Outcome Oriented

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Center for Outcome Measurement in Brain Injury **(COMBI)**

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COMBI Gets a New Look: Improved Navigation and Organization

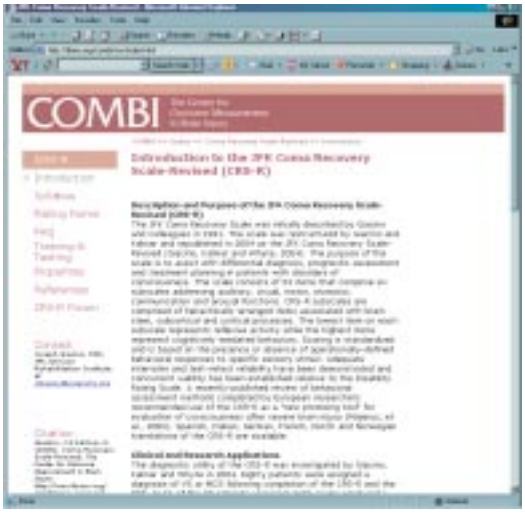
Jerry Wright
Rehabilitation Research Center
Santa Clara Valley Medical Center

Since 1998, the Center for Outcome Measurement in Brain Injury (COMBI) has acted as an online resource for information on brain injury-related outcome and assessment scales. Over one million visitors later, it was decided that it needed an upgrade (even virtual carpeting gets worn a little thin after more than a million visitors).

In 2006, the Rehabilitation Research Center at Santa Clara Valley Medical unveiled the new look for the COMBI. It incorporated new colors and more importantly new navigational and organizational aids. Same great scales, only now easier to access!

Some things you might notice on the redesigned website: a navigation aid called breadcrumbs, showing you exactly where in the website you are (i.e. COMBI>>Scales>>DRS>>Introduction), scale specific navigation aids on the left side to access important items for each scale (syllabi, rating forms, training materials, references, etc), a scale contact listed on every scale page, and instructions for citing instruments on every scale page.

Please let us know what you think of our redesign. Comments received through emails and our online survey drove the current changes. What will the next generation COMBI bring?



COMBI pages now have scale specific navigation on the left side and site specific navigation on the top and bottom. Contact and citation information are given on every page.

How to Cite the COMBI

If you find the information in the COMBI useful, please mention it when citing sources of information. The COMBI website may be cited as:

Santa Clara Valley Medical Center (2005). *The Center for Outcome Measurement in Brain Injury.* http://www.tbims.org/combi (access date).

The COMBI is a collaborative project funded by the National Institute on Disability and Rehabilitation Research. Citing the COMBI is a way of demonstrating the usefulness of this project. Please recognize the work of your colleagues in bringing this information to you.☑

A COMBI Primer

The Center for Outcome Measurement in Brain Injury (COMBI) is an online resource center cataloguing information on brain injury outcome and assessment scales. The COMBI is funded by the National Institute on Disability and Rehabilitation Research (NIDRR) and is a collaborative project of eleven TBI Model System Projects. Information on the COMBI is available free of charge.

Currently, the COMBI contains information on 30 outcome or assessment scales. Materials available include scale syllabi, administration and scoring guidelines, training and testing materials, information on scale properties, references, scale forums, and frequently asked questions (FAQs). Rating forms for most of the measures are also available for downloading. COMBI users have the advantage of instant access to the materials they want.

Measuring Up!

The COMBI continues to add more important scales to its resource center. As of February 2007 there are currently 30 measures featured and detailed in the COMBI.

