

St Andrew's – Swansea Neurobehavioural Outcome Scale' (SASNOS) Guidance Notes

INTRODUCTION

Purpose

Neurobehavioural disability (NBD) has a major impact on long-term psychosocial outcome following acquired brain injury (ABI). It is a term that describes a complex, subtle, pervasive constellation of cognitive-behavioural changes that characterise post-acute ABI. Emotional difficulties, problems with inhibition, intolerance, poor insight, lack of awareness and aggressive behaviour all reflect NBD.

NBD undermines social independence and is associated with poor prognosis. However, assessing and quantifying NBD remains elusive. A review published in the journal *Brain Injury* in 2008 highlighted that a reliable, valid measure that adequately capture the subtle, varied characteristics of NBD had yet to be developed [1].

The 'St Andrew's – Swansea Neurobehavioural Outcome Scale' (SASNOS) has been created for the purpose of accurately capturing NBD and social handicap arising from this [2]. It has been conceptualised and designed specifically for ABI, has sufficient items to capture the diversity of NBD, and has known, robust psychometric properties.

Description

Behaviours and symptoms of NBD are rated on 49 items which measure five major domains of NBD (interpersonal behaviour, cognition, aggression, inhibition and communication; each has 2-3 subdomains). Each item consists of a statement regarding a behaviour or other symptom of NBD whose perceived prevalence is rated using a seven point scale ('never' to 'always'). An Excel spreadsheet is used to calculate a range of standardised scores based on ratings of a neurologically healthy sample. Scoring is constructive, so higher ratings equate to a perception of ability. The profile of NBD can be used to determine needs, track recovery and response to rehabilitation, and for research purposes.

Development

An initial pool of 117 items reflecting NBD was generated. Item selection was based on the WHO-ICF [3] relating to sections dealing with classifications of 'activities' and 'participation' in everyday functional and psychosocial activities. The selection of items was further refined by reference to a content analysis of semi-structured interviews with relatives of seriously injured ABI patients. Items were selected on the basis that they reflected behaviours that could be observed objectively, representing characteristics that result in social disadvantage, interpreted in terms of social handicap or social limitations. Clinicians working in a neurobehavioural service then rated ABI patients using the initial item pool. Principal Components Analysis was

used to reduce the number of items to 49 and identify the underlying factor (domain) structure; Rasch analysis and item discrimination statistics were used to ensure appropriate calibration of the scale. Staff and students at Swansea University rated close family members using the 49-item SASNOS. Further statistical analysis of the 336 sets of ratings comprising both ABI and neurologically healthy controls enabled a comprehensive range of validity and reliability indicators of the new measure to be determined. Finally, norm-referenced interpretation of ratings was undertaken by converting ratings to T-scores to enable comparison for diagnostic purposes with the neurologically healthy control group and for clinicians to construct a meaningful profile of strengths and weaknesses from items within the scale.

Benefits

- Designed specifically for ABI with sufficient items to capture the diversity of NBD
- Based on the conceptual framework underpinned by the WHO ICF
- Comprehensive and robust psychometric properties
- Availability of normative data, as well as self and proxy versions
- Standardised scores to enable rapid identification of rehabilitative goals
- Known indicators of internal responsiveness, enabling detection of clinically important, meaningful change on repeat assessment
- Optional dependency ratings enable item weighting to reflect autonomy / support needs
- Repeat assessment enables monitoring of rehabilitation efficacy
- Suitable for a wide range of settings, and for research and clinical purposes
- Informs cost savings
- Adopted Worldwide
- Website support and availability of training events
- Available in Multiple Languages (English, Welsh, French, German, Spanish)

SCORING

Principles

Ratings are made by clinicians, relatives, carers and others who know the person well. Ratings reflect observation and perception of the behaviours and symptoms of NBD described within each of the 49 items over the course of the preceding two week period.

SASNOS was primarily designed to use in residential neurorehabilitation settings. However, it can also be used in outpatient or community services, and for research purposes, providing an informant is available who a) has good knowledge of the person being rated, and b) has had sufficient opportunity to observe them closely during the previous two weeks.

Making Ratings

In residential or inpatient settings, ratings should reflect the views of the interdisciplinary team, not just one member. In community or outpatient settings, a clinician should elicit ratings from a significant other during a semi-structured interview. To reduce the likelihood of acquiescence responding, balanced keying is employed. The Excel spreadsheet ensures consistency in the direction of scoring prior to transforming the domain and sub-domain sum of ratings into standardised scores based on the T-distribution.

