Utilization of the Coma Recovery Scale Revised (CRS-R)

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Introduction

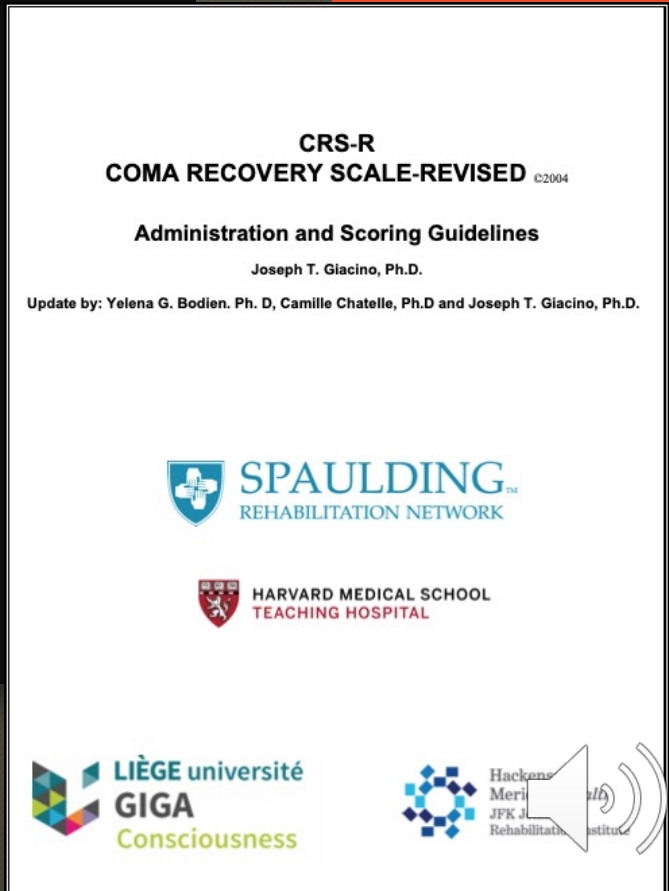
- I am a 2nd year Physical Therapy student at UNC-Chapel Hill
- I am interested in employing Evidence-based practice techniques in the hospital
- Due to this presentation being online, please read the “note section” for critical details about the slide.
  - When you see “WC#”, this indicates the work cited page
  - I recommend going to slide show and reading through in Presenter view.
- Lastly, I would like to evaluate my ability to teach you and your ability to retain the information so please keep track of how many questions you get right
  - Yes, there are 10 questions spread throughout the powerpoint

Introduction

- Learning Objectives:
  - Therapists will understand why CRS-R was developed
  - Therapists will feel confident in their ability to administer this tool
  - Therapists will be able to interpret the results from the CRS-R, which will allow them to reflect on best treatment practices
  - We, Wake Med employees, will be unified in our assessment tools of patients with disorders of consciousness (DOC)

Background/History of CRS-R[1]

- History:
  - 1991, “Monitoring Rate of Recovery to Predict Outcome in Minimally responsive Patients” was the forerunning Paper to the CRS-R
  - 2002, Formal case definition and case criteria for MCS was established
  - 2004, JFK Comma Recovery Scale was revised and the CRS-R project was born
  - 2018, -“Practice Guidelines update recommendations summary: Disorders of consciousness” AAN, ACRM, and NIDILRR all support CRS-R for management of patients with DOC
- Rationale for updating CRS-R
- What was updated and revised



Question 1

- ***What was addressed in the recent revision of the CRS-R?***
  - A) The record form identifies MCS- and MCS+
  - B) Test Completion Codes to identify if a test given was valid
  - C) Arousal facilitation protocol amended to emphasize deep pressure to face, neck, shoulder and SCM
  - D) Sentence stems to help examiners elicit intelligible verbalization
  - E) All of the above

Question 1—Answer

- ***What was addressed in the recent revision of the CRS-R?***
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What is the CRS-R?[1-3]

- Purpose of CRS-R is to monitor the course of recovery for patients
- Develop the support areas of need for DOC patients
- 6 subscales
- Interval Scale
- Organization
  - Lowest Item—Reflexive
  - High item—Cognitively-mediated

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 – Localisation to Noxious Stimulation*
2 – Flexion Withdrawal
1 – Abnormal Posturing
0 – None
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

What is the CRS-R?[4-5]

