APPENDICES

Appendix A: Full Coma Recovery Scale-Revised (CRS-R)

CRS-R

COMA RECOVERY SCALE-REVISED

Administration and Scoring Guidelines

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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 *

BRAIN STEM REFLEX GRID ©2004

Record Form

Patient:	**Date:**						
Pupillary Light	Reactive						
	Equal						
	Constricted						
	Dilated						
	Pinpoint						
	Accommodation						
Corneal Reflex	Absent						
	Present Unilateral						
	Present Bilateral						
Spontaneous Eye Movements	None						
	Skew Deviation						
	Conjugate Gaze Deviation						
	Roving						
	Dysconjugate						
Oculocephalic Reflex	None						
	Abnormal						
	Full						
	Normal						
Postural Responses (Indicate Limb)	Abnormal Extension						
	Abnormal Flexion						

NOTES

AROUSAL FACILITATION PROTOCOL ©2004

GUIDELINES

1) The goal of this intervention is to prolong the length of time the patient maintains arousal (i.e. eye opening)

2) The protocol is administered anytime the patient is observed to:

- Exhibit sustained eyelid closure ***AND/OR***
- Stops following commands for a period of at least one minute.

3) Readminister the arousal facilitation protocol when:

- Sustained eye closure re-occurs ***OR***
- Behavioral responsiveness ceases despite sustained eye opening.

INTERVENTIONS

Deep Pressure:

1) Present deep pressure stimulation unilaterally to the face, neck, shoulder, arm, hand, chest, back, leg, foot, and toes. The muscle should be firmly grasped at its base between the thumb and forefinger. While squeezing the muscle firmly, it should be "rolled" back and forth through the finger tips three to four times. This procedure should be repeated sequentially working from the facial musculature to the toes. The examiner should assure that there are no internal lines, local injuries (e.g., fractures, contusions, decubiti) or systemic complications (e.g., heterotopic ossification) before administering deep pressure.

2) Administer same on contralateral side.

AUDITORY FUNCTION SCALE ©2004

Score	Item	Method	Response
		1. Observe frequency of spontaneous movement for a one minute interval (See **Baseline Observation** and **Command Following Protocol** on page 5).	Clearly discernible and accurate responses occur within 10 seconds on all 4 trials administered.
		2. Choose at least 1 object-related and 1 non-object related command from the Command Following Protocol. The type of command chosen (eye, limb, oral) should be based on patient's physical capacity and should be of low spontaneous frequency. If time permits, more than one type of command from each category may be used. The command should be repeated once during the 10 second response interval.	This item is credited only when ***all 4 trials*** of ***2 different*** commands are passed.
4	***Consistent Movement to Command***	**a. Object-Related Eye Movement Commands:** Present 2 common objects simultaneously and approximately 16 inches apart within the patient's field of view. Ask the patient to look at the object named (i.e. "Look at the [name object]". Next, reverse the positions of the 2 objects and ask the patient to look at the ***same*** object again (i.e. "Look at the [name object]"). Administer two additional trials using the same 2 objects and repeat the above procedure with instruction to look at the ***other*** object on both trials. Two trials per object should be administered for a total of 4 trials.	
		b. Object-Related Limb Movement Command: Present 2 common objects simultaneously and approximately 16 inches apart within the patient's field of view and within arm's (or leg's) length and ask the patient to touch the object named with their hand (or foot). Next, reverse the positions of the 2 objects and ask the patient to touch the ***same*** object again. Administer two additional trials using the same two objects and repeat the above procedure with instruction to touch the ***other object on both trials***. Two trials per object should be administered for a total of 4 trials.	
		c. Non-Object Related Commands: Select at least 1 eye movement, limb movement or oral movement/vocalization command and present it over 4 trials at 15 second intervals. The same command should be used for all 4 trials. Movements that occur between commands (ie: after the response interval has elapsed) should be noted but not scored.	
3	***Reproducible Movement to Command***	Same as above	3 clearly discernible responses occur over the 4 trials on any one of the object ***or*** non-object related commands.

Continued

AUDITORY FUNCTION SCALE ©2004

Score	Item	Method	Response
2	***Localization to Sound***	Standing behind the patient and out of view, present an auditory stimulus (eg. voice, noise) from the right side for 5 seconds. Perform a second trial presenting the auditory stimulus from the left side. Repeat above procedure for a total of 4 trials, 2 on each side.	Head and/or eyes orient toward the location of the stimulus on **both trials** in at least one direction. This item is scored when there is clear evidence of head and/or eye movement. It is not dependent on the degree or duration of movement.
1	***Auditory Startle***	Present a loud noise directly above the patient's head and out of view. Administer 4 trials.	Eyelid flutter or blink occurs immediately following the stimulus on at least 2 trials.
0	***None***	See above	No response to any of the above

BASELINE OBSERVATION AND COMMAND FOLLOWING PROTOCOL ©2004

Commands	Baseline	Trial 1	Trial 2	Trial 3	Trial 4
	1 minute frequency count				
I Object Related Commands					
A. Eye Movement Commands					
Look at the *(object #1)*					
Look at the *(object #2)*					
B. Limb Movement Commands					
Take the *(name object #1)*					
Take the *(name object #2)*					
Kick the *(name object #1)*					
Kick the *(name object #2)*					
II Non-Object Related Commands					
A. Eye Movement Commands					
Look away from me					
Look up *(at ceiling)*					
Look down *(at floor)*					
B. Limb Movement Commands					
Touch my hand					
Touch your nose					
Move your *(object/body part)*					
C. Oral Movement/ Vocalization Commands					
Stick out your tongue					
Open your mouth					
Close your mouth					
Say "ah"					

Spontaneous Eye Opening	**Yes:**		**No:**	
Spontaneous Visual Tracking	**Yes:**		**No:**	

Resting Posture

RUE:	
RLE:	
LUE:	
LLE:	

