**TBI Assessment Toolbox: cognition/behavioral deficits**

TBI can have many and varied consequences on function and behavior of an individual. Consequences can range from impacts on gait and biomechanics to difficulties with activities of daily living and community reintegration. It is therefore important that physical therapists have an expansive range of outcome measures to gather information across a spectrum of different performance and life contexts.

1. **Short form – 36 (SF-36)**: a generic, patient self-report measure to assess health-related quality of life. The test consists of 36 items across 8 subscales including 1. Physical functioning 2. Role limitation due to physical problems 3. General health perceptions 4. Vitality 5. Social functioning 6. Role limitations due to emotional problems 7. General mental health 8. Health transition.1 Each score is weighted and totaled for each subscale to give a final total score on a scale of 0 to 100 (higher score more positive health).1 Polinder et al. found that subscale items 2 and 4 had the lowest scores in patients with a TBI.2 Compared to population norm scores, PTs can expect clients with a TBI to rank subscales 2, 5, and 6 as the lowest scoring.2 Use of the SF-36 may indicate direction for future treatments because it is useful in estimating disease burden and comparing disease-specific benchmarks with the general population.3

Link to SF-36v2: <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCQQFjAA&url=http%3A%2F%2Fwww.sf-36.org%2Ftools%2Fpdf%2FSF-36v2_Standard_Sample.pdf&ei=sxkXVaWwK-LisASh-YDgCw&usg=AFQjCNFfIYDDlHd_fDInCuhxQqrmfbTgng&sig2=W1RU92HMUfnOtU1qXQsyYw>

1. **Quality of Life after Brain Injury (QOLIBRI):** a specific health related quality of life questionnaire designed specifically for survivors of a TBI.4 It has a 37-item scale using 6 overall subscales and 29 items related to thinking, feelings and emotion, and autonomy with daily life and social aspects.5 The QOLIBRI total score and responses in each subscale are summed and then divided by the number of items answered to give a scaled mean score.5 The scaled mean score will range between 1 to 5 and converted to a 0-100 scale by subtracting 1 from the mean and multiplying by 25 with 0 = worst quality of life, and 100 = best quality of life.5 The QOLIBRI scores show strong relationship with scores reported on other measures such as the SF-36 and Hospital Anxiety and Depression scale (HADS).4 The QOLIBRI is specific to quality of life in TBI survivors and contains novel content information.4

Link to QOLIBRI:

<http://www.qolibrinet.com/registration.htm>

1. **Functional Independence Measure (FIM):** an 18-item instrument assessed using a seven point ordinal scale with higher item scores indicating higher levels of patient independence. The scale is divided in two groups; motor items and cognitive items. Total scores can range from 18 to 126.6 Discharge FIM scores and degree of improvement in PT is most strongly predicted by the FIM motor scores.7 The presence of any accompanying extremity fractures as a result of the TBI causing event is associated with improved outcome in TBI as depicted in higher FIM discharge scores in the cognitive category.7

Link to FIM:

<http://www.oqp.med.va.gov/cpg/STR/str_cpg/content/appendices/appendixD.htm>

1. **Functional Assessment Measure (FAM):** an adjunct self-report measure developed for use with the FIM to cover items not found in the FIM such as communication, psychological adjustment and cognition.8 The FAM is a 12 item test intended to be added to the 18 item FIM.9 The rating of the FAM is on a 7 point scale matching the FIM.8 The FIM+FAM can be scored as a total 30-item outcome measure.9

Link to FAM:

<http://www.tbims.org/combi/FAM/famform.pdf>.

1. **Barthel Index (BI):** a 10 item measure to evaluate functional independence with activities of daily living (ADLs) including; feeding, bathing, grooming, dressing, bowel and bladder care, toilet use, and mobility associated with ambulation, transfers, and stair climbing.10 Scoring for the BI is complex involving a mixture of dichotomous and polytomous response items.10 Scores range from 0 to 100 (independence).10 The BI was initially developed for improved clinical relevance with respect to ADL performance.10 The BI has been shown to be appropriate and responsive for use in the TBI population with younger (<65 years) patients undergoing early inpatient rehabilitation.11 However, Liu et al found poor discrimination between some items on the BI and issued a note of caution when determining ADL independence.10

Link to BI:

<http://www.strokecenter.org/trials/scales/barthel.pdf>

1. **6-Minute Walk Test (6MWT):** the patient is asked to walk for 6 minutes with any assistive device needed and is allowed to pause for breaks but the counter does not stop during these instances. The primary measurement is total distance walked (feet) in 6 minutes.12 Secondary variables include fatigue and dyspnea (using modified Borg or visual analog scale).12 The 6MWT can predict measure functional capacity in patients with moderately severe functional endurance impairments.12 The 6MWT can also provide decent estimates of peak aerobic capacity in patients with a TBI.13

Link to 6MWT:

<http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0CDMQFjAD&url=http%3A%2F%2Fwww.aadep.org%2Fdocuments%2Fresources%2FAppendix_E__6MWT_Instructions_267DCB2E392F3.pdf&ei=zTYXVcbONPTdsATN_4KYCg&usg=AFQjCNFR3p6PRZbiikjHYpkX-QiCtTHglg&sig2=ipBqMpLNZRvQNDKYBEkhzw&bvm=bv.89381419,d.cWc&cad=rja>

1. **Berg Balance Scale (BBS):** includes 14 tasks of ability to maintain balance and mobility with increasingly difficult task progressions including reduced base of support and reaching beyond base of support tasks.14 Items are scored from 0 (worst) to 4 (best) for a total score of 56.14 Cut-off score of </= 45/56 indicates client is at a high falls risk. The BBS was originally designed to assess fall risk with the geriatric population but has been found to predict rehabilitative outcomes when used in combination with other clinical measures for patients admitted to inpatient acute rehabilitation with a TBI.14

Link to BBS:

<http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.aahf.info%2Fpdf%2FBerg_Balance_Scale.pdf&ei=4GsZVfS7E4vegwSdnYHoDg&usg=AFQjCNH0pwOHOZ_ZGtgAJWa-WZjB6ZCfQg&sig2=19TggVZxbnHrY9KBqugMFg&bvm=bv.89381419,d.eXY&cad=rja>

1. **Dizziness Handicap Inventory (DHI)**: an outcome measure used to quantify patient’s complaints of dizziness and associated functional deficits following a TBI.15 The DHI is a 25 item self-assessment to assess the effects of dizziness on functional, emotional, and physical capabilities and how these deficits impact everyday functioning. A 4 point score is awarded for a “yes” answer, 2 points for a “sometimes” answer and 0 points for a “no” answer.15 The highest score is 100 with each physical, functional, and emotional subscale worth a maximum of 28, 36, and 36 points respectively.15 A higher total score indicates higher levels of impairment on each subscale and total score overall.15

Link to DHI:

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCMQFjAA&url=https%3A%2F%2Fwww.southamptonhospital.org%2FResources%2F10355%2FFileRepository%2FForms%2FDizziness%2520Hanicap%2520Inventory%2520-%2520English.pdf&ei=VW4ZVbmqCIikNsTcgrAI&usg=AFQjCNF4K9fDgyN0Zcsq4XocCWufuzXsAA&sig2=y-WSt0yGn\_cPBMdBBRLvGg&bvm=bv.89381419,d.eXY&cad=rja

Below are further outcome measures that may be useful in assessment of individuals with a TBI:16-19

1. **European Brain Injury Questionnaire (EBIQ)** – self-report measure across nine scales including content that measures subjective experience of cognitive, emotional and social difficulties in individuals with a TBI.
2. **World Health Organization of Quality of Life short version (WHOQOL-BREF)** – self-report 25 item questionnaire on a 5 point scale measuring four domains: physical health, psychological health, social relationships, and environment.
3. **Community Balance and Mobility Scale (CB&M)** – 15 item test covering home integration, social integration, and productive activities. Enables the user to gauge patient mobility and integration in the community.
4. **Modified Ashworth Scale** – 5 point scale used to assess spasticity from 0 (no increase in tone) to 4 (rigid flexion or extension).
5. **Glasgow Coma Scale** – 3 subscale measure (eyes opening, best verbal response, best motor response) totaling 15 points used to measure responsiveness after/during a coma from a TBI. </=8 = severe TBI, 9-12 = moderate TBI, 13+ = mild TBI.
6. **Moss Attention Rating Scale (MARS)** – Observational rating scale for assessment of attention-related behavior after a TBI. Uses a 5 point scale across 22 items to capture data on influence of impaired attention on cognition and mobility.
7. **High level mobility assessment (Hi-MAT) –** higher level motor performance measure to capture data on physically demanding vocational roles, sporting activities, and social roles.
8. **Galveston Orientation and Amnesia Test (GOAT) –** standardized questioningtool to measure orientation and recall before and after the TBI. Scores between 76 and 100 are ‘normal’ with scores <76 indicating post-traumatic amnesia.

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