- Accessory aspects of the CRS-R
  - Brainstem Reflex
  - Arousal facilitation Protocol
  - Interventions
- Necessary tools to administer CRS-R
  - Mirror
  - Brightly/vibrant colored object
  - Common objects (comb, toothbrush)
  - Ball to kick
  - Small ball (e.g. baseball)
  - Cup
  - Loud noise
  - Tongue depressor
  - Pencil

Question 2

- ***Which statement is NOT true about the CRS-R?***
  - A) It has 6 subscales to examine various functions
  - B) Scoring is organized high to low, where high scores correlate with reflexive behaviors
  - C) It allows health care professionals to monitor the course of recovery in DOC patients
  - D) An examiner starts with the arousal facilitation protocol first

Question 2—Answer

- ***Which statement is NOT true about the CRS-R?***
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  - C) It allows health care professionals to monitor the course of recovery in DOC patients
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Appropriate Patients to utilize CRS-R on[1-2]

- Target population
  - Coma, VS, MCS-, MCS+
  - DOC who are functioning between Ranchos I-IV
- TBI
- Non-traumatic brain injuries

Rancho Los Amigo levels of Cognitive Function

Level I: No Response: Total Assistance

- No response to external stimuli

Level II: Generalized Response: Total Assistance

- Responds inconsistently and non-purposefully to external stimuli
- Responses are often the same regardless of the stimulus

Level III: Localized Response: Total Assistance

- Responds inconsistently and specifically to external stimuli
- Responses are directly related to the stimulus, for example, patient withdraws or vocalizes to painful stimuli
- Responds more to familiar people (friends and family) versus strangers

Level IV: Confused/Agitated: Maximal Assistance

- The individual is in a hyperactive state with bizarre and non-purposeful behavior
- Demonstrates agitated behavior that originates more from internal confusion than the external environment
- Absent short-term memory

Level V: Confused, Inappropriate Non-Agitated: Maximal Assistance

Question 3

- ***CRS-R can be used on both traumatic and non-traumatic brain injury patients that are in a minimally conscious state?***
  - True or False?

Question 3—Answer

- ***CRS-R can be used on both traumatic and non-traumatic brain injury patients that are in a minimally conscious state?***
  - True or False?

How to administer[1,5]

The 6 subgroups and their scoring system:

AUDITORY FUNCTION SCALE

4 – Consistent Movement to Command*
3 – Reproducible Movement to Command*
2 – Localization to Sound
1 – Auditory Startle
0 – None

MOTOR FUNCTION SCALE

6 – Functional Object Use†
5 – Automatic Motor Response*
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3 – Intelligible Verbalization*
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0 – None

AROUSAL SCALE

3 – Attention
2 – Eye Opening w/o Stimulation
1 – Eye Opening with Stimulation
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Question 4

VISUAL FUNCTION SCALE ©2004			
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

How would you score this?

An examiner, you, are attempting a visual startle test on a patient. You have to hold the patient's eyes open due to them not being able to. Trail 1: No response. Trail 2: No response. Trail 3: you may have hit their eyelash, but the eyelid fluttered. Trail 4: The patient blinks. You attempt this procedure on the other eye, but all 4 trails result in no response.

Question 4—Answer

VISUAL FUNCTION SCALE ©2004			
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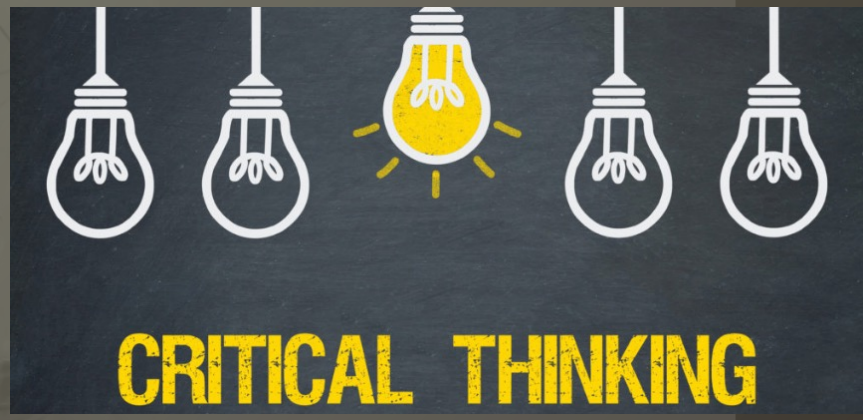
How to administer [1,2]