VISUAL FUNCTION SCALE ©2004

Score	Item	Method	Response
5	***Object Recognition***	Same as Consistent Movement to Command on Auditory Function Scale, Section 2a and b (p. 3).	3 to 4 clearly discernible responses occur over the 4 trials administered.
4	***Object Localization: Reaching***	**1.** Identify the arm or leg with the greatest range of movement. **2.** For upper extremity reaching, select common ADL objects (e.g. comb, toothbrush, etc.). For lower extremity assessment, select a ball suitable for kicking. **3.** Present the object approximately 8 inches to the left or right of the limb's resting position. The object should be placed in a position that is not obstructed from view. The patient should be instructed to "Touch the ***(name object)*** " with the appropriate arm or leg. **4.** The command may be repeated once within the assessment interval. Do not provide any tactile cues, as these may stimulate random limb movement. **5.** Present an object twice to the left of the limb and twice to the right of the limb, in random order for a total of 4 trials.	Score the ***direction*** in which the limb ***first*** moves within a 10 second observation period, or score as no movement. The limb does not need to make contact with the object, only to move toward it; *and* Movement must occur in the correct direction on 3 of the 4 trials administered.
3	***Visual Pursuit***	Hold a hand mirror 4-6 inches directly in front of the patient's face and verbally encourage the patient to fixate on the mirror. Move mirror slowly 45 degrees to the right and left of the vertical midline and 45 degrees above and below the horizontal midline. Repeat the above procedure so that a total of 2 trials are administered in each plane.	Eyes must follow the mirror for 45 degrees ***without loss of fixation*** on 2 occasions in any direction. *If above criterion is not met, repeat the procedure assessing one eye at a time (using an eye patch).*
2	***Fixation***	Present a brightly colored or illuminated object 6 to 8 inches in front of the patient's face and then rapidly move to upper, lower, right and left visual fields for a total of 4 trials.	Eyes change from initial fixation poin and refixate on the new target location for more than 2 seconds. At least 2 episodes of fixation are required.
1	***Visual Startle***	Present visual threat by passing finger 1 inch in front of patient's eye. Be careful not to touch eyelashes or create a breeze (manually open eyes if necessary). Conduct 4 trials per eye.	Eyelid flutter or blink following presentation of visual threat on at least 2 trials with **either** eye.
0	***None***	See above	No response to any of the above.

MOTOR FUNCTION SCALE ©2004

Score	Item	Method	Response
6	***Functional Object Use***	Select 2 common objects (e.g. comb, cup). Place one of the objects in the patient's hand and instruct the patient to "Show me how to use a [name object]." Next, place the second object in the patient's hand and restate the same instruction. Repeat the above procedure using the same objects so that a total of 2 trials are administered with each object.	Movements executed are generally compatible with both object's specific function (e.g. comb is placed on or near the head) on all 4 trials administered. *If the patient is unable to hold the object because of neuromuscular involvement, this should be noted on the record form and the item should* ***not*** *be scored.*
5	***Automatic Motor Response***	Observe for automatic motor behaviors such as nose scratching, grasping bedrail that occur spontaneously during the examination. If spontaneous automatic motor behaviors are not observed, present a familiar gesture (e.g. wave) in association with the following series of alternating commands: **1)** "Show me how to wave" ***(demonstrate gesture).*** **2)** "I'm going to wave again. Do not move at all. Just hold still." ***(demonstrate gesture).*** **3)** "Show me how to wave" ***(demonstrate gesture)*** . **4)** "I'm going to wave again. Do not move at all. Just hold still." ***(demonstrate gesture)*** . For patients with limited ability to move the limbs, objects associated with oromotor activity may be used (e.g. spoon). Place the object in front of the patient's mouth ***without making contact.*** Administer the following series of alternating commands: **1)** "Show me how to use ***(name object)*** . **2)** "I'm going to show you ***(name object)*** again. Do not move at all. Just hold still." **3)** "Show me how to use ***(name object).*** " **4)** "I'm going to show you ***(name object)*** again. Do not move at all. Just hold still."	At least 2 episodes of automatic motor behavior are observed within the session and each episode can be clearly differentiated from a reflexive response. Patient performs the gesture (e.g. waves) *on trials 2 and 4* (regardless of performance on trials 1 and 3). Patient performs the oral movement pattern (e.g. mouth opening occurs when spoon is brought to mouth by examiner) *on trials 2 and 4* (regardless of performance on trials 1 and 3).

Continued

MOTOR FUNCTION SCALE ©2004

Score	Item	Method	Response
4	***Object Manipulation***	Place a baseball size ball on the ***dorsal*** surface of one of the patient's hands. Roll the ball across the index finger and thumb without touching the undersurface of the hand or fingers. While moving the ball, instruct the patient to, "Take the ball." Repeat the above for a total of 4 trials.	The following criteria must be met on 3 of the 4 trials administered: **1.** The wrist must rotate and the fingers should extend as the object is moved along the dorsal surface of the hand; *and* **2.** The object must be grasped and held for a minimum of 5 seconds. The object cannot be held by means of a grasp reflex or increased finger flexor tone.
3	***Localization to Noxious Stimulation***	Extend all four extremities. Apply pressure to the finger or toe of an extremity (use best extremity on each side of the body) for a minimum of 5 seconds (ie.squeeze the finger or toe between your thumb and index finger). Administer 2 trials on each side for a total of 4 trials.	The non-stimulated limb must locate and make contact with the stimulated body part at the point of stimulation on at least 2 of the four trials.
2	***Flexion Withdrawal***	Extend all 4 extremities. Apply deep pressure to nailbeds of each extremity (ie. press the ridge of a pencil into the cuticle). Administer1 trial per extremity.	There is ***isolated*** flexion withdrawal of at least one limb. The limb must move ***away*** from the point of stimulation. If quality of response is uncertain, the trial may be repeated.
1	***Abnormal Posturing***	Observe response to above method	Slow, stereotyped flexion ***or*** extension of the upper and/or lower extremities occurs immediately after the stimulus is applied.
0	***None/Flaccid***	Observe response to above method	There is no discernible movement following application of noxious stimulation, secondary to hypertonic ***or*** flaccid muscle tone.