- Agitated Behavior Scale (ABS)
- Alcohol and Substance use items
- Apathy Evaluation Scale (AES)
- Awareness Questionnaire (AQ)
- The Cognitive Log (Cog-Log)
- Coma/Near Coma Scale (CNC)
- Coma Recovery Scale-Revised (CRS-R)
- Community Integration Questionnaire (CIQ)
- Confusion Assessment Protocol (CAP)
- The Craig Handicap Assessment and Reporting Technique (CHART)
- The CHART Short Form (CHART-SF)
- The Craig Hospital Inventory of Environmental Factors (CHIEF)
- Disability Rating Scale (DRS)
- Employment variables after TBI
- The Family Needs Questionnaire (FNQ)
- Functional Assessment Measure (FAM)
- Functional Independence Measure (FIM)
- Glasgow Outcome Scale (GOS)
- Extended Glasgow Outcome Scale (GOS-E)
- High Level Mobility Assessment Tool (HiMat)
- Levels of Cognitive Functioning Scale (LCFS)
- Mayo Portland Adaptability Inventory (MPAI)
- Mississippi Aphasia Screening Test (MAST)
- Neurobehavioral Functioning Inventory (NFI)
- The Orientation Log (O-Log)
- Participation Objective, Participation Subjective (POPS)
- The Patient Competency Rating Scale (PCRS)
- Satisfaction With Life Scale (SWLS)
- Service Obstacle Scale (SOS)
- Supervision Rating Scale (SRS)

New Scales on the COMBI!

JFK Coma Recovery Scale-Revised (CRS-R)

The JFK Coma Recovery Scale was initially described by Giacino and colleagues in 1991. The scale was restructured by Giacino and Kalmar and republished in 2004 as the JFK Coma Recovery Scale-Revised (Giacino, Kalmar and Whyte, 2004). The purpose of the scale is to assist with differential diagnosis, prognostic assessment and treatment planning in patients with disorders of consciousness. The scale consists of 23 items that comprise six subscales addressing auditory, visual, motor, oromotor, communication and arousal functions. CRS-R subscales are comprised of hierachically-arranged items associated with brain stem, subcortical and cortical processes. The lowest item on each subscale represents reflexive activity while the highest items represent cognitively-mediated behaviors. Scoring is standardized and is based on the presence or absence of operationally-defined behavioral responses to specific sensory stimuli. Adequate interrater and test-retest reliability have been demonstrated and concurrent validity has been established relative to the Disability Rating Scale. A recently-published review of behavioral assessment methods completed by European researchers recommended use of the CRS-R as a "new promising tool" for evaluation of consciousness after severe brain injury (Majerus, et al., 2005). Spanish, Italian, German, French, Dutch and Norwegian translations of the CRS-R are available.

Clinical and Research Applications

The diagnostic utility of the CRS-R was investigated by Giacino, Kalmar and Whyte in 2004. Eighty patients were assigned a diagnosis of VS (vegetative state) or MCS (minimally conscious state) following completion of the CRS-R and the DRS. In 51 of the 80 patients assessed, both scales produced a diagnosis of MCS. An additional 19 patients received a diagnosis of VS on both measures. The overall rate of agreement in diagnosis was 87%. There were no cases in which the DRS found evidence of MCS while the CRS-R did not. Conversely, there were 10 cases in which the CRS-R profile supported a diagnosis of MCS while the DRS findings were indicative of VS. In all 10 of these cases, the CRS-R detected evidence of visual pursuit, a diagnostic feature of MCS that is not represented on the DRS.

The CRS-R has been utilized in TBI outcomes research and in large-scale epidemiologic studies. A 2005 Australian study of patients who were in MCS for at least one month after TBI used the CRS-R to document long-term outcome. Results showed that duration of time in MCS did not predict psychosocial outcome at 2-5 years post-injury and that a large percentage of MCS patients eventually regained functional independence. The governments of Belgium and Italy are currently using the CRS-R to investigate the incidence, prevalence, functional outcome and costs of care in patients diagnosed with VS and MCS.

