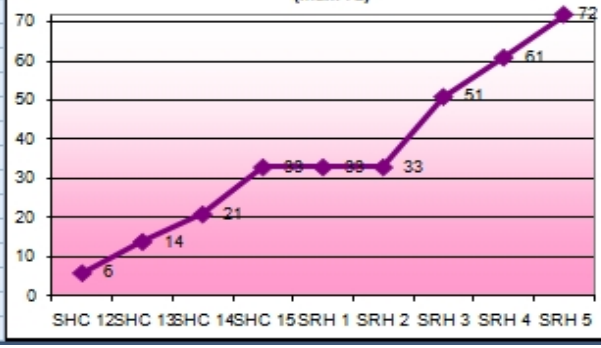
CAP Galvenston Orientation and Amnesia Test (GOAT)



Functional Communication Measures 2 (max: 7)

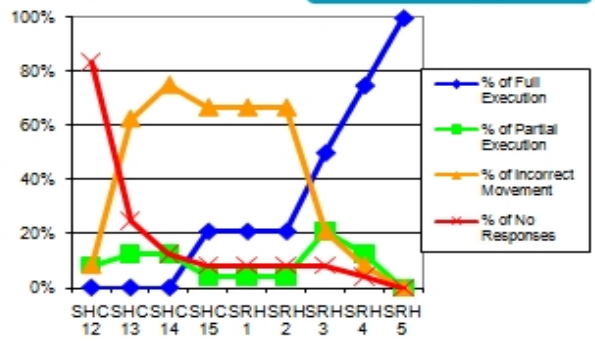


Limb Movement Protocol (LMP) Total (max: 72)



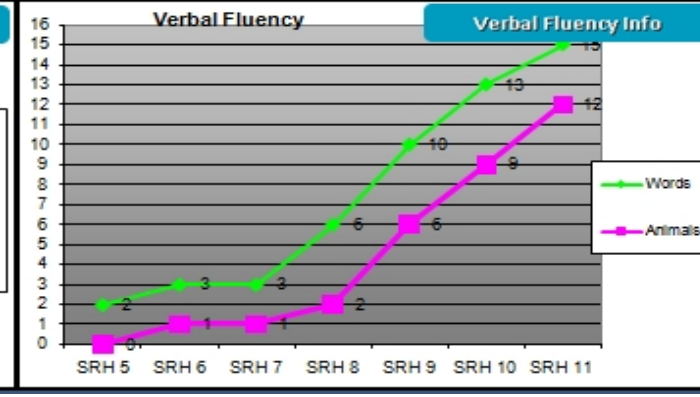
LMP Movement Breakdown

LMP Info



Verbal Fluency

Verbal Fluency Info



Demographic Information | SHC Weekly Data | SRH-B Weekly Data | Overview

Page 1 | Page 2 | Page 3 | Status Report

Spaulding Rehabiliation Network- Disorders of Consciousness Program Neurobehavioral E-Profile

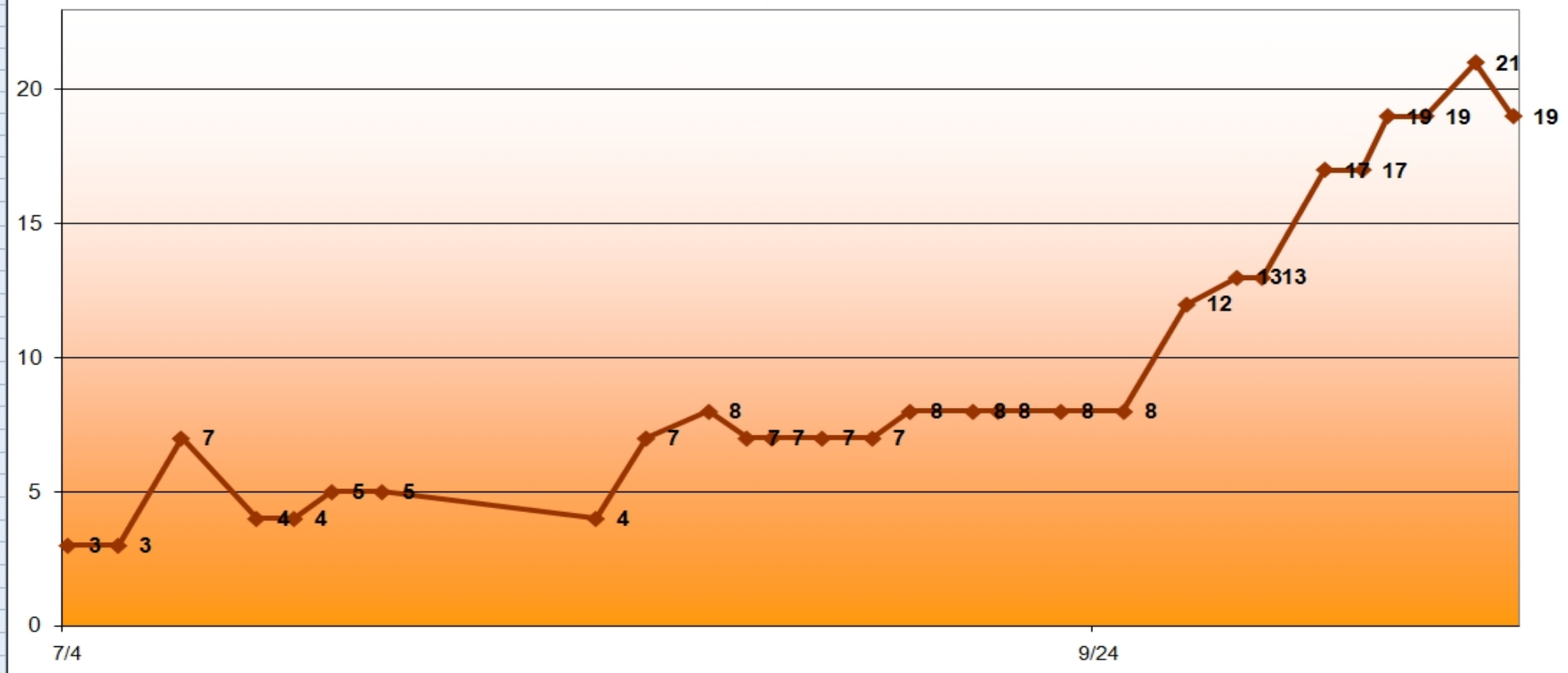
Patient Name: John Doe
MRN: MXXXXXX + MXXXXXX
Date of Injury: 07/02/12