OROMOTOR/VERBAL FUNCTION SCALE ©2004

Score	Item	Method	Response
3	***Intelligible Verbalization***	**1.** Tell patient "I would like to hear your voice." This should be followed by an attempt to directly elicit speech using the verbal prompts shown below. At least one prompt should be selected from the Aural Set and at least one from the Visual Set. **2.** A maximum of 3 trials should be administered for each prompt chosen from the Aural and Visual Sets. Prompts should be administered at 15 second intervals. **Aural Set:** **a)** "What is your name?" **b)** "How are you today?" **c)** "Where do you live?" **Visual Set:** **a)** "What do you call this thing?" (Hold up common object in front of the patient's right and then left visual field for 10 seconds). **b)** "How many fingers am I holding up right now?" (Hold up 1 finger in front of the right and then left visual field for 10 seconds). **c)** "What part of my body is this?" (Point to your nose while positioned at the patient's visual midline).	Each of the following criteria must be met: **1.** Each verbalization must consist of at least 1 consonant-vowel-consonant (C-V-C) triad. For example, "ma" would not be acceptable, but "mom" would. Make sure objects chosen have a C-V-C sequence; *and* **2.** Two different words must be documented by the examiner to ensure that a repetitive word-like sound is not mistaken for a word. Words need not be appropriate or accurate for the context, but must be fully intelligible; *and* **3.** Words produced by writing or alphabet board are acceptable. *Verbalizations that occur spontaneously or at other times during the assessment and meet the above criteria should also receive a score of 3.*
2	***Vocalization / Oral Movement***	Observe for non-reflexive oral movements, spontaneous vocalizations or vocalizations that occur during administration of vocalization commands (see page 5).	At least one episode of non-reflexive oral movement and/or vocalization occurs spontaneously or in response to application of sensory stimulation. *Yawning is scored as reflexive oral movement.*
1	***Oral Reflexive Movement***	Present tongue blade between patient's lips and/or teeth	There is clamping of jaws, tongue pumping, or chewing movement following introduction of tongue blade into mouth.
0	***None***	See above	No response to any of the above.

COMMUNICATION SCALE ©2004

(if there is no evidence of reproducible command following or spontaneous communicative behavior, the Communication subscale is not administered)

Score	Item	Method	Response
2	***Functional: Accurate***	Administer the 6 Situational Orientation questions from the Communication Assessment Protocol (page12). The examiner may use the Visual set, Auditory set or both sets, if appropriate.	Clearly discernible and accurate responses occur on all 6 of the Visual ***or*** Auditory Situational Orientation questions from the Communication Assessment Protocol (see page 12).
1	***Non-Functional: Intentional***	Same as above	A clearly discernible communicative response* (e.g. head nods/shakes, thumbs up) must occur within 10 seconds on at least 2 of the 6 Situational Orientation questions (irrespective of accuracy). **The examiner must determine that this response occurs more frequently following verbal prompting (e.g. questions) than when non-specific auditory stimulation (e.g. hand clapping) is administered.*
0	***None***	See above	No discernible verbal or non-verbal communication responses occur at any time.

COMMUNICATION ASSESSMENT PROTOCOL ©2004

Situational Orientation

Visually Based				Aurally Based		
Am I touching my ear right now? (do not touch ear)				Am I clapping my hands right now? (do not clap)		
Am I touching my nose right now? (touch nose)				Am I clapping my hands right now? (clap)		
Am I touching my nose right now? (touch nose)				Am I clapping my hands right now? (clap)		
Am I touching my ear right now? (do not touch ear)				Am I clapping my hands right now? (do not clap)		
Am I touching my nose right now? (do not touch nose)				Am I clapping my hands right now? (clap)		
Am I touching my ear right now? (touch ear)				Am I clapping my hands right now? (do not clap)		
			Date			
Score						
of 6	of 6	of 6		of 6	of 6	of 6
			Date			
Score						
of 6	of 6	of 6		of 6	of 6	of 6

AROUSAL SCALE ©2004

Score	Item	Method	Response
3	***Attention***	Observe consistency of behavioral responses following verbal or gestural prompts.	There are no more than 3 occasions across the length of the evaluation in which the patient fails to respond to a verbal prompt.
2	***Eye Opening w/o Stimulation***	Observe status of the eyelids across length of assessment.	Eyes remain open across the length of the examination without the need for tactile, pressure or noxious stimulation.
1	***Eye Opening with Stimulation***	Same as above	Tactile, pressure or noxious stimulation must be applied at least once during the examination in order for the patient to sustain eye opening (the length of time the eyes remain open may vary and is not considered in the scoring).
0	***Unarousable***	See above	No eye opening noted.

ASSESSMENT OF CONTINGENT BEHAVIOR ©2004

(Supplementary Item)

Score	Item	Method	Response
Not Scored	***Contingent Vocalization / Gesture / Affective Response***	**1.** Vocalizations, gestures and affective responses are assessed through a combination of reports from family and clinicians, and direct observations from treating staff. Family and clinical staff should be questioned about any vocalizations, gestures or affective responses (i.e. smiling, laughing, frowning, crying) that are observed to occur spontaneously or in response to a specific stimulus. **2.** If above response is based on report, staff should attempt to directly elicit the behavior again with the assistance of the individual who reported it. **3.** If affective responses are observed during direct examination, the examiner should attempt to re-elicit the behavior using the same eliciting stimulus previously noted to produce the behavior. Examples of appropriate eliciting stimuli include verbal requests ("What's your name?"), limb gestures (wave), facial gestures (sticking out tongue) and pictures (family photos). **4.** The examiner should document: **a.** The nature of the eliciting stimulus (e.g. Verbal: "Are you feeling sad?"; Limb gesture: handshake); **b.** Specific characteristics of the behavioral response (e.g. facial grimace with tearing of the eyes; smiling, moaning); **c.** Number of times the behavior has been observed to occur within 10 seconds of the eliciting stimulus; **d.** Number of times the behavior has been observed to occur spontaneously; **e.** The time frame allowed for **"c"** and **"d"** should be specified and approximately the same.	A vocalization, gesture or affective response occurs significantly more often in response to a specific eliciting stimulus, than when the stimulus is absent. *Contingent responses do not include those that occur following administration of painful stimuli.*

RECORD DATE AND DESCRIPTION OF ABOVE STIMULI UTILIZED AND RESPONSES OBSERVED

DATE	ELICITING STIMULUS	TARGET BEHAVIOR	# SPONTANEOUS OCCURRENCES OF TARGET BEHAVIOR	# OCCURRENCES OF TARGET BEHAVIOR WITHIN 10 SEC OF ELICITING STIMULU