The prognostic utility of the CRS was investigated in a number of additional studies. Giacino et al. (1991) found that CRS change scores obtained during the initial four weeks of inpatient rehabilitation correlated more strongly with functional outcome at one year than did GCS change scores, after controlling for the influence of injury severity and length of time post-injury. In a second study (Giacino and Kalmar, 1997) focusing on the influence of diagnosis on functional outcome, level of functional disability on the DRS was found to be significantly lower at 12 months post-injury in patients diagnosed with MCS on admission to rehabilitation (mean time post-injury=9 weeks), relative to those in VS. This difference was most pronounced for patients with traumatic versus non-traumatic brain injuries. In those with traumatic injuries, 50% of patients in MCS had no to moderate disability at 12 months, while only 3% of patients in VS recovered to this level of function. Thompson et al. (1999) used the CRS to study the relationship between time to recovery of consciousness and degree of cognitive improvement from admission to discharge on the Functional Independence Measure. Principal components analysis indicated that time to recovery of consciousness (based on CRS subscale scores) accounted for 60% of the variability in cognitive change and correctly classified 22 of 25 patients on this index.

Information regarding the CRS-R was contributed by JFK-Johnson Rehabilitation Institute. Please contact Joseph Giacino, Ph.D., at <JGiacino@solarishs.org> for more information.

Giacino JT, Kalmar K, Whyte J. The JFK Coma Recovery Scale-Revised:Measurement characteristics and diagnostic utility. Arch Phys Med Rehabil, 2004;85(12):2020-29.

Giacino JT, Kezmarsky MA, DeLuca J, Cicerone KD. Monitoring rate of recovery to predict outcome in minimally responsive patients. Arch Phys Med Rehabil, 1991,72:897-901.

Giacino JT, Kalmar K. The vegetative and minimally conscious states: A comparison of clinical features and functional outcome. J Head Trauma Rehabil, 1997;12(4):36-51.

Thompson N, Sherer M, Nick T, et al. Predicting change in functional outcomes in minimally responsive patients using the Coma Recovery Scale. Arch of Clinical Neuropsych, 1999;14(8):790-1.

Participation Objective, Participation Subjective (POPS) Scale

The POPS was developed in 2004 at Mount Sinai School of Medicine (MSSM), New York NY. It is a product of the Rehabilitation Research and Training Center on TBI Interventions, a NIDRR-funded project (H133B040033), to the Department of Rehabilitation Medicine, MSSM.

The POPS consists of a list of 26 "items", which are elements of participation (e.g., going to the movies, housework, opportunities to meet new people). For each item, two types of questions are asked. The first is an objective question, e.g., how often in a typical month do you go to the movies. The second two questions asked of each item are subjective: How important is this to your well being? Are you satisfied with your current level of participation, or would you like to be doing more or be doing less?

The 26 items are sorted into five categories: Domestic Life; Major Life Activities; Transportation; Interpersonal Interactions and Relationships; and Community, Recreational and Civic Life.

The POPS was developed within the context of traumatic brain injury, but was not specifically aimed at that population. Its content is neutral, in the sense that items refer to activities engaged in normatively, and their inclusion is not based on relevance to a specific disability group. The POPS takes 10-20 minutes to administer.

Information regarding the POPS was contributed by Mount Sinai School of Medicine. Please contact Margaret Brown, Ph.D., at <margaretbrow@gmail.com> for more information.

High Level Mobility Assessment Tool (HiMAT)

Restricted participation has been well documented following TBI. Existing scales used in neurological rehabilitation are unable to quantify mobility to the level required for participation in physically demanding employment roles, leisure activities, social roles and sporting activities. The HiMAT was developed to quantify high-level mobility outcomes following traumatic brain injury (TBI). The HiMAT items were generated from existing adult and paediatric neurological mobility scales and the opinions of expert clinicians (Williams et al., 2005a), before being tested on a cohort of people with TBI. The final HiMAT items are unidimensional and can be used to quantify high-level mobility on people with severe cognitive impairment. The HiMAT is suitable for any TBI clients who have goals which require a level of mobility beyond independent level walking.

