

Screening for pain in patients with cognitive and communication difficulties: evaluation of the SPIN-screen

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ABSTRACT – The scale of pain intensity (SPIN)-screen is a simple visual tool for the screening and measurement of pain intensity, which is designed to be accessible by patients with cognitive and communication problems. It was applied prospectively in a consecutive cohort of 79 patients admitted to a tertiary specialist neurorehabilitation unit, of which 86% had significant cognitive/communicative disabilities. In all, 71 patients (90%) responded to the SPIN. Concurrent validation against a standard numbered graphic rating scale (NGRS) showed a strong overall correlation (ρ 0.94 $p < 0.0001$). When the NGRS was converted to an equivalent six-point scale, weighted Kappa tests demonstrated ‘almost perfect’ agreement ($K=0.81$, SE 0.083) between the two sets of ratings. Repeat testing after 24 hours provided preliminary evidence for the stability and responsiveness of the SPIN-screen, but these require further evaluation. Of those who expressed a preference for one tool over the other, 70% preferred the SPIN. The study provides support for application of the SPIN-screen as a routine screening tool in this group of patients.

KEY WORDS: measurement, neurological disabilities, pain intensity, reliability, validity

Introduction

Pain is a common sequel to neurological disability, and self-report of pain intensity is an essential part of any clinical examination.^{1,2} It is commonly achieved through verbal rating on a scale of 0–10, or through the use of a 10 cm visual analogue scale. However, many patients with cognitive or communication problems, for example due to stroke or other brain injury, dementia, confusion or other severe illness, may have difficulty in using such instruments.^{3,4} As a result the presence of pain may be missed, or its severity under-estimated, and this may impact on the outcome of rehabilitation.

A number of tools have been put forward to assist in evaluation of pain in cognitively-impaired adults including the Faces pain rating scale and the Pain Thermometer.^{5,6} However their performance in people with cognitive impairment is somewhat vari-

able,^{7,8} and elderly people with mild and moderate cognitive deficits have shown poor comprehension of the Faces concept.⁹

The development of a scale of pain intensity (the SPIN) has been previously described – it is a simple six-point visual scale, which is designed to be used with either simple verbal or picture cues to convey information regarding pain intensity and location.¹⁰ Initial evaluation in a group of patients without cognitive impairment demonstrated satisfactory performance of the SPIN as a rating instrument for pain in comparison with two other well-validated pain scales.¹⁰ Exploratory work in patients with complex neurological disability has indicated that it is easy to present and score, and some patients who are unable to use standard pain assessments have been able to report pain symptoms using this tool.¹¹ The SPIN has yet to be properly tested, however, in the neurologically-impaired population for which it was intended.

This paper describes evaluation of a screening version of the SPIN (the SPIN-screen) for the detection and initial assessment of pain intensity in a cohort of patients undergoing neurological rehabilitation, the majority of whom had communication and/or cognitive problems in addition to physical disabilities. Its utility as a measurement tool was examined in the context of a clinical care pathway; also its concurrent validity in comparison with a numbered graphic rating scale (NGRS); and stability and responsiveness after 24 hours. Patients were also asked which instrument they would prefer to use for routine self-report of their pain.

Materials and methods

Setting and participants

The Regional Rehabilitation Unit, Northwick Park Hospital, is a tertiary specialist inpatient unit, providing mainly post-acute neurorehabilitation for younger adults (predominantly 16–65 years) with complex neurological disabilities, whose rehabilitation needs are beyond the scope of their local services. This setting was chosen to provide a real-life sample of patients with a high proportion of patients with cognitive and/or communicative problems. A consecutive cohort of 79 patients admitted to the

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unit over a 10-month period from March 2006–January 2007 were screened for pain symptoms as part of an integrated care pathway (ICP) approach to pain management.¹² Figure 1 shows a flowchart for recruitment and test numbers.

Screening tools and procedure

The care pathway was originally developed to support coordinated management of shoulder pain, but its scope has subsequently been extended to include other types of pain. The protocol includes initial assessment on Day 1 of the pathway, followed by re-evaluation on Day 2 to assess the effects of initial pain management. Normally, pain assessments are carried out by the junior medical staff or any member of the treating team. In this evaluation, the pain assessments were undertaken by one of three clinically trained members of staff to ensure consistency of administration.