CRS-R TOTAL SCORE PROGRESS TRACKING CHART ©2004

Record Form

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
23																
22																
21																
20																
19																
18																
17																
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9																
8																
7																
6																
5																
4																
3																
2																
1																
0																
CRS-R Total Score																

Appendix B: Full revised Motor Behaviour Tool (MBT-r)

MOTOR BEHAVIOUR TOOL – revised MBT-r Record Form								
Patient :								
Date : ***Time …:… (AM)/(PM)***								
Examiner :								
Positive signs								
1	*Spontaneous non-reflexive movements*		*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
	If YES precise							
2	*Response to command*		*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
3	*Visual fixation or visual pursuit*		*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
4	*Responses in a motivational context*		*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
5	*Responses to a noxious stimulation*							
	5.a	*Defensive response - Nipple*	*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
	5.b	*Defensive response – Nailbed*	*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
	5.c	*Grimace*	*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
Negative signs								
6	*Abnormal posturing (i.e., decerebration/decortications, primitive reflexes) or neurovegetative responses (i.e., tachycardia, hypo/hyper-ventilation, hypertension, excessive sweating) to stimulation*		*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
7	*Signs of roving eyes or, absence of oculocephalic reflex*		*YES*	*NO*	*YES*	*NO*	*YES*	*NO*
DX according to MBT-R :								

- Sedation (<24h before assessment): YES NO
  Medication: …… Dosage: ……..
  Time of last administration: Date …….. Time ……(AM) (PM)
- Temperature at time of assessment : ……..
- PIC at time of assessment : ……

- Suspicion of:
  - ☐ Attentional disturbances (e.g., vigilance fluctuation, fatigability)
  - ☐ Receptive or global aphasia
  - ☐ Cranial nerve palsy
  - ☐ Peripheral neuropathy
  - ☐ Frontal syndrome

Additional comments:

Administration guidelines

Note on administration: this tool has been developed to supplement the clinical assessment of consciousness based on the Coma Recovery Scale Revised. It should therefore be **administered at the same time** as the CRS-R. For a valid assessment, make sure the sedation has been stopped at least 24 hours before.

Population: The MBT is focusing on patient with acute brain injury, and it **should not be used after 28 days** post injury.

Item	Administration	Scoring	Clinical note
1. Spontaneous non-reflexive movements	Observe the spontaneous non-reflexive movements (without stimulation) for a 1 min interval at the beginning (use CRS-R baseline observation to score this item) as well as at the end of the assessment (start 20 seconds after administration of the last stimulation). Ensure that the bed sheets need to be removed.	**At least one** non-reflexive response (i.e., movement of fingers or limb) is observed during the period of observation, when no stimulation is administered: 1. The intentional motor pattern has to be non-stereotypical, not contextualized and non-repetitive. 2. Movements may include the upper or lower limbs, head, or postural changes that are not induced by the examiner	
2. Response to command	No stimulation is administered as scoring of this item will be based on the response observed at the CRS-R auditory subscale items 3 & 4.	Presence of **at least one** scorable response to command.	Specify if lack of reproducibility could be due to **i)** disorders in vigilance/attention or fatigability; **ii)** receptive or global aphasia; **iii)** perseverations (as inability to switch between responses to different commands); **iv)** others.
3. Visual fixation or visual pursuit	No stimulation is administered as scoring of this item will be based on the response observed at the CRS-R visual subscale items 2 & 3.	Presence of **at least one** clearly discernible visual fixation or visual pursuit in **any** direction.	Precise if oculomotor nerve palsy.
4. Motor responses in a motivational context	Observe the non-reflexive motor responses in a potentially motivational context (e.g., familiar voices, mother tongue, patient's own name).	An increased in the frequency of non-reflexive motor responses especially during the motivational/salient context. 1. CF: Mother tongue / familiar voice 4 times each	
5. Responses to noxious stimulation	a. Twist the patient's nipple keeping the patient's healthier arm between the patient's body and the examiner's arm (see picture 1a). Apply the stimulation twice for maximum 5 seconds. b. Score the response observed at the CRS-R motor subscale items 1 – 3 (see picture 2a).	a. The patients will push away the examiner's hand when the stimulation in administered (either by localizing with the other hand or by any attempt to push away the examiner's arm (see picture 1b). Note: the target movement will involve a selective contraction of the triceps (as compared with a stereotypical posture involving extension and internal rotation of the arms. b. Any limb movement whose kinematics differs from a motor reflex response in terms of orientation planes and the type of elicited muscles is scored as defensive. A motor reflex response in the upper limb due to a nociceptive stimulation applied on the index finger consists of wrist adduction (frontal plane), elbow flexion (sagittal plane), and shoulder anteflexion (sagittal plane) occurring in two planes (see picture 2b). Absence of motor response to stimulation will be scored as "not present". *c.* Grimace: **at least one** grimace (e.g., facial distortion, eyebrows frown, etc.) is observed during administration of noxious stimulation.	Precise if context of concomitant causal pathology such as i) cranial nerve palsy, ii) cranial or peripheral neuromyopathy.

Figure 1. Stimulation protocol for 5.a.
1.a. Nipple stimulation – starting position
1.b. Examples of response to stimulation: defensive flexion withdrawal (left), stereotypical flexion (center), stereotypical extension (right)