- How often should a health care professional administer it?
  - First 28 days (Acute phase)~ daily
  - Sub-acute phase, 1-2/week
- Can we deviate from the manual?
  - No, but there are exceptions
- When do we Discontinue using it?
  - 3 consecutive exams conducted over at least 2 weeks with highest scores in Auditory, Communication, and Arousal subscales.
- How long should it take to administer?
  - 15-30minutes depending on level of consciousness



Question 5

- **It has been 3 weeks since the initial brain injury, at what frequency should you be performing the CRS-R?**
  - A) 1 day/week
  - B) 2 days/week
  - C) 5 days/ week
  - D) 7 days/ week

Question 5—Answer

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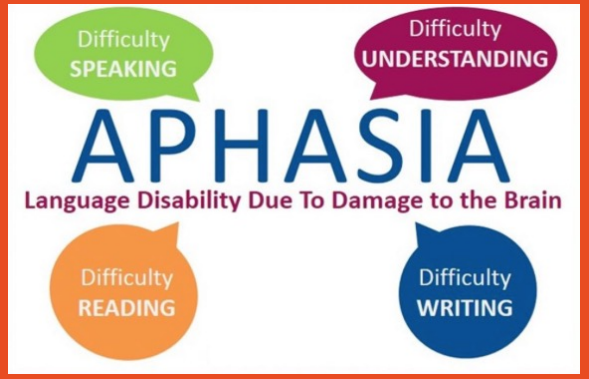

Addressing TCC[1]

Test Completion Codes	
1	test completed in full - results valid
Test attempted, not completed due to:	
2.1	impaired sensory function (cortical or peripheral)
2.2	aphasia
2.3	physical injury (e.g., fracture, brachial plexus, hemiparesis)
2.4	primary language barrier
2.5	illness/medical instability
2.6	examiner error
2.7	logistical reasons
2.8	other (specify):
Test not attempted due to:	
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3.4	primary language barrier
3.5	illness/medical instability
3.6	examiner error
3.7	logistical reasons
3.8	other (specify):

- What is the purpose of Test completion codes?
  - To understand why we're missing data or not collecting it
  - Better acknowledge the whole person and their impairments
  - During clinical use, we know when not to interpret the whole score
- How do I use TCC?
  - Most often use code 1, which indicates a completed, valid test
  - Codes starting with 2
  - Codes starting with 3

CRS-R Total Score Cut-off	7	8	9	10
Sensitivity	0.97	0.93	0.88	0.78
Specificity	0.80	0.963	0.97	1
Accuracy	0.921	0.937	0.905	0.841

- Vegetative State/Unresponsive wakefulness Syndrome (VS/UWS)
- Minimal Conscious State (MCS)
  - MCS -
  - MSC +
- Cut-off Scores

How to differentiate between VS/UWS vs MCS-/+ [6,7]

VS vs MCS vs eMCS Chart

CRS-R subscale	Vegetative State	Minimally Conscious State	Emergence from Minimally Conscious State (MCS+)
Auditory	Less than or equal to 2 **and**	3-4 OR	
Visual	Less than or equal to 1 **and**	2-5 OR	
Motor	Less than or equal to 2 **and**	3-5 OR	6 **OR**
Oromotor/verbal	Less than or equal to 2 **and**	3 OR	
Communication	0	1	2-3

Question 6

- *An examiner performs the CRS-R on a patient with a recent TBI, what is the minimal score they can perform to be considered in a Minimally Conscious State (MCS)?*
  - A) 5/23
  - B) 7/23
  - C) 10/23
  - D) 12/23

Question 6—Answer

- *An examiner performs the CRS-R on a recent TBI patient, what is the minimal score they can perform to be considered in a Minimally Conscious State (MCS)?*
  - A) 5/23
  - B) 7/23
  - C) 10/23
  - D) 12/23