It should be possible to quantify the relative prevalence of behaviours characteristic of NBD by circling one of seven descriptors which are arranged in hierarchical order (see Table 1).

Rank Order	Rank Order Items 16, 27-30, 32-49	Descriptor	Definition
1	7	'Never'	no behaviour/symptom observed within the review period
2	6	'Rarely'	the behaviour/symptom has been observed once or twice
3	5	'Occasionally'	the behaviour/symptom has been observed a few times
4	4	'Sometimes'	the behaviour/symptom has been observed on about 50% of occasions when applicable
5	3	'Fairly Often'	the behaviour/symptom has been observed on many occasions
6	2	'Very Often'	the behaviour/symptom has been evident nearly all the time
7	1	'Always'	the behaviour/symptom has been a constant feature of the person throughout the review period

Table 1: Definition of descriptors used to rate the prevalence of items during the review period ('review period' is two weeks with the possible exception of items 1, 11 and 13: see explanation below)

Three items are dependent on contact with friends, family and strangers:

1. Interacts appropriately with strangers
11. Participates in family activities
13. Is well mannered and polite with friends and family

Unless friends, family and/or strangers have been a constant feature in the person's environment, they cannot be rated on the basis of observation during the preceding two weeks. Instead, the 'review period' should constitute whatever time during these two weeks contact with one or more of these groups took place. For example, if the only time a person was observed to have contact with strangers was during a one

hour trip in the community, item 1 should be rated on that basis (i.e. the review period for item 1 is one hour). Similarly, in an inpatient setting, items 11 and 13 might be rated on the basis of observations made during two one hour family visits (review period two hours). In addition to the seven descriptors used for rating, Items 1, 11 and 13 have a further annotation 'N/A'. If no observations were made of the person whilst in the company of friends, family and/or strangers, this should be indicated by circling both 'never' and 'N/A' (not applicable).

All items should be rated.

Example Items

Cognition

Executive Function

- 16. Fails to initiate or sustain activities
- 17. Maintains appropriate standards of hygiene
- 18. Capable of setting and achieving personal goals

Never	Rarely	Occasionally	Sometimes	Fairly Often	Very Often	Always	N/A

Example Items (reverse scoring)

Overt Aggression

- 43. Uses physical aggression against others
- 44. Displays threatening behaviour towards others
- 45. Directs aggression towards objects

Never	Rarely	Occasionally	Sometimes	Fairly Often	Very Often	Always	N/A

Example Item (rated on basis of contact with friends, family and /or strangers during the preceding two weeks)

Interpersonal Relationships

Social Interaction

- 1. Interacts appropriately with strangers

Never	Rarely	Occasionally	Sometimes	Fairly Often	Very Often	Always	N/A

T-scores and Graphs

Verbal ratings are converted to numerical ratings from 1-7 based on hierarchical order (see Table 1, columns 1 and 2) which are entered into the Excel spreadsheet available from the SASNOS website (sasnos.swansea.ac.uk). This produces a range of T-scores based on the means and standard deviations obtained from ratings of neurologically healthy controls [2]. The Excel file also produces line graphs profiling the principal and sub-domains, and a splat chart of individual responses to the 49 items. A PowerPoint template is also available that enables repeat ratings to be displayed simultaneously.

Website

For website support visit: sasnos.swansea.ac.uk

Contact: sasnos@Swansea.ac.uk

References

1. Wood, R.LI., Alderman, N. and Williams, C. (2008). Assessment of Neurobehavioural Disability: a review of existing measures and recommendations for a comprehensive assessment tool. *Brain Injury*, 22, 905-918.
2. Alderman, N., Wood, R.LI. and Williams, C. (2011). The development of the St Andrew's-Swansea Neurobehavioural Outcome Scale: validity and reliability of a new measure of neurobehavioural disability and social handicap. *Brain Injury*, 25, 83-100.
3. World Health Organisation. International classification of functioning, disability and health (ICF). Available online at: <http://www.who.int/classifications/icf/en/>, accessed 23 Nov 2007.

New SASNOS Developments:

1. Alderman, N., Williams, C., Knight, C. & Wood, R. (2017). Measuring Change in Symptoms of Neurobehavioural Disability: Responsiveness of the St Andrew's-Swansea Neurobehavioural Outcome Scale. *Archives of Clinical Neuropsychology*, 1-12.
2. Alderman, N., Williams, C., & Wood, R. (in press). When normal scores don't equate to independence: Recalibrating ratings of neurobehavioural disability from the 'St Andrew's – Swansea Neurobehavioural Outcome Scale' to reflect context-dependent support. *Brain Injury*.