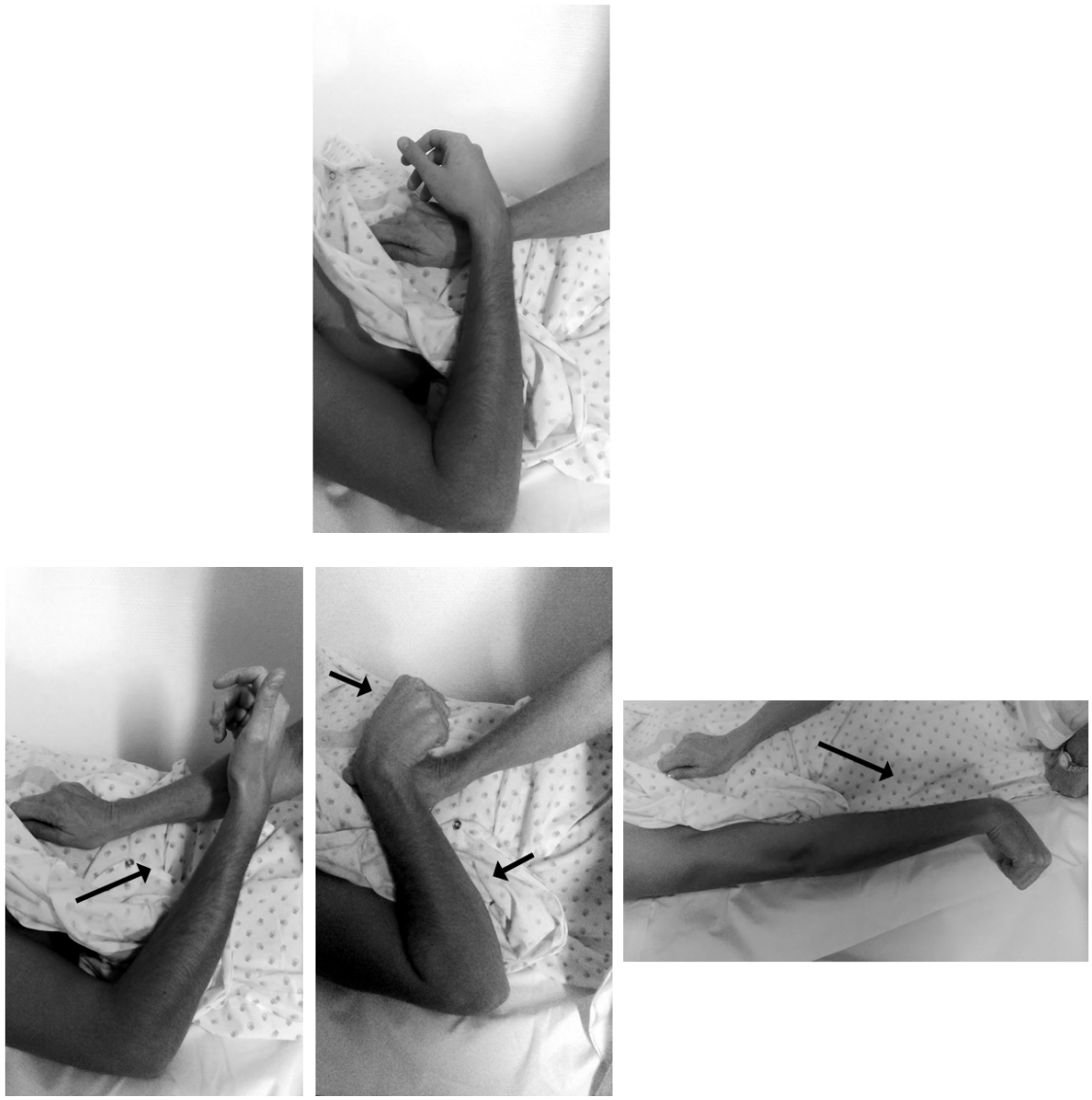
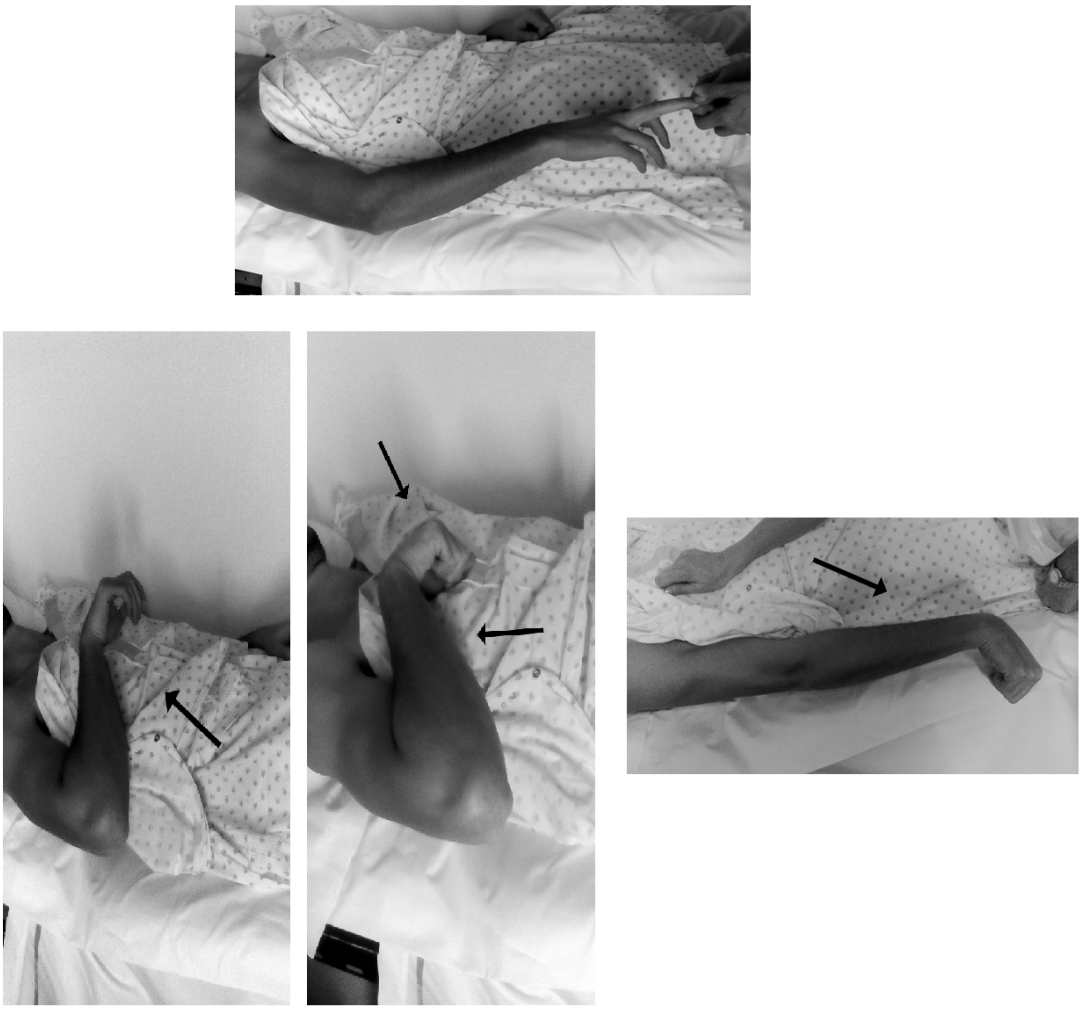


