



Inter-rater agreement on assessment of outcome within a trauma registry



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ABSTRACT

Introduction: To better evaluate the degree of ongoing disability in trauma patients, it has been recommended that trauma registries introduce routine long-term outcome measurement. One of the measures recommended for use is the Extended Glasgow Outcome Scale (GOS-E). However, few registries have adopted this measure and further research is required to determine its reliability with trauma populations. This study aimed to evaluate the inter-rater agreement of GOS-E scoring between an expert rater and trauma registry follow-up staff with a sample of detailed trauma case scenarios.

Methods: Sixteen trauma registry telephone interviewers participated in the study. They were provided with a written summary of 15 theoretical adult trauma cases covering a spectrum of disability and asked to rate each case using the structured GOS-E interview. Their ratings were compared with those of an expert rater in order to calculate the inter-rater agreement for each individual rater-expert rater pair. Agreement was reported as the percentage of agreement, the kappa statistic, and weighted kappa. A multi-rater kappa value was also calculated for agreement between the 16 raters.

Results: Across the 15 cases, the percentage of agreement between individual raters and the expert ranged from 63% to 100%. Across the 16 raters, the percentage of agreement with the expert rater ranged from 73–100% (mean = 90%). Kappa values ranged from 0.65 to 1.00 across raters (mean = 0.86) and weighted kappa values ranged from 0.73 to 1.00 (mean = 0.89). The multi-rater kappa value was 0.78 (95% CI: 0.66, 0.89). **Conclusions:** Sixteen follow-up staff achieved 'substantial' to 'almost perfect' agreement with an expert rater using the GOS-E outcome measure to score 15 sample trauma cases. The results of this study lend support to the use of the GOS-E within trauma populations and highlight the importance of ongoing training where multiple raters are involved to ensure reliable outcome reporting. It is also recommended that the structured GOS-E interview guide be used to achieve better agreement between raters. Ensuring the reliability of trauma outcome scores will enable more accurate evaluation of patient outcomes, and ultimately, more targeted trauma care.

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Introduction

Recent improvements in trauma care have led to a reduction in injury-related mortality, resulting in an expansion in the focus of trauma care to long-term quality of survival[1,2]. To better evaluate the degree of ongoing disability and functional-loss in this patient group, it has been recommended that trauma registries introduce routine long-term outcome measurement[3]. However, there is a lack of research validating the use of long-term outcome

measures with trauma patients and few registries have adopted this recommendation[4].

One of the functional outcome measures recommended for use in trauma populations is the Extended Glasgow Outcome Scale (GOS-E)[3,4]. This scale, widely used to evaluate outcomes in brain-injured patients, focuses on the impact of injury on overall function rather than the measurement of specific impairment and, as such, can be applied to different types of patients[5]. The GOS-E was developed as an extension to the original five-point Glasgow Outcome Scale (GOS), enabling differentiation of patients at a higher functional level[6]. To create the extended eight-point scale, the original upper three GOS categories of 'severe disability', 'moderate disability' and 'good recovery' were divided into upper and lower levels, creating the following functional outcome

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categories: dead, vegetative state, lower severe disability, upper severe disability, lower moderate disability, upper moderate disability, lower good recovery, and upper good recovery (Box 1).

Compared to the GOS, GOS-E scoring is more complex which can lead to increased rater error[7,8]. To address this issue, a structured interview guide has been developed to assist raters in correctly classifying patients relative to assessment, with questions covering domains such as independence inside and outside the home and resumption of normal social roles, including work, social and leisure activities[5]. However, in order to be confident with using GOS-E with trauma populations, the measure must be shown to have adequate validity (i.e. measuring what it purports to measure), reliability (i.e. consistency over time and between raters) and responsiveness to change (i.e. ability to detect change)[9]. An outcome measure with these attributes will have better capacity to detect important differences between patients and changes over time, which is vital for evaluating health services and the quality of care of patients.

Previous research has established that the GOS-E has sufficient responsiveness and a low ceiling effect (i.e. able to discriminate at higher functional levels) in a major trauma population[10]. Its reliability has also been established with neurological patients, but not yet with trauma patients[5,11]. To address this knowledge gap, this study aimed to evaluate the inter-rater agreement of GOS-E scoring between an expert rater and trauma registry follow-up staff with a sample of detailed trauma case scenarios.