Date of Admission: 07/04/12
Hospital: SHC + SRH-B Combined

Conference Room View | SHC + SRH-B Combined

Coma Recovery Scale-Revised (CRS-R)

(max: 23)



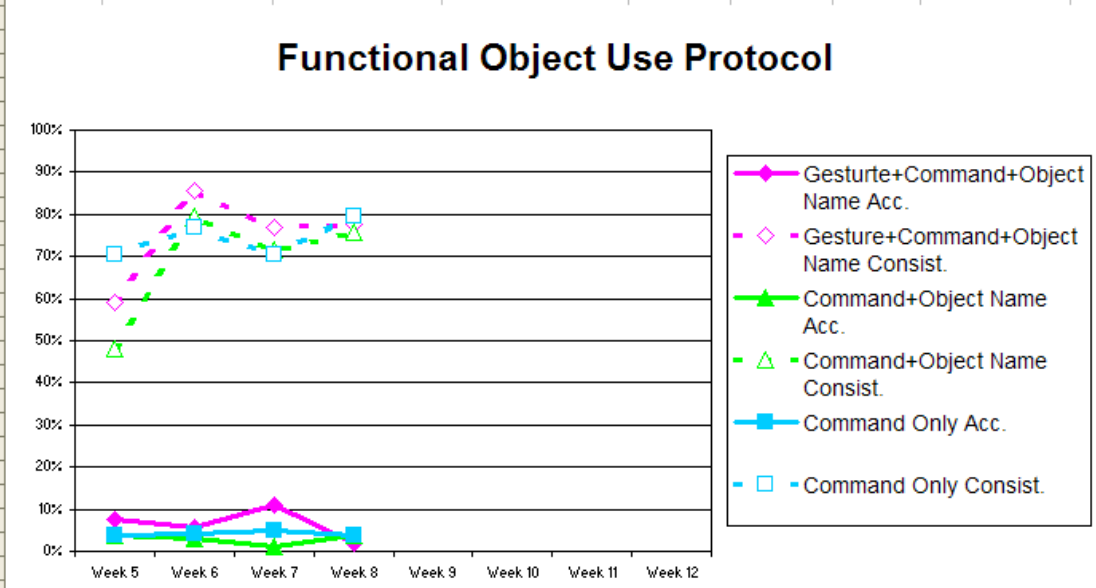
PROTOCOL: Functional Object Use Protocol

PATIENT NAME (Last, First):

DATE OF BIRTH (XX/XX/XX): 4/22/95

	Command Only						Command + Object Name					
WEEK	total Matches	total Not Matches	total No Responses	total trials	Consist. %	Acc. %	total Matches	total Not Matches	total No Respo	total trials	Consist. %	Acc. %
Week 5	1	18	8	27	70%	4%	1	12	14	27	48%	4%
Week 6	3	50	16	69	77%	4%	2	53	14	69	80%	3%
Week 7	4	53	24	81	70%	5%	1	57	23	81	72%	1%
Week 8	2	41	11	54	80%	4%	2	39	13	54	76%	4%
Week 9	0	0	0	0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Week 10	0	0	0	0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Week 11	0	0	0	0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Week 12	0	0	0	0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!