The HiMAT was developed as a unidimensional measure of motor performance rather than a general measure of functional mobility. Functional mobility for activities such as shopping or sport requires the integration of motor, cognitive and behavioural control mechanisms. A unidimensional scale of mobility, used in conjunction with other measures of cognitive, behavioural and emotional status, could assist clinicians to identify the reasons why participation in pre-morbid physically demanding activities is restricted. In turn this could enable clinicians to more easily quantify mobility restrictions.

Williams, Robertson and Greenwood (2004) showed that little is known about the extent of high-level mobility limitations following TBI. Although independent mobility is an important goal of rehabilitation, outcome studies often fail to measure it. When mobility is measured, the scales used suffer from a ceiling effect and fail to extend mobility to age-appropriate levels for return to physically demanding employment roles, leisure activities, social roles and sporting activities. A new high-level mobility scale was needed to quantify motor performance to the high-level required for such activities.

The HiMAT was developed over several years of research (Williams et al., 2005a; Williams et al., 2005b). In the initial stages, a literature review was conducted to determine the range of existing high-level items on adult and paediatric neurological mobility scales. To further extend the pool of high-level mobility items, a consensus method was used to survey the opinions of expert physiotherapists and physical educators. This process resulted in a group of 20 high-level mobility items that were prepared for testing on TBI clients.

The HiMAT consists of 13 items that are measured using either a stopwatch or tape-measure. Measures obtained on each item are scored and summed for a total HiMAT score (maximum score 54). Higher scores indicate better mobility performance. Depending on the ability of the client and how many items they can perform, testing takes 5-15 minutes. No formal training is required to administer the HiMAT. The HiMAT has been developed and validated in TBI for clients who have high-level mobility goals, or whose goals required advanced mobility. Although clinically it is being used in CVA, Multiple Sclerosis, Spinal Cord Injuries and Cerebral Palsy, it is yet to be validated in these populations.

Information regarding the HiMAT was contributed by Epworth Rehabilitation. For further information, please contact Gavin Williams, PhD, at <gavin.williams@epworth.org.au>.

Williams G, Robertson V, Greenwood K, et al. The High Level Mobility Assessment Tool (HiMAT) for traumatic brain injury. Part 1: Item generation. Brain Injury, 2005a, 19(11):925-32.

Williams G, Robertson V, Greenwood K. Measuring high level mobility after traumatic brain injury. Am J Phys Med Rehabil, 2004;83:910-20.

Williams G, Robertson V, Greenwood K, et al. The High Level Mobility Assessment Tool (HiMAT) for traumatic brain injury. Part 2:Content validity and discriminability. Brain Injury, 2005a, 19(10):833-43.

Log Files 101

When you access a web page, a record is created (a log file). Log files give webmasters information about you and what you looked at on the site. We use log files to assess how the COMBI is being used.

The Stats

In the last 12 months (January 06 –December 06) the COMBI has logged in 455,000 visitors. That's over 1,200 users a day! During this period 761,000 pages of information were reviewed (that's 12,044 megabytes of data).

The COMBI newsletter, *Outcome Oriented*, is primarily disseminated in Portable Document Format (PDF) from the website. Over the last 12 months, 11,688 newsletters were downloaded by COMBI users.

Itemized scale activity is summarized in the table below. *Please, no wagering.* ☑

Scale Activity (Number of Downloads or Visits)
January 2006 through December 2006

Scale	Activity
ABS	2104 downloads
AES	1751 downloads
Alcohol	1164 downloads
AQ	4036 downloads
CAP	1574 downloads
CHART	2214 downloads
CHART-SF	1635 downloads
CHIEF	2108 downloads
CIQ	2216 downloads
CNC	2364 downloads
Cog-Log	1663 downloads
CRS-R	620 downloads*
DRS	3740 downloads
EMPLOY	1319 downloads
FAM	5552 downloads
FIM	45903 visitors
FNQ	2702 visitors
GOS	12941 visitors
GOS-E	3785 visitors
HiMAT	1534 downloads*
LCFS	1680 downloads
MAST	1875 downloads
MPAI	11844 downloads
NFI	2755 visitors
O-LOG	1253 downloads
PCRS	3878 downloads
POPS	699 downloads*
SOS	769 downloads
SRS	1254 downloads
SWLS	10947 visitors

Visitors are reported when scales are not available on the COMBI.
*CRS-R, HiMAT, POPS figures do not reflect 12 months of data.