Figure 2. Stimulation protocol for 5.b.
1.a. Nailbed stimulation – starting position
1.b. Examples of response to stimulation: defensive flexion withdrawal (left), stereotypical flexion (center), stereotypical extension (right)



Appendix C: Full outcome scales

Glasgow outcome scale (GOS)

GLASGOW OUTCOME SCALE

Patient Name: _____
Rater Name: _____
Date: _____

Note: The scale presented here is based on the original article by Jennett and Bond. It has become common practice in clinical trial administration, however, to use a modified version that places the scores in reverse order (i.e., "good recovery" = 1, "moderate disability" =2, etc.).

Score	Description
1	DEATH
2	PERSISTENT VEGETATIVE STATE Patient exhibits no *obvious cortical* function.
3	SEVERE DISABILITY (Conscious but disabled). Patient depends upon others for daily support due to mental or physical disability or both.
4	MODERATE DISABILITY (Disabled but independent). Patient is independent as far as daily life is concerned. The disabilities found include varying degrees of dysphasia, hemiparesis, or ataxia, as well as intellectual and memory deficits and personality changes.
5	GOOD RECOVERY Resumption of normal activities even though there may be minor neurological or psychological deficits.

TOTAL (1–5): _____

References

Jennett B, Bond M. "Assessment of outcome after severe brain damage."
Lancet 1975 Mar 1;1(7905):480-4

The Early Rehabilitation Barthel Index (ERBI)

ERBI - Barthel précoce 1

Etiquette			Date	Date	Date	Date	Date	Date	Date
FR Index			**Score**						
Etat de vigilance nécessitant monitoring (p. ex. crises végétative)et structures de SC	0	-50							
Trachéotomie nécessitant d'aspirations répétitives	0	-50							
Désorientation nécessitant une infrastructure de SC	0	-50							
Troubles du comportement nécessitant une infrastructure de SC	0	-50							
Troubles de la communication sévère	0	-25							
Nécessite une ventilation intermittente	0	-50							
Troubles de la déglutition nécessitant une infrastructure de SC	0	-50							
Index de Barthel			**Score**						
1. Manger et boire	Pas possible	0							
	A besoin d'aide, pour couper par ex.	5							
	Autonome, capable de se servir des instrument nécessaires, prend ses repas en un temps raisonnable	10							
2. Transfert lit-fauteuil	Pas possible	0							
	Capable de s'asseoir, mais aide max pour le transfert	5							
	Surveillance ou aide minime	10							
	Autonome y compris pour faire fonctionner le FR	15							
3. Soins personnels	Pas possible	0							
	Se lave le visage, se coiffe, se brosse les dents, se rase, peut brancher le rasoir électrique	5							

ERBI - Barthel précoce 2

4. Usage des WC	Pas possible	0							
	A besoin d'aide pour l'équilibre, pour ajuster ses vêtements et se servir du papier hygiénique	5							
	Autonome. Se sert du papier seul, de la chasse d'eau	10							
5. Bain et douche	Pas possible, aide	0							
	Autonome	5							
6. Déplacements	Pas possible	0							
	Autonome dans un FR, si incapable de marcher	5							
	Peut faire 50 m avec aide	10							
	N'a pas besoin de FR, autonome sur 50m, éventuellement avec des cannes	15							
7. Escaliers	Pas possible	0							
	Aide et surveillance	5							
	Autonome +/- cannes	10							
8. Habillement	Pas possible	0							
	Aide mais fait au moins la moitié de la tâche dans un tps raisonnable	5							
	Autonome, attache ses chaussures, ses boutons, met ses bretelles	10							
9. Continence rectale	Pas possible	0							
	Accidents occasionnels	5							
	Aucun accident	10							
10. Continence urinaire	Pas possible	0							
	Accidents occasionnels	5							
	Aucun accident	10							
TOTAL B									
TOTAL A									
TOTAL EBI A+B									

TBI NATIONAL DATABASE COLLECTION FORM

Patient Name: _____ Date of Rating:_____

Name of Person Completing Form: _____

DISABILITY RATING SCALE:

Disability Rating Scale ratings to be completed within 72 hours after Rehab. Admission. And within 72 hours before Rehab. Discharge.

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
- ☐ (1.0) Partial
- ☐ (2.0) Minimal
- ☐ (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
- ☐ (1.0) Partial
- ☐ (2.0) Minimal
- ☐ (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.

F.GROOMING (COGNITIVE ABILITY ONLY)

- ☐ (0.0) Complete
- ☐ (1.0) Partial
- ☐ (2.0) Minimal
- ☐ (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.) Grooming refers to bathing, washing, brushing of teeth, shaving, combing or brushing of hair and dressing.
0-COMPLETE: continuously shows awareness that he knows how to groom self and can convey unambiguous information that he knows when this activity should occur.
1-PARTIAL: intermittently shows awareness that he knows how to groom self 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 groom self 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 groom self and cannot convey information by signs, sounds, or activity that he knows when the activity should occur.

G.LEVEL OF FUNCTIONING (PHYSICAL, MENTAL, EMOTIONAL OR SOCIAL FUNCTION))

- ☐ (0.0) Completely Independent
- ☐ (1.0) Independent in special environment
- ☐ (2.0) Mildly Dependent-Limited assistance (non-resid - helper)
- ☐ (3.0) Moderately Dependent-moderate assist (person in home)
- ☐ (4.0) markedly Dependent-assist all major activities, all times
- ☐ (5.0) Totally Dependent-24 hour nursing care.

