Assessing disability after head injury: improved use of the Glasgow Outcome Scale


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Object. The Glasgow Outcome Scale (GOS) is widely used to assess outcome after head injury, but is recognized as having a number of shortcomings that are highlighted and investigated in this study. The authors pursued two goals: 1) investigating the practicality of using a standard set of questions as part of a structured interview to assign GOS scores, and 2) studying the role of preinjury problems in confounding postinjury assessment of disability.

Methods. Several of the major limitations of the GOS appear to arise from the use of a format that encourages impressionistic ratings. In the present study the authors examined the use of a standard interview for assessing the GOS covering five areas of social disability. Ratings were made for 80 head-injured patients. The results show that the rating based on the GOS provides an assessment of disability that is more complete than that given by an alternative scale of functional disability (Disability Rating Scale [DRS]) and much more complete than an assessment of physical disability (Barthel Activities of Daily Living [ADL] index). A measure of preinjury dependency was made revealing that, within this sample, 20% of patients required supervision in basic ADL before their injury.

Conclusions. Assignment of GOS scores based on information obtained using a structured interview format provides a more comprehensive assessment of disability than using the DRS or the ADL index. There is a need to standardize attitudes about preinjury dependency in assessing disability after head injury.

KEY WORDS • head injury • Glasgow Outcome Scale • disability assessment • preinjury dependency

THE Glasgow Outcome Scale (GOS), devised by Jennett and Bond,9 is the most widely used method to assess patient outcome in the 1st year after traumatic head injury. It is popular because it allows overall patient disability to be assessed without the need for a detailed neurological and psychological assessment, and it has been recommended as a key outcome measure for clinical trials.3 However, limitations of the GOS are being reported: the categories used are broad and the scale does not allow subtle improvements in functional status of an individual to be measured;5,7 the higher outcome levels of the GOS are not well defined;6 the GOS can be over-influenced by physical disability rather than cognitive and behavioral problems;4 the reliability of the GOS varies with the method of obtaining information and, in some circumstances, agreement between raters can be as low as 50%;1,15 and there are no guidelines for dealing with commonly encountered problems, including the effects of extracranial injury, epilepsy, and preinjury deficits.1 Some of these criticisms are, perhaps, unwarranted, reflecting misinterpretation and misapplication of the scale. For example, it is unreasonable to criticize the GOS for failing to give a detailed picture of specific limitations leading to disability in an individual, because its aim is to provide an overall summary relevant to social disability and to facilitate comparisons between groups.

Several of the problems encountered in the use of the GOS may reflect its format; its description invites an impressionistic application. This may contribute to inconsistency in application of the scale and lack of clarity in defining different levels of disability. It may permit the tendency of some raters to focus on physical disability, even though Jennett and Bond9 noted that mental change was more important than physical limitation in determining disability after head injury. It appears that in practice this principle is often overlooked.

The first aim of the present study was to investigate the practicality of using a standard set of questions as part of the structured interview to assign GOS scores. The questions were designed to cover the range of physical, mental, and social problems identified in the original descriptions of the GOS.9,10 Use of this format was compared with ratings based on the Barthel Activities of Daily Living (ADL) index4,16 and the Disability Rating Scale (DRS).18
The Barthel ADL index has been recommended as a standard measure of physical disability. On the other hand, the DRS includes aspects of more high-level social integration, and it has been suggested that it is more sensitive than the GOS.

The second aim was to study the role of preinjury problems in confounding assessment of disability. None of the common measures of disability include an assessment of preinjury dependency. Most research studies focus on select groups and preinjury problems are usually an exclusion criterion; however, this neglects many victims for whom preinjury problems play an important role. We therefore investigated the use of the GOS in a group of patients that included people with evidence of preinjury dependency.

Clinical Material and Methods

Patient Population

Eighty patients suffering from head injury were recruited into the study. The patients were part of a larger sample that was collected to give a representative picture of the problems head-injured patients and their relatives face following the patients’ discharge from the hospital.

The patients ranged in age from 16 to 89 years at the time of injury (mean ± standard deviation [SD] 42.3 ± 19.3 years). Thirty-three percent were 30 years of age or younger and 16 of the patients were female. Classification of the severity of injury based on the worst recorded Glasgow Coma Scale (GCS) score indicated that 29% of the injuries were severe (GCS score < 8), 14% were moderate (GCS score 9–12), and 57% were mild (GCS score 13–15). Forty-two percent of injuries were accounted for by falls, 28% were the result of assault, 20% traffic accidents, 6% work-related accidents, and 4% were attributed to other causes. Medical records indicated that at the time of injury, 65% (52) of the patients had been drinking alcohol.