Numbered graphic rating scale. Patients in this setting are often unable to use a plain 10 cm visual analogue scale.⁴ Previous work has shown that the addition of numbered increments improves accessibility for some patients.¹³ The NGRS consists of a 10 cm vertical line, with marked 1 cm increments labelled 0–10.^{14,15} It should be noted that many patients in this group are unable to hold a pencil, let alone place a mark precisely on a line. Therefore the NGRS may be completed in a number of ways depending on the patient’s ability and the NGRS score is taken as the nearest whole number. Despite the inherent difficulties of pain rating for this group, the NGRS was the existing standard for best practice on the pathway prior to introduction of the SPIN-screen. It was therefore used in this context for concurrent validation.

The SPIN-screen. The SPIN is a vertical visual scale, in which six circles with progressively increased proportions of red shading represent increasing pain intensity. It ranges from zero (no shading = no pain) to five (completely red = pain as bad as it could be).¹⁰

It addresses three simple questions:

- 1 Does the patient complain of any pain – if so where?
- 2 How severe is the pain? – broad assessment of pain intensity using the SPIN scale
- 3 Does the patient appear to understand the SPIN scale?

Like the NGRS, the method of administration depends on the patient’s ability. They either point to the relevant circle, or indicate agreement/disagreement as the administrator points to each circle in turn.

Procedure

The order of administration was not randomised because we wished to examine the patients’ ability to understand the SPIN-screen without immediate prior exposure to other pain tools.

- 1 The SPIN-screen was explained to the patients and administered according to its instructions. If they had different pain symptoms in different locations, these were

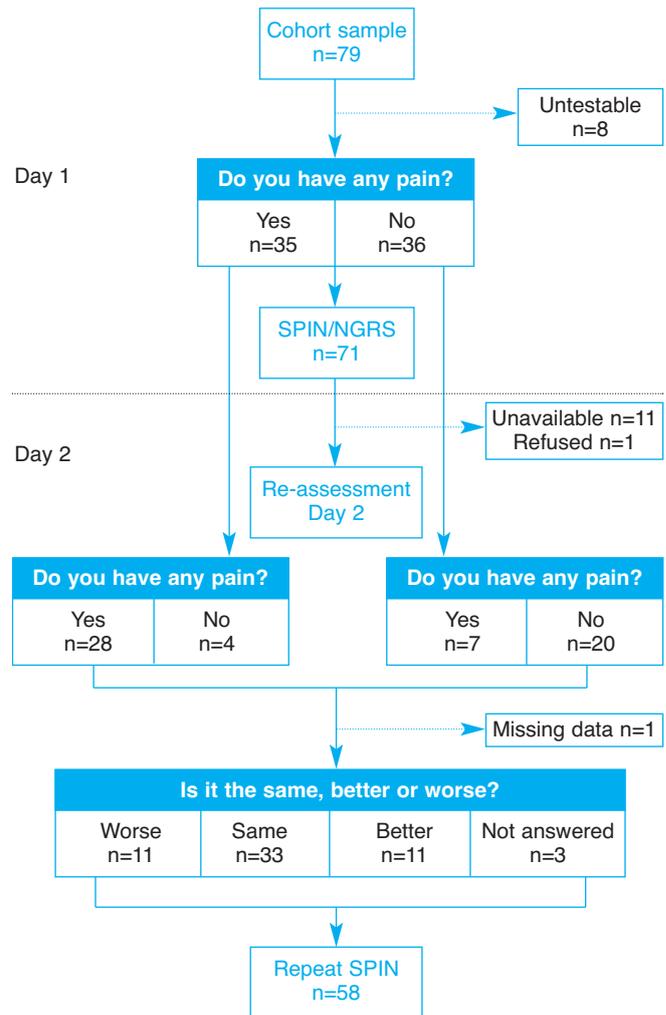


Fig 1. Flowchart of recruitment and testing. NGRS = numeric graphic rating scale; SPIN = scale of pain intensity.

rated separately, but for the purpose of this evaluation only one pain symptom (the most severe) was included for analysis.

- 2 The numbered graphic rating scale (NGRS) was then explained and administered according to its instructions.
- 3 After the two ratings, the patient was asked which scale they would prefer to use to report their pain routinely.
- 4 Patients who were able (or possibly able) to use the SPIN-screen were re-evaluated the following day. They were asked if they thought their pain was the same, better, or worse since the previous day, and the SPIN-Screen as then re-administered as per 1 above.