0-COMPLETELY INDEPENDENT: able to live as he wishes, requiring no restriction due to physical, mental, emotional or social problems.
1-INDEPENDENT IN SPECIAL ENVIRONMENT: capable of functioning independently when needed requirements are met (mechanical aids)
2-MILDLY DEPENDENT: able to care for most of own needs but requires limited assistance due to physical, cognitive and/or emotional problems (e.g., needs non-resident helper).
3-MODERATELY DEPENDENT: able to care for self partially but needs another person at all times. (person in home)
4-MARKEDLY DEPENDENT: needs help with all major activities and the assistance of another person at all times.
5-TOTALLY DEPENDENT: not able to assist in own care and requires 24-hour nursing care.

H."EMPLOYABILITY"(AS A FULL TIME WORKER, HOMEMAKER, OR STUDENT)

- ☐ (0.0) Not Restricted
- ☐ (1.0) Selected jobs, competitive
- ☐ (2.0) Sheltered workshop, Non-competitive
- ☐ (3.0) Not Employable

0-NOT RESTRICTED: can compete in the open market for a relatively wide range of jobs commensurate with existing skills; or can initiate, plan execute and assume responsibilities associated with homemaking; or can understand and carry out most age relevant school assignments.
1-SELECTED JOBS, COMPETITIVE: can compete in a limited job market for a relatively narrow range of jobs because of limitations of the type described above and/or because of some physical limitations; or can initiate, plan, execute and assume many but not all responsibilities associated with homemaking; or can understand and carry out many but not all school assignments.
2-SHELTERED WORKSHOP, NON-COMPETITIVE: cannot compete successfully in a job market because of limitations described above and/or because of moderate or severe physical limitations; or cannot without major assistance initiate, plan, execute and assume responsibilities for homemaking; or cannot understand and carry out even relatively simple school assignments without assistance.
3-NOT EMPLOYABLE: completely unemployable because of extreme psychosocial limitations of the type described above, or completely unable to initiate, plan, execute and assume any responsibilities associated with homemaking; or cannot understand or carry out any school assignments.

The psychosocial adaptability or "employability" item takes into account overall cognitive and physical ability to be an employee, homemaker or student.
This determination should take into account considerations such as the following:

1. Able to understand, remember and follow instructions.
2. Can plan and carry out tasks at least at the level of an office clerk or in simple routine, repetitive industrial situation or can do school assignments.
3. Ability to remain oriented, relevant and appropriate in work and other psychosocial situations.
4. Ability to get to and from work or shopping centers using private or public transportation effectively.
5. Ability to deal with number concepts.
6. Ability to make purchases and handle simple money exchange problems
7. Ability to keep track of time and appointments

Revised 03/2010

Rancho Los Amigos - Revised Levels of Cognitive Functioning

Level I - No Response: Total Assistance
• Complete absence of observable change in behavior when presented visual, auditory, tactile, proprioceptive, vestibular or painful stimuli.
Level II - Generalized Response: Total Assistance
• Demonstrates generalized reflex response to painful stimuli.
• Responds to repeated auditory stimuli with increased or decreased activity.
• Responds to external stimuli with physiological changes generalized, gross body movement and/or not purposeful vocalization.
• Responses noted above may be same regardless of type and location of stimulation.
• Responses may be significantly delayed.

Level III - Localized Response: Total Assistance
• Demonstrates withdrawal or vocalization to painful stimuli.
• Turns toward or away from auditory stimuli.
• Blinks when strong light crosses visual field.
• Follows moving object passed within visual field.
• Responds to discomfort by pulling tubes or restraints.
• Responds inconsistently to simple commands.
• Responses directly related to type of stimulus.
• May respond to some persons (especially family and friends) but not to others.

Level IV - Confused/Agitated: Maximal Assistance
• Alert and in heightened state of activity.
• Purposeful attempts to remove restraints or tubes or crawl out of bed.
• May perform motor activities such as sitting, reaching and walking but without any apparent purpose or upon another's request.
• Very brief and usually non-purposeful moments of sustained alternatives and divided attention.
• Absent short-term memory.
• May cry out or scream out of proportion to stimulus even after its removal.
• May exhibit aggressive or flight behavior.
• Mood may swing from euphoric to hostile with no apparent relationship to environmental events.
• Unable to cooperate with treatment efforts.
• Verbalizations are frequently incoherent and/or inappropriate to activity or environment.

Level V - Confused, Inappropriate Non-Agitated: Maximal Assistance
• Alert, not agitated but may wander randomly or with a vague intention of going home.
• May become agitated in reponse to external stimulation, and/or lack of environmental structure.
• Not oriented to person, place or time.
• Frequent brief periods, non-purposeful sustained attention.
• Severely impaired recent memory, with confusion of past and present in reaction to ongoing activity.
• Absent goal directed, problem solving, self-monitoring behavior.
• Often demonstrates inappropriate use of objects without external direction.
• May be able to perform previously learned tasks when structured and cues provided.
• Unable to learn new information.
• Able to respond appropriately to simple commands fairly consistently with external structures and cues.
• Responses to simple commands without external structure are random and nonpurposeful in relation to command.
• Able to converse on a social, automatic level for brief periods of time when

provided external structure and cues.
• Verbalizations about present events become inappropriate and confabulatory when external structure and cues are not provided.

Level VI - Confused, Appropriate: Moderate Assistance
• Inconsistently oriented to person, time and place.
• Able to attend to highly familiar tasks in non-distracting environment for 30 minutes with moderate redirection.
• Remote memory has more depth and detail than recent memory.
• Vague recognition of some staff.
• Able to use assistive memory aide with maximum assistance.
• Emerging awareness of appropriate response to self, family and basic needs.
• Moderate assist to problem solve barriers to task completion.
• Supervised for old learning (e.g. self care).
• Shows carry over for relearned familiar tasks (e.g. self care).
• Maximum assistance for new learning with little or nor carry over.
• Unaware of impairments, disabilities and safety risks.
• Consistently follows simple directions.
• Verbal expressions are appropriate in highly familiar and structured situations.

