

<b>Outcome Measure</b>	<b>Glasgow Outcome Scale – 8 category</b>
<b>Sensitivity to Change</b>	No
<b>Population</b>	Adult and paediatric
<b>Domain</b>	Global Outcome
<b>Study Suitability</b>	Intervention – Rehabilitation
<b>ICF-Code/s</b>	b1, d1-d9
<b>Description</b>	<p>The <b>Original</b> Glasgow Outcome Scale (GOS) was developed as a practical index of social outcome following head injury designed to complement the Glasgow Coma Scale as the basis of a predictive system (Jennett and Bond, 1975, Jennett et al. 1981). The original GOS categorised outcomes as (1) death, (2) persistent vegetative state, (3) severe disability, (4) moderate disability, (5) good recovery with individuals within any single outcome category representing a range of abilities (Jennett and Bond, 1975).</p> <p>The Glasgow Outcome Scale <b>8 category version</b> is an expanded version of the Glasgow Outcome Scale (GOS) designed to better classify patients who have regained consciousness and to recognize the difference between patients who are dependent and those who are not (Jennett, Snoek, Bond &amp; Brooks, 1981).</p> <p>In the Glasgow Outcome Scale <b>8 category version</b>, each of the 3 categories applicable to conscious patients are subdivided into an upper and lower band resulting in 8 possible categories (Death, Vegetative State, Lower Severe Disability, Upper Severe Disability, Lower Moderate Disability, Upper Moderate Disability, Lower Good Recovery, Upper Good Recovery). GOS ratings can be derived from the Glasgow Outcome Scale Expansion by collapsing these subdivisions (Wilson et al. 2000).</p>
<b>Properties</b>	<p><b>TIME</b> Depending on prior familiarity with the patient, the scale can be completed in as little as 5 minutes.</p> <p><b>SCORING</b> Ratings for the Glasgow Outcome Scale Expansion range from 1 to 8 (Dead to Upper Good Recovery). The GOS / Glasgow Outcome Scale Expansion are generally rated by a clinician or research assistant who is familiar with the patient. Glasgow Outcome Scale Expansion ratings are easily recorded to GOS ratings.</p> <p><b>PSYCHOMETRIC PROPERTIES</b> <u>Reliability: Test-retest reliability</u> Same raters rated 35 patients with TBI on two occasions (3-6 mnths apart) using the <b>8 category GOS</b>. A difference of one or more categories between testing occasions were seen in 60/180 cases (30%). Using the <b>original 5</b></p>

**category** GOS such discrepancies occurred in 34 cases (19%) (Maas et al, 1983)

#### Inter-observer reliability

**Original 5 category GOS** Jennett et al. (1981) reported 95% agreement between observers using the original GOS. Agreement between assessment based on a mail-administered research questionnaire and assessment via interview by a psychologist was reported to be  $r = 0.79$  while agreement between a GP's assessment and the psychologist interview was  $r = 0.49$  (Anderson et al. 1993).

**Original 5 vs 8 category GOS**  $k = 0.77$  vs  $0.48$  (live interviews),  $k = 0.58$  vs  $0.49$  (previously recorded data)  $k = 0.77$  vs  $0.53$  (agreement between live and recorded data)(Maas et al. 1983); In another study (Brooks et al. 1986) 70% of GOS ratings were in perfect agreement while none differed by more than one category – for the GOS Expanded none differed by more than one category –most discrepancy seen in the middle categories.

Validity: There is little research examining the validity of the **8 category** version of the GOS. The following reports on validity studies for mainly the **original** (5 category) version.

#### Construct validity

The **original 5 category** GOS ratings are reported to be associated with neurological testing of motor tasks, psychomotor tests, assessments of memory variables and attention variables such that neuropsychological test performance decreased as a function of increased severity on the GOS rating scale (K. Zaucha, 1998). Performance on cognitive tests 3 months post injury differed significantly between outcome subgroups corresponding to **original** GOS ratings demonstrating a clear gradation in cognitive scoring between groups in the expected direction – this relationship was not as clear when the **GOS 8 category version** was used (Brooks et al., 1986).

#### Criterion Validity: Predictive

**Original 5 category** GOS scores could discriminate between groups based on categories of vocational recommendations (return to work, vocational training, supported work and continued remedial therapy;  $p < 0.0001$ ), GOS scores accounted for 76% variance between cell means (Mysiw, Corrigan, Hunt, Cavin, & Fish, 1989).

The **original** GOS at discharge from rehabilitation significantly correlated with GOS 5 – 7 years after head injury ( $r = 0.60$ ,  $p < 0.001$ ) and with discharge destination ( $p < 0.0001$ ; (Massagli, Michaud, & Rivara, 1996).