Study Procedure

Patients were interviewed by a research psychologist 3 to 12 months postinjury (mean ± SD 8.2 ± 3.2 months). Interviews were conducted either in the hospital or in the patients’ homes at their request. The interview included questions concerning preinjury difficulties and dependency, and scores were assigned to the patients based on the GOS, the Barthel ADL index, and the DRS.

Glasgow Outcome Scale. A short questionnaire was constructed based on the descriptions of the GOS given by Jennett and Bond and colleagues. Questions relating to five key areas were included.

1) Independence within the home; that is, the ability of patients to look after themselves at home for a 24-hour period without requiring assistance. This includes the ability to prepare a simple meal, deal with callers, and handle minor domestic crises. The patients need not actually look after themselves, but must be able to do so if necessary without needing prompting or reminders.

2) Independence outside the home; that is, the ability of patients to shop and use public transportation without assistance. The patients need not normally shop, but must be able to do so; this includes being able to plan what they need to buy, take care of money themselves, and behave appropriately in public. The ability to use a taxi is sufficient, provided the patients can phone for it themselves and instruct the driver.

3) Employability, which includes change in the patients’ capacity for work postinjury. If patients were working before the injury, then their current capacity for work should be at the same level. If they were not working before, then the injury should not have adversely affected their chances of obtaining work or the level of work for which they were eligible.

4) Social and leisure activities; that is, the ability of patients to resume previous social and leisure activities. The patients need not have resumed all of their previous leisure activities, but should not be prevented by physical or mental impairment.

5) Interpersonal relationships, presence or absence of a change in the patients’ personality, resulting in ongoing family disruption. Typical posttraumatic personality changes include quick temper, irritability, anxiety, insensitivity to others, mood swings, depression, and unreasonable or childish behavior.

Responses to Question Areas 1) and 2) were used to determine whether patients were in the severe disability category, and responses to Question Areas 3), 4), and 5) were used to decide whether patients were in the moderate disability or good recovery categories. Preinjury dependency was also assigned in relation to the patients’ ability to perform activities specified in Question Areas 1) and 2). Patients were also asked whether they had any other current problems resulting from the head injury, and the presence or absence of posttraumatic complaints, such as headaches, tiredness, slowness, memory failures, and concentration problems, was recorded.

In light of the current study, modifications were made to the GOS structured interview and a complete description of the final form of the methodology is available elsewhere.

Barthel ADL Index. This is an assessment of the ability of individuals to perform basic self-care activities. In its recommended form it consists of 10 ADL: bowel and bladder control, mobility, feeding, grooming, stair climbing, toilet use, dressing, transfer, and bathing. Each activity is scored and the total of all 10 activities provides an overall indication of the individual’s dependency.

Disability Rating Scale. This scale was developed as a single instrument to provide quantitative information to chart the progress of patients with severe head injury from “coma to community.” The scale includes measures of changes in levels of arousal; cognitive ability to deal with problems of feeding, toileting, and grooming; degree of physical dependency on others, and psychosocial adaptability as reflected primarily in the ability to do useful work as independently as possible in a socially relevant context.

Results

Preinjury Difficulties

Alcohol and drug abuse were measured by self-report. Forty patients (50%) reported drinking excessively (more
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<th>TABLE 1</th>
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<td>Comparison of outcome assessments by GOS and Barthel ADL Index</td>
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<table>
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<tr>
<th>Barthel Score</th>
<th>GOS Score (no. of patients)</th>
<th>Moderate Disability</th>
<th>Severe Disability</th>
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<tr>
<td>0–3</td>
<td>Good Recovery</td>
<td>0</td>
<td>1</td>
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<tr>
<td>4–8</td>
<td>0</td>
<td>2</td>
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<tr>
<td>9–12</td>
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<td>13–16</td>
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<td>17–20</td>
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Impact of Preexisting Dependency

Patients were defined as being “dependent” preinjury if they could not have been left alone in their home for a period of 24 hours without need for assistance or supervision or if they required assistance or supervision to shop or travel outside their home. For 16 patients (20%) there was evidence of preinjury dependency. Before being injured, these patients were, by definition, equivalent to being severely disabled according to the GOS and it is no surprise that each was rated as severely disabled after injury because there was no measurable change in their functional status as a result of the head injury. Using the DRS, nine of the patients who displayed prior dependency were rated as having moderate disability and seven were rated as having moderately severe disability. On the Barthel ADL index 10 (63%) of the patients with evidence of prior dependency were assigned a current score less than 20. As a result, when patients with a history of dependency were removed, the distribution of outcome altered in all three scales with an increased proportion of patients being rated favorably (Table 3).