Methods

Raters

Raters included in the study were interviewers employed by the Victorian State Trauma Outcome Registry and Monitoring Group (VSTORM) to collect long-term outcomes data for the Victorian State Trauma Registry[12] and the Victorian Orthopaedic Trauma

Outcomes Registry[13]. Ethics approval for the registries is provided by human research ethics committees at all participating hospitals and by the Monash University Human Research Ethics Committee, and covers regular staff training and testing. The registries routinely follow up registered patients at set time points post-injury, with approximately 1100 interviews completed per month. The primary outcome measure used in these registries is the GOS-E.

Sixteen telephone interviewers participated in the study. Their length of VSTORM service ranged from eight months to eight years (mean (SD) = 2.2 (2.1) years). Most of the telephone interviewers have health-related experience, such as nursing, psychology and physiotherapy. On commencement of their employment, all undergo comprehensive training, including practice with mock patient scenarios and supervised interviews with registry patients, followed by in-depth feedback from senior registry staff on their scoring and interview technique. Training days for all staff are held every six to 12 months ensuring consistency of interviewing technique and individuals are provided with specific feedback on their performance throughout the year as required.

Procedure

Fifteen sample cases describing realistic examples of adult major trauma and orthopaedic trauma patients were written by one of the registry coordinators responsible for training and supervision of the interview staff. The cases aimed to cover a range of GOS-E outcomes, while also challenging raters to discriminate between subtle differences in patient function. Two examples of these cases are provided in Box 2 and the remaining scenarios are provided as Supplementary Material. The cases were provided to the second registry coordinator responsible for supervision and training of interviewers, the 'expert rater', who scored each of the cases using the structured GOS-E interview guide. Her responses were checked for consistency against the coordinator who developed the scenarios, and 100% agreement was achieved.

Box 1. Summary of function at each level of the Extended Glasgow Outcome Scale (GOS-E)².

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- 1 Death (D)
 - 2 Vegetative state (VS)
Unable to obey simple commands, utter any words or communicate in any way.
 - 3 Lower severe disability (SD-)
Assistance of another person at home is essential every day for activities of daily living.
 - 4 Upper severe disability (SD +)
Able to look after themselves for up to 8 h during the day but unable to shop or travel locally without assistance.
 - 5 Lower moderate disability (MD-)
Able to shop without assistance, drive or use public transport to get around. Unable to work or study if doing so prior to injury. Unable to participate in social or leisure activities, and experiences daily disruption to family and friendships.
 - 6 Upper moderate disability (MD +)
Able to shop without assistance, drive or use public transport to get around. Able to work or study but at a reduced capacity. Much less participation in social or leisure activities, and experiences frequent disruption to family and friendships.
 - 7 Lower good recovery (GR-)
Returned to pre-injury work or study capacity. Participating less in social and leisure activities. Occasional disruption to family and friendships, or reporting other problems related to the injury that affect daily life.
 - 8 Upper good recovery (GR +)
Returned to pre-injury capacity for work or study, social and leisure activities. No disruption to family and friendship.
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Box 2. Case study example.

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- Case study 6
24 year old male
Occupation prior to injury: Athlete
Mechanism of injury: Fall from balcony
Injuries sustained: Bilateral ankle fractures
Independent at home and can shop and drive although only for short periods. Pre-injury patient was a professional triathlete (sponsored) and has not been able to get back to this professionally or for leisure purposes. Is now a pharmaceutical rep and works full time. Still has ongoing issues with pain, limp, decreased strength and is awaiting further ankle surgery. States he has been depressed at times but does not feel this impacts on his relationships.
GOS-E score = 6 (Upper moderate disability)
- Case study 8
20 year old male
Occupation prior to injury: Farm hand (full-time)
Mechanism of injury: Working on farm and was charged by a bull hit in the back and trampled on whilst on ground
Injuries sustained: Fractured L2 and L3 and ruptured spleen
At six months decided to undertake tertiary farming-related studies as he could no longer work to his previous work capacity. At 12 months had returned to work to full capacity but was limited socially in terms of his sporting activities. Two years post-injury he is studying and working to full capacity but no longer plays contact sport due his physical limitations relating to his injuries. He is independent at home and can drive and has occasional pain and tiredness.
GOS-E score = 7 (Lower good recovery)
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