Question 7

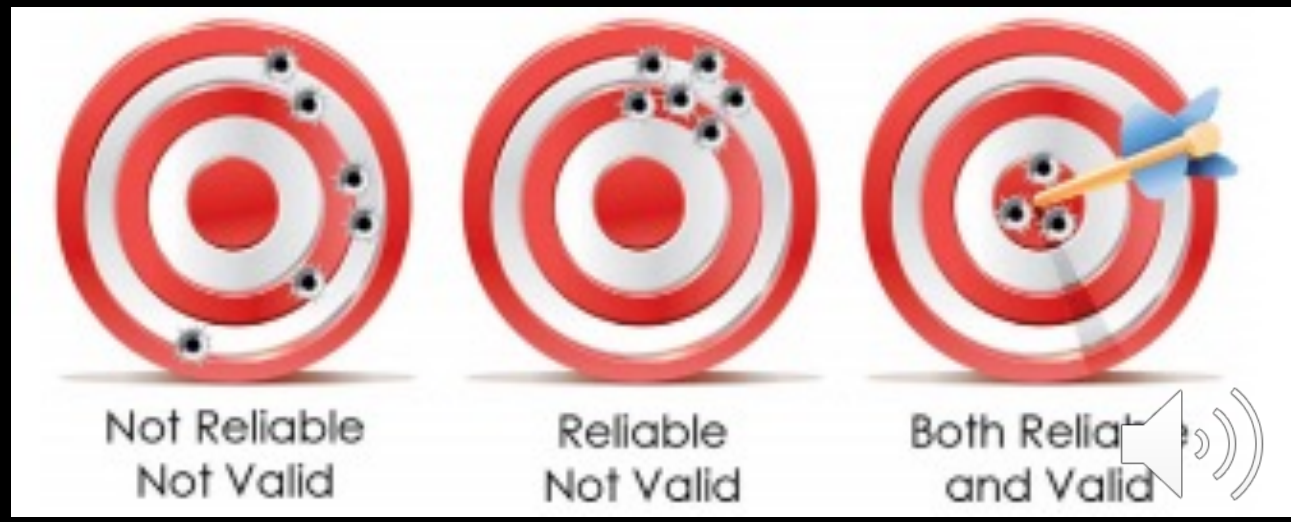
- *MCS– describes patients with minimal level of behavioral interactions consisting of command following, while MCS+ patients show higher-level behavioral responses such as object recognition and intelligible verbalization*
  - True or False?

Question 7—Answer

- *MCS– describes patients with minimal level of behavioral interactions consisting of command following, while MCS+ patients show higher-level behavioral responses such as object recognition and intelligible verbalization*
  - True or False?

Psychometric Properties[2,7]

- Top-rated Neurobehavioral rating scale for clinical assessment
- Test-retest Reliability
  - Excellent (Q=.94, P<0.001)
  - Oromotor/verbal (P= 0.17)
- Inter-rater and Intra-rater Reliability
- Internal Consistency
- Criterion validity
  - Concurrent
  - Predictive



Psychometric Properties[7,8]

- *Construct validity*
  - Strong relationship between CRS-R and GCS
- *Content validity*
- *Floor/ceiling effects*
- *Responsiveness*
  - *Sensitive at capturing changes in diagnosis*

Question 8

- ***When looking at each subscale individually, which one should we take extra caution interpreting? (Due to its test-retest reliability)***
  - A) Motor function
  - *B) Oromotor function*
  - *C) Visual function*
  - *D) Auditory function*

Question 8—Answer

- ***When looking at each subscale individually, which one should we take extra caution interpreting? (Due to its test-retest reliability)***
  - A) Motor
  - *B) Oromotor*
  - *C) Visual*
  - *D) Auditory*

Question 9

- **When analyzing the generalized Kappa statistic for all raters in all subscales, there was a moderate agreement. Additionally, it is understood that agreement is better between experienced examiners verse newly trained.**
  - True or False?

Question 9—Answer

- When analyzing the generalized Kappa statistic for all raters in all subscales, there was a moderate agreement. Additionally, it is understood that agreement is better between experienced examiners verse newly trained.
  - True or False?

CRS-R is multilingual[2]

- It has been translated to 15 different languages
- Validated in these languages
  - Spanish, Italian, French, Portuguese, Norwegian, Russian, German, Polish, Korean, and Chinese
- Consider using the validated, translated version for our patients

Can CRS-R diagnosis DOC?[1]

- Technically No, but…
- A score of 10 or greater indicates a diagnosis of MCS or eMCS
- It can portray a “quick” snapshot of how the patient is recovering over time

Why it's important we all utilize CRS-R

- Consistency
- Standardization
- Assess our own treatments/interventions effectiveness
- Improve Patient outcomes

WHY IT MATTERS

Survey Link

- Thanks for taking the time to learn about CRS-R
- Feel free to email me at: Robbey_Lindstedt@med.unc.edu with any questions.

- **Please take a few minutes to fill out this survey. I appreciate any feedback you can provide.**
- CRS-R Survey

Work cited

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