Physical, cognitive and communicative function is routinely tested using the functional assessment measure (UK FIM+FAM) within 10 days of admission to the unit.¹⁵ A ‘significant physical’ deficit was identified if they scored <100/112 on the FIM+FAM motor subscale. Similarly, a cognitive/communicative deficit was defined as ≤90/98 on the cognitive subscale, and categorised as mild (score 75–90), moderate (50–74) or severe (<50).

Patients who were unable to understand and respond to the SPIN-screen, or in whom there was some doubt, were referred for more detailed pain assessment by the speech and language therapy (SLT) and/or psychology team using facilitated techniques, including the full SPIN test which is described elsewhere.¹¹

The data in this evaluation were collected as part of the pain pathway, in which we constantly seek to facilitate and improve self-report of pain symptoms. Ethical permission for this analysis was provided by the Harrow Research Ethics Committee (ref no: 04/0405/47).

Data analysis

Data were analysed using SPSS version 12.0. The SPIN and the NGRS provide ordinal data, so non-parametric methods were used throughout.

- An analysis of sensitivity and specificity was undertaken to determine concordance between the patients' report of present or absent pain and SPIN/NGRS scores. Also to determine the cut-off points for positive pain reporting in each scale. (It is possible, for example, that a score of 1 might indicate 'discomfort' only and therefore that only higher scores indicate actual pain.)
- Concurrent validity of the SPIN was tested against the NGRS during initial screening (Day 1). The association between the SPIN and NGRS ratings was tested by Spearman rank correlation. For closer evaluation of agreement with the SPIN, NGRS ratings were converted to a corresponding six-point scale (NGRS-C) as follows: NGRS 0 = '0'; NGRS 1 or 2 = '1'; NGRS 3 or 4 = '2'; NGRS 5 or 6 = '3'; NGRS 7 or 8 = '4'; NGRS 9 or 10 = '5'. (Although this consolidation is unequal (the NGRS-C '0' level encompasses only NGRS = 0), both are ordinal scales in any event, so this simple conversion was considered acceptable for the purpose of comparison.) Percentage of agreement between the SPIN and converted NGRS-C ratings was then recorded and agreement was further tested by weighted Cohen's Kappa statistics, computed in STATA, and interpreted according to Landis and Koch.¹⁶ Weighted Kappa tests provide an indication of proportional agreement for multiple level tests, where higher weighting is given for closer agreement. A linear weighting model was used.
- It was anticipated that, after 24 hours, many patients would have the same level of pain, but in others pain may have changed either for the better or worse. Stability and responsiveness of the SPIN were therefore evaluated by comparing individual scores for Days 1 and 2 in separate subgroups:
 - Stability (test-retest repeatability) could only be tested in those patients who reported that their pain was unchanged. This was evaluated by recording percentage agreement between repeat scores and weighted Cohen's Kappa statistics.

- Responsiveness to change in pain symptoms was tested by evaluating directional change in SPIN scores for patients who said that their pain was either 'better' or 'worse'. SPIN scores were expected to rise in patients reporting worse pain, and fall in those reporting that their pain was better. These groups were therefore analysed separately using Wilcoxon signed rank tests to identify significant change and, in view of small numbers, individual change scores were plotted graphically in the two groups to look for directional trends.

Selection of sample size was based on the test of agreement between the SPIN and the NGRS-C scores. In the absence of pre-existing data to make a formal power calculation, our sample size was based on the crude calculation of $2K^2$ which, for a six-point scale, is 72. Precision, determined retrospectively through calculation of the standard error alongside Kappa statistics, suggests that a kappa value of 0.8 for agreement between these two sets of ratings should be accurate to within 0.166.

Results

The demographic characteristics of the cohort sample are shown in Table 1. Eight patients (10%) were excluded as they were unable to respond to the question 'Do you have any pain?', but 35 (44%) said 'yes', they had pain, and 36 (45%) said 'no', they did not. All of these 71 patients completed SPIN and NGRS scores on initial screening, although nine of them had questionable ability to understand the scales fully.

All 17 of those who were either unable to use the SPIN (n=8), or in whom this was questionable (n=9), had substantial communication deficits as well as cognitive problems – their median FIM+FAM cognitive score was 44 (IQR 24–49, range 14–77). Further evaluation by SLT/psychology staff, using facilitated assessment including the full SPIN,¹¹ yielded a clear response in nine of these patients, but eight remained untestable, and the

Table 1. Demographics of the sample (n=79).