Future Directions

This is the fifth *Outcome Oriented* newsletter for this funding cycle (2002-2007). We are updating materials for all of our current measures. We are looking to add more training and testing materials for COMBI measures, and to make the existing materials more interactive (automatic email of results from testing exercises).

Please email us at <jerry.wright@hhs.sccgov.org> with your thoughts and suggestions. Let us know how we measure up! Thank you for allowing us to be your brain injury outcome measure resource! ☑

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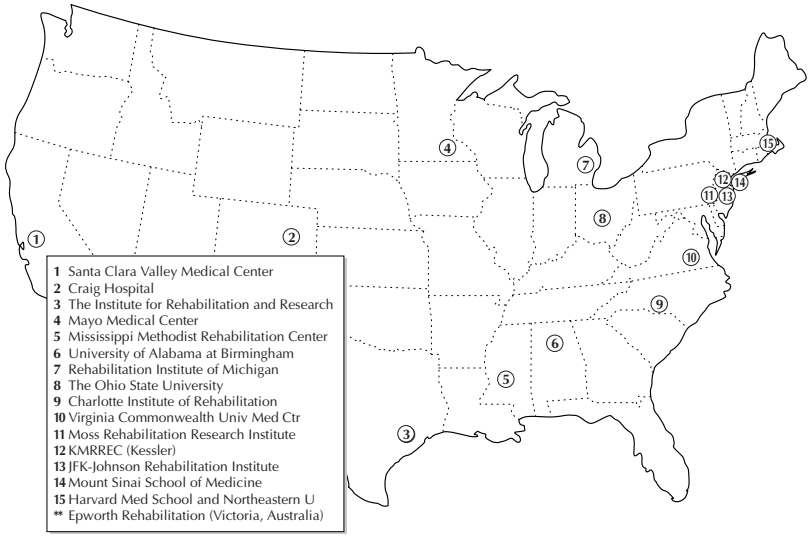
Address inquiries to
***Jerry Wright**, Editor. Phone (408) 793-6430;*
Email jerry.wright@hhs.sccgov.org

This document is available online at:
<www.tbims.org/combi/combinews.html>

Credit to Our Collaborators



The COMBI is a collaborative project of sixteen brain injury centers. Without the expertise of these centers this project would not be possible. We would like to offer special recognition to the individuals at these facilities who have taken the time to prepare materials for the COMBI and act as contacts:

Tamara Bushnik, PhD, Jerry Wright, BA, Laura Jamison, and Maurice Rappaport, MD, PhD at Santa Clara Valley Medical Center **(Lead Center)**

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James F. Malec, PhD, LP at the Mayo Medical Center

Risa Nakase-Richardson, PhD at the Mississippi Methodist Rehabilitation Ctr

Tom Novack, PhD at University of Alabama at Birmingham

Jennifer Bogner, PhD & John D. Corrigan, PhD at the Ohio State University

Flora Hammond, MD at Charlotte Institute of Rehabilitation

Jeffrey Kreutzer, PhD and Jenny Marwitz, MA at Virginia Commonwealth University Medical Center

Tessa Hart, PhD at Moss Rehabilitation Research Institute

Kessler Medical Rehabilitation Research and Education Corporation

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Marcel Dijkers, PhD and Margaret Brown, PhD, at Mount Sinai School of Medicine

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Gavin Williams, PhD, at Epworth Rehabilitation (Victoria, Australia) ☑

SANTA CLARA VALLEY MEDICAL CENTER

Rehabilitation Research Center
Santa Clara Valley Medical Center
751 South Bascom Avenue
San Jose, CA 95128

UPDATE
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