Level VII - Automatic, Appropriate: Minimal Assistance for Daily Living Skills
• Consistently oriented to person and place, within highly familiar environments. Moderate assistance for orientation to time.
• Able to attend to highly familiar tasks in a non-distraction environment for at least 30 minutes with minimal assist to complete tasks.
• Minimal supervision for new learning.
• Demonstrates carry over of new learning.
• Initiates and carries out steps to complete familiar personal and household routine but has shallow recall of what he/she has been doing.
• Able to monitor accuracy and completeness of each step in routine personal and household ADLs and modify plan with minimal assistance.
• Superficial awareness of his/her condition but unaware of specific impairments and disabilities and the limits they place on his/her ability to safely, accurately and completely carry out his/her household, community, work and leisure ADLs.
• Minimal supervision for safety in routine home and community activities.
• Unrealistic planning for the future.
•Unable to think about consequences of a decision or action.
• Overestimates abilities.
• Unaware of others' needs and feelings.
• Oppositional/uncooperative.
• Unable to recognize inappropriate social interaction behavior.

Level VIII - Purposeful, Appropriate: Stand-By Assistance
• Consistently oriented to person, place and time.
• Independently attends to and completes familiar tasks for 1 hour in distracting environments.
• Able to recall and integrate past and recent events.
• Uses assistive memory devices to recall daily schedule, "to do" lists and record critical information for later use with stand-by assistance.
• Initiates and carries out steps to complete familiar personal, household, community, work and leisure routines with stand-by assistance and can modify the plan when needed with minimal assistance.
• Requires no assistance once new tasks/activities are learned.
• Aware of and acknowledges impairments and disabilities when they interfere with task completion but requires stand-by assistance to take appropriate corrective action.
• Thinks about consequences of a decision or action with minimal assistance.
• Overestimates or underestimates abilities.
• Acknowledges others' needs and feelings and responds appropriately with minimal assistance.

• Depressed.
• Irritable.
• Low frustration tolerance/easily angered.
• Argumentative.
• Self-centered.
• Uncharacteristically dependent/independent.
• Able to recognize and acknowledge inappropriate social interaction behavior while it is occurring and takes corrective action with minimal assistance.

Level IX - Purposeful, Appropriate: Stand-By Assistance on Request
• Independently shifts back and forth between tasks and completes them accurately for at least two consecutive hours.
• Uses assistive memory devices to recall daily schedule, "to do" lists and record critical information for later use with assistance when requested.
• Initiates and carries out steps to complete familiar personal, household, work and leisure tasks independently and unfamiliar personal, household, work and leisure tasks with assistance when requested.
• Aware of and acknowledges impairments and disabilities when they interfere with task completion and takes appropriate corrective action but requires standby assist to anticipate a problem before it occurs and take action to avoid it.
• Able to think about consequences of decisions or actions with assistance when requested.
• Accurately estimates abilities but requires stand-by assistance to adjust to task demands.
• Acknowledges others' needs and feelings and responds appropriately with stand-by assistance.
• Depression may continue.
• May be easily irritable.
• May have low frustration tolerance.
• Able to self monitor appropriateness of social interaction with stand-by assistance.

Level X - Purposeful, Appropriate: Modified Independent
• Able to handle multiple tasks simultaneously in all environments but may require periodic breaks.
• Able to independently procure, create and maintain own assistive memory devices.
• Independently initiates and carries out steps to complete familiar and unfamiliar personal, household, community, work and leisure tasks but may require more than usual amount of time and/or compensatory strategies to complete them.
• Anticipates impact of impairments and disabilities on ability to complete daily living tasks and takes action to avoid problems before they occur but may require more than usual amount of time and/or compensatory strategies.
• Able to independently think about consequences of decisions or actions but may require more than usual amount of time and/or comepensatory strategies to select the appropriate decision or action.
• Accurately estimates abilities and independently adjusts to task demands.
• Able to recognize the needs and feelings of others and automatically respond in appropriate manner.
• Periodic periods of depression may occur.
• Irritability and low frustration tolerance when sick, fatigued and/or under emotional stress.
• Social interaction behavior is consistently appropriate.

Original Scale co-authored by Chris Hagen, Ph.D., Danese Malkmus, M.A., Patricia Durham, M.A. Communication Disorders Service, Rancho Los Amigos Hospital, 1972. Revised 11/15/74 by Danese Malkmus, M.A., and Kathryn Stenderup, O.T.R.

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MODIFIED RANKIN SCALE (MRS)
MIM # 721

Rater Name: _____

Date: _____

Score Description

0 No symptoms at all
1 No significant disability despite symptoms; able to carry out all usual duties and activities
2 Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
3 Moderate disability; requiring some help, but able to walk without assistance
4 Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
5 Severe disability; bedridden, incontinent and requiring constant nursing care and attention
6 Dead

TOTAL (0–6): _____

Rater Sign / pager:_____

Provider Sign / MD# / pager:_____

HDF 536 / 4/03

References
Rankin J. "Cerebral vascular accidents in patients over the age of 60." *Scott Med J* 1957;2:200-15
Bonita R, Beaglehole R. "Modification of Rankin Scale: Recovery of motor function after stroke." *Stroke* 1988 Dec;19(12):1497-1500
Van Swieten JC, Koudstaal PJ, Visser MC, Schouten HJ, van Gijn J. "Interobserver agreement for the assessment of handicap in stroke patients." *Stroke* 1988;19(5):604-7

Appendix—Description of Functional Ambulation Category (FAC)

FAC	Ambulation Description	Definition
0	Nonfunctional ambulation	Subject cannot ambulate, ambulates in parallel bars only, or requires supervision or physical assistance from more than one person to ambulate safely outside of parallel bars
1	Ambulator-Dependent for Physical Assistance Level II	Subject requires manual contacts of no more than one person during ambulation on level surfaces to prevent falling. Manual contacts are continuous and necessary to support body weight as well as maintain balance and/or assist coordination
2	Ambulator-Dependent for Physical Assistance Level I	Subject requires manual contact of no more than one person during ambulation on level surfaces to prevent falling. Manual contact consists of continuous or intermittent light touch to assist balance or coordination
3	Ambulator-Dependent for Supervision	Subject can physically ambulate on level surfaces without manual contact of another person but for safety requires standby guarding on no more than one person because of poor judgment, questionable cardiac status, or the need for verbal cuing to complete the task.
4	Ambulator-Independent Level Surfaces only	Subject can ambulate independently on level surfaces but requires supervision or physical assistance to negotiate any of the following: stairs, inclines, or non-level surfaces.
5	Ambulator-Independent	Subject can ambulate independently on nonlevel and level surfaces, stairs, and inclines.