#### Concurrent validity

**10 category GOS:** Discharge: GOS scores correlated with DRS scores ( $r = 0.85$ ) (Gouvier et al. 1987); GOS ratings correlated with SF-36 subscale scores ( $r = 0.51 - 0.68$ ,  $p < 0.01$ ; Jenkinson et al. 1993 cited in Teasdale et al. 1998); **Original 5 category GOS** scores correlated with DRS ratings at admission to ( $r = 0.50$ ,  $p < 0.01$ ) and discharge from rehabilitation ( $r = 0.67$ ,  $p < 0.01$ ; Hall et al. 1985).

<b>Advantages</b>	Brief, free, can be used in clinical context.
<b>Disadvantages</b>	<ol style="list-style-type: none"> <li>1) Not sensitive for social outcomes; not developmentally calibrated.</li> <li>2) Standard Error of Measurement (SEM) not established.</li> <li>3) Minimal Detectable Change (MDC) not established.</li> <li>4) Minimal Clinically Important Difference (MCID) not established.</li> </ol>
<b>Additional Information</b>	<ol style="list-style-type: none"> <li>1) Primarily intended to describe outcome in groups of cases for research purposes. Utility for individual assessment is limited.</li> <li>2) The Glasgow Outcome Scale should not be done too early in a person's recovery, because the degree of resumption of normal life cannot be assessed at this stage.</li> </ol>
<b>Reviewers</b>	Vicki Anderson (paediatrics) Cathy Catroppa (paediatrics) Jenny Fleming (adults)

### References

- Brooks, D. N., et al. (1986). "Cognitive sequelae of severe head injury in relation to the Glasgow Outcome Scale." Journal of Neurology, Neurosurgery & Psychiatry **49**(5): 549-553.
- Hall, K. M., Bushnik, T., et al. (2001). "Assessing traumatic brain injury outcome measures for long-term follow-up of community-based individuals." Arch Phys Med Rehabil **82**(3): 367-374.
- Jennett, B., & Bond, M. (1975). Assessment of outcome after severe brain damage. A practical scale. Lancet, *1* (March 1), 480-484.
- Jennett, B., Snoek, J., Bond, M.R., & Brooks, N. (1981). Disability after severe head injury: observations on the use of the Glasgow Outcome Scale. Journal of Neurology, Neurosurgery, and Psychiatry, **44**, 285-293.
- Levin, H. S., Boake, C., et al. (2001). "Validity and sensitivity to change of the extended Glasgow Outcome Scale in mild to moderate traumatic brain injury." J Neurotrauma **18**(6): 575-584.
- Lu, J., Marmarou, A., et al. (2010). "A method for reducing misclassification in the extended Glasgow Outcome Score." J Neurotrauma **27**(5): 843-852
- Maas, A. I. R., et al. (1983). "Agreement between physicians on assessment of outcome following severe head injury." Journal of Neurosurgery **58**: 321-325.
- Massagli, T. L., et al. (1996). "Association between injury indices and outcome after severe traumatic brain injury in children." Archives of physical medicine and rehabilitation **77**(2): 125-132.
- Mysiw, W. J., et al. (1989). "Vocational evaluation of traumatic brain injury patients using the functional assessment inventory." Brain Injury **3**(1): 27-34.
- Nichol, A. D., Higgins, A. M., et al. (2011). "Measuring functional and quality of life outcomes following major head injury: common scales and checklists." Injury **42**(3): 281-287.
- Pettigrew, L. E., Wilson, J. T., et al. (2003). "Reliability of ratings on the Glasgow Outcome Scales from in-person and telephone structured interviews." J Head Trauma Rehabil **18**(3): 252-258.
- Teasdale, G. M., Pettigrew, L. E., et al. (1998). "Analyzing outcome of treatment of severe head injury: a review and update on advancing the use of the Glasgow Outcome Scale." J Neurotrauma **15**(8): 587-597.

- Wilson, J. T., Edwards, P., et al. (2002). "Reliability of postal questionnaires for the Glasgow Outcome Scale." *J Neurotrauma* 19(9): 999-1005.
- Wilson, J. T., Pettigrew, L. E., et al. (1998). "Structured interviews for the Glasgow Outcome Scale and the extended Glasgow Outcome Scale: guidelines for their use." *J Neurotrauma* 15(8): 573-585.
- Wilson, J. T., Pettigrew, L. E., et al. (2000). "Emotional and cognitive consequences of head injury in relation to the Glasgow outcome scale." *J Neurol Neurosurg Psychiatry* 69(2): 204-209.
- Zaucha, K., et al. (1998). "Neuropsychological, psychosocial and vocational correlates of the Glasgow Outcome Scale at 6 months post injury: a study of moderate to severe traumatic brain injury patients." *Brain Injury* 12(7): 555-567.