	Gesture + Command + Object Name						Totals					
WEEK	total Matches	total Not Matches	total No Responses	total trials	Consist. %	Acc. %	total responses	total accurate	total No Respo	total trials	Consist. %	Acc. %
Week 5	2	14		27	59%	7%	4	44	33	81	59%	5%
Week 6	4	55		69	86%	6%	9	158	40	207	81%	4%
Week 7	8	48		73	77%	11%	13	158	64	235	73%	6%
Week 8	1	41		54	78%	2%	5	121	36	162	78%	3%
Week 9	0	0		0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Week 10	0	0		0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Week 11	0	0		0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!
Week 12	0	0		0	#DIV/0!	#DIV/0!	0	0	0	0	#DIV/0!	#DIV/0!



RAW Data | Summary+Graph

Arousal Facilitation Protocol

Procedure:

This protocol is designed to increase arousal level. After completing the first 5-minute arousal monitoring period, position the patient sitting upright at least 30° with the RUE lying across the stomach on top of a pillow. Administer one full cycle of deep pressure stimulation according to the CRS-R Arousal Facilitation Protocol (AFP). After the cycle is completed, record 1) eye-opening status, 2) frequency of right upper extremity anti-gravity movement and 3) any other non-reflexive behaviors that occur within one minute of completing the AFP. Repeat the same procedure after completing the second arousal monitoring period.

Operational Definitions:

Eye-Opening: An episode of arousal begins any time the eyelid of at least one eye opens sufficiently and exposes the pupil for at least 3 seconds. Begin timing the length of time the pupil remains fully exposed. Stop timing when the pupil becomes at least partially obscured for at least three seconds.

RUE Anti-Gravity Movement: An episode of LUE anti-gravity movement occurs when the limb elevates at least 4 inches above the resting position and remains elevated for at least 2 seconds (the limb may fluctuate above and below the 4 inch cut-off during the 2-seconds). The episode ends when the limb returns to a resting position for at least 2 seconds.

Other Non-Reflexive Behaviors: Describe any other non-reflexive behaviors that occur within one minute of completing the AFP.

Date:_____ Activity:_____

Time:_____ Therapist:_____

Behavior	AFP Cycle 1	AFP Cycle 2	Total duration of eyelid opening - - - - - Total # episodes of RUE movement
Duration of eyelid closure with 60 secs of completing AFP cycle			
Frequency of RUE anti-gravity movement			
Description of other non-reflexive behavior 1			
Description of other non-reflexive behavior 2			
Description of other non-reflexive behavior 3			
Description of other non-reflexive behavior 4			
Description of other non-reflexive behavior 5			

Sustained Attention Protocol

SRN Disorders of Consciousness Program

Patient:

Time: _____

Therapist: _____

Objective: Mr. A will independently sustain performance on a low cognitive load task for 10s continuously.

Protocol Description:

This protocol is designed to facilitate recovery of sustained attention. Three different tasks will be administered requiring uninterrupted performance. Three trials of a single task will be conducted per session. Tasks can be modified as needed but should be characterized by low cognitive demands and should be able to be completed within a 10s timeframe. Protocol steps are as follow:

1. Describe the task in simple terms.
2. Request verbal reinstatement of the task. Repeat until accurate or change task if 3 consecutive attempts are failed.
3. Initiate task.
4. Re-direct attention to task by calling out patient's name.
5. Request verbal reinstatement of task.
    a. If accurate, prompt to continue task.
    b. If inaccurate, re-state task and rehearse until task is accurately repeated or 3 consecutive attempts are failed.
    c. If accurately repeated, complete trial.
6. On completion of steps 1-5, re-administer task instructions (repeat instructions 1x) and conduct a new trial but provide no assistance.
7. In the table below, record whether the trial was completed without loss of set and without assistance, completed with verbal prompts to "Keep going" or failed (ie, set loss even with verbal prompting)..

Patient: **Date:** _____

Task Description	Persists on task for 10" w/o loss of set	Persists on task for 10" but requires prompts to "keep going"	Fails to persist on task for 10" even with verbal prompting

Acknowledgements

- DoC Program Strategic Planning Committee

-Joseph T Giacino, PhD
-Sandra Suduikis, MD
-Carrie Charney, SLP-CCC
-Chris Carter, PsyD
-Susan Moore, RN
-Nancy Agostino
-Beth Hansen, PT
-Deb Murphy
-Matthew Doiron, BA
-Benton Giap, MD
-Denise Ambrosi, SLP-CCC
-Marilyn Spivack
-Vanessa Gormley, RN
-Genevieve Conlin, RN
-Dan Meninger, PT
-Nancy Engelhardt, OTR
-Suzanne Hevener
-Brian Castelluccio, BA
-Ron Hirschberg, MD
-Bob McCall, OTR
-Laurie Huber, R
-Joanne Fucile, RN
-Leanne Quigley
-Lee Ann Tata, RN
-Maureen Baer, OTR
-Sharon McKenzie
-Maria MacPherson