Without assessing the preinjury situation in each of the areas included in the assessment scales it is not possible to determine the true impact of head injury on the individual’s daily functioning. In this study, for all three assessment scales, the variable of preinjury dependency confounded the postinjury assessment because all scales use “dependency” as an index of outcome severity.

Discussion

In this study we used a standard set of questions to assign GOS scores, covering the five key areas of social disability described by Jennett and colleagues. The results indicate that this approach detects aspects of disability not reflected either in the DRS or in a standard measure of physical disability, the Barthel ADL index.
Assessment of Disability and Classification of Severity

In this study the DRS indicated fewer sequelae than the GOS. It is particularly noteworthy that the DRS rated 11 patients as having no disability, whereas the GOS rated the same patients as having a moderate disability. This is not due to semantics and shows that the DRS does not take into account key areas of functioning that contribute to disability after head injury. Although the DRS has more scale points, it is a misunderstanding to believe that it is more sensitive to disability than the GOS; the current study shows that upper levels of independent functioning can be better subdivided by applying the GOS.

The DRS and the GOS each use “employability” as an index of outcome postinjury. Although employment is perhaps the most widely used index of recovery, it can be questioned whether it is the best measure to use, particularly in isolation. Predictive factors such as social class, age, and injury severity have been extensively researched in relation to return to work. Results suggest that preinjury factors of age, social class, and personality are as important as, or more than, injury variables such as severity, length of coma, or postrapeutic amnesia when attempting to predict whether individuals will return to their previous work status. The younger and more skilled the individual, irrespective of the consequences of the injury, the more likely that the individual will be able to return to work. There may also be social and financial pressures to return to work when the individual is not fully fit. Therefore, although capacity for work is a very significant aspect of a person’s lifestyle, other aspects, such as the capacity to form and sustain family and social relationships and the ability to pursue leisure interests, may be more important sources of disability.

Physical Compared With Psychological Elements of Disability

Medical professionals have been reported to be more concerned with physical recovery and to use the GOS in a way that emphasizes physical disability over cognitive and emotional problems. The structured interview format, which was designed to incorporate areas of functioning sensitive to either physical or psychological impairment, appears to have avoided this problem. Thus, some patients who were determined by the Barthel ADL index not to have problems in activities of daily life were rated as severely disabled on the GOS. Properly applied, the current approach should avoid undue emphasis on the physical aspects of disability.

Preinjury Factors

A weakness of all three scales is that the descriptions do not specify how to assess individuals who had psychological or physical problems before injury. In view of the characteristics of the head-injured population, this is unrealistic. There is a need for greater recognition of preexisting impairments as factors complicating outcome assessment. This is a particular problem in head-injured patients, many of whom are reported to have an alcohol or drug dependency problem, a history of psychiatric disorder, or have sustained a head injury previously. These features were reflected in this sample. More than one third of the patients had some form of physical restriction before injury and 15% had received treatment for alcoholism. Results from this study suggest that application of the DRS and the GOS properly reflects the severity of the disability but, unless some adjustment is made, could clearly risk mistakenly attributing this to the injury. For almost half of the patients classified as severely disabled, functioning after injury was indistinguishable from the preinjury status. How this issue is dealt with is currently open to interpretation by the individual rating the patient receives and this may contribute to reduced reliability and validity. Further research is required to clarify this issue.

Conclusions

Assignment of outcome category according to the GOS made using a structured interview format provides a more comprehensive assessment of disruption in social recovery postinjury than using the DRS or the Barthel ADL index. Further studies are assessing the reliability of the GOS when applied by a range of raters. In this sample, one-fifth of the patients reported having a disability prior to injury. As a result, when the format is strictly applied without reference to preinjury status, a greater amount of disability is ascribed to the injury than is, in fact, the case. The development of a structured, consistent, and meaningful approach to preinjury status is, therefore, a key target.

References

13. Kreutzer JS, Wehman PH, Harris JA, et al: Substance abuse and...
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