

<b>Outcome Measure</b>	<b>Glasgow Outcome Scale – Extended</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 Glasgow Outcome Scale (GOS) is 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). It is a simple, hierarchical rating scale with a limited number of broad categories. The scale focuses on how head injury had affected function in major life areas and is not intended to provide detailed information on specific deficits (Wilson et al. 1998). Individuals within any single outcome category represent a range of abilities (Jennett and Bond, 1975). Patients are assigned to one of 5 possible outcome categories: death, persistent vegetative state, severe disability, moderate disability, and good recovery (Jennett and Bond, 1975).</p> <p>In 1981, a revision to the scale was proposed to better classify patients who had regained consciousness (Jennett et al. 1981). In the <b>Extended Glasgow Outcome Scale (GOSE)</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 GOSE by collapsing these subdivisions (Wilson et al. 2000).</p> <p>The assignment of an individual to an outcome category should be based on the results of a structured interview focused on social and personal functional ability (Jennett et al. 1981). The final rating is based on the lowest category of outcome indication in the interview (Wilson et al. 2000).</p>
<b>Properties</b>	<p><b>PURPOSE</b></p> <p>The GOSE is a revision of the GOS that divides the upper three ratings into upper and lower categories: Lower severe disability, Upper severe disability, Lower moderate disability, Upper moderate disability, Lower good recovery, and Upper good recovery.</p> <p><b>TIME</b></p> <p>Depending on prior familiarity with the patient, the scale can be completed in as little as 5 minutes.</p>

## **SCORING**

Ratings for the GOS range from 1 to 5 (Dead to Good Recovery). Ratings for the GOSE range from 1 to 8 (Dead to Upper Good Recovery). THE GOS / GOSE are generally rated by a clinician or research assistant who is familiar with the patient or who conducts a structured interview to obtain information. GOSE ratings are easily recorded to GOS ratings.

## **PSYCHOMETRIC PROPERTIES**

### Test-retest reliability

k ranged from 0.40 – 0.92 for the GOS and 0.40 – 0.87 for the GOSE; however, the retest period was lengthy ranging from 3 – 6 months (Maas et al. 1983).

### Inter-observer reliability

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); based on live interviews  $k = 0.77$  for GOS and 0.48 for GOSE – when ratings were based on previously recorded data,  $k = 0.58$  for GOS and 0.49 for GOSE – agreement between live and recorded data ratings,  $k = 0.77$  for GOS and 0.53 for the GOSE (Maas et al. 1983); 70% of GOS ratings were in perfect agreement while none differed by more than one category – for the GOSE none differed by more than one category – most discrepancy seen in the middle categories (Brooks et al. 1986).

### Construct validity

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

### Construct validity (known groups)

GOS scores could discriminate between groups based on categories of vocational recommendations (return to work, vocational training,

	<p>supported work and continued remedial therapy; <math>p &lt; 0.0001</math>), GOS scores accounted for 76% variance between cell means (Mysiw et al. 1989).</p> <p><u>Concurrent validity</u></p> <p>Admission DRS scores correlated with initial Stover &amp; Zeiger (S-Z) ratings (<math>r = 0.92</math>), discharge DRS scores correlated with discharge SZ scores (<math>r = 0.81</math>), GOS scores (0.80) and EGOS scores (0.85) (Gouvier et al. 1987); GOS ratings correlated with SF-36 subscale scores (<math>r = 0.51 - 0.68</math>, <math>p &lt; 0.01</math>; Jenkinson et al. 1993 cited in Teasdale et al. 1998); GOS scores correlated with DRS ratings at admission to (<math>r = 0.50</math>, <math>p &lt; 0.01</math>) and discharge from rehabilitation (<math>r = 0.67</math>, <math>p &lt; 0.01</math>; Hall et al. 1985).</p> <p><u>Predictive validity</u></p> <p>GOS at discharge from rehabilitation significantly correlated with GOS 5 – 7 years after head injury (<math>r = 0.60</math>, <math>p &lt; 0.001</math>) and with discharge destination (<math>p &lt; 0.0001</math>; Massagli et al. 1996).</p> <p>The GOS-E Peds is highly correlated with its parent instrument, the GOS, and in a sample of infants, toddlers, and young children, the concurrent and predictive validity analyses indicate that the GOS-E Peds is an improvement over the GOS in relation to the VABS, a commonly used and developmentally appropriate parent rating of daily living skills (Beers et al. 2012).</p>
<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) The GOSE is a Core measure in the Global Outcome Domain in both McCauley et al (2012) and Wilde et al (2010).</li> <li>2) Primarily intended to describe outcome in groups of cases for research purposes. Utility for individual assessment is limited.</li> <li>3) The GOSE 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>	<p>Vicki Anderson (paediatrics)  Cathy Catroppa (paediatrics)  Jenny Fleming (adults)</p>

## References

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.

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.

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.