Mean age (SD)	45.2 (15.4) years
Male:female ratio	48:31 (or approximately 3:2)
Diagnostic category (%)	
Cerebrovascular accident	42 (53)
Traumatic or other brain injury	24 (30)
Spinal cord injury	9 (11)
Guillain Barre syndrome	4 (5)
Significant physical disability* (%)	76 (96)
Significant cognitive/communicative disability** (%)	67 (85)
Mild (75–90)	21 (27)
Moderate (50–74)	23 (29)
Severe (<50)	23 (29)
Missing data	1

* <100/112 on the UK FIM+FAM motor subscale; ** ≤90/98 on the cognitive subscale.

Table 2. Sensitivity analysis for scale of pain intensity (SPIN) and numbered graphic rating scale (NGRS) pain ratings ≥ 1 in concordance with positive reporting of pain.

	SPIN ≥ 1 (%)	NGRS ≥ 1 (%)
Sensitivity	100	100
Specificity	92	89
Positive predictive value	92	90
Negative predictive value	100	100

team then relied on pain-related behaviour to monitor their symptoms. Sixty-two patients (78% of the total sample) were considered fully able to respond to the SPIN, and similarly to the NGRS, and even among this group, half had either moderate (n=20) or severe (n=11) cognitive/communication disabilities.

Among those who reported having pain (n=35), the median SPIN score was 2 (IQR 1–3, range 1–5) and median NGRS score 4 (IQR 3–5, range 1–10). The site of pain was stated in 34 as ‘upper limb’ n=11 (32%); ‘lower limb’ n=13 (38%); ‘head’ n=6 (18%); ‘back or trunk’ n=3 (9%) and ‘generalised’ n=1 (3%). The results of sensitivity analysis for concordance with pain reporting are shown in Table 2, which shows similar performance for the two scales. In total five patients scored ≥ 1 on the SPIN or NGRS while reporting that they had no pain. All of these, however, had questionable ability to understand the scale. On the basis of data gathered in this evaluation, a cut-off point of 1/0 appears to be the best indicator for pain/no pain, both for the SPIN and the NGRS.

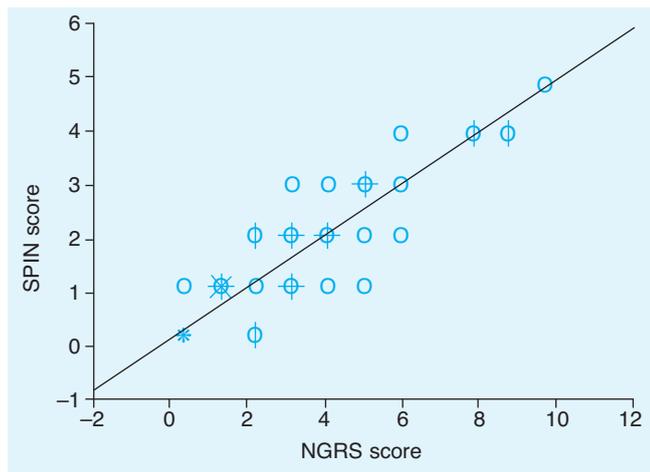


Fig 2. Scattergram of the scale of pain intensity (SPIN) versus the numeric graphic rating scale (NGRS) ratings in initial assessment (Day 1). The sunflower icons represent on data pair per patient. Scattergram showing the relationship between concurrent SPIN and NGRS ratings (n=71). There was a very strong overall correlation (Spearman rho 0.94 p<0.0001). After removal of the 34 cases clustered at the zero scores, the association remained strong (rho 0.80 p<0.0001).

Concurrent validity

The initial SPIN and NGRS ratings (n=71) were very strongly correlated (rho 0.94 p<0.0001) as illustrated in Fig 2. When NGRS ratings were converted to a six-point scale (NGRS-C), there was 73% absolute agreement between the two sets of ratings with a weighted Kappa 0.81 (SE 0.082) which constitutes ‘almost perfect’ agreement.¹⁶

On Day 2, 11 patients were unavailable and one refused reassessment, so pain was re-evaluated in 59 (83%) of the 71 who had been tested on Day 1. Of the 32 who previously said they had pain, four (12%) now reported no pain; and of the 27 who reported no pain previously, seven (26%) now reported having pain. Repeat SPIN ratings were obtained in 58 of the 59 patients.

Stability (repeatability)

Thirty-three (57%) considered that their pain was ‘the same’ as on the previous occasion, of which 27 (82%) gave exactly the same SPIN rating and the agreement between ratings was ‘substantial’ – weighted Kappa 0.72, SE 0.13. These figures provide supportive evidence that the SPIN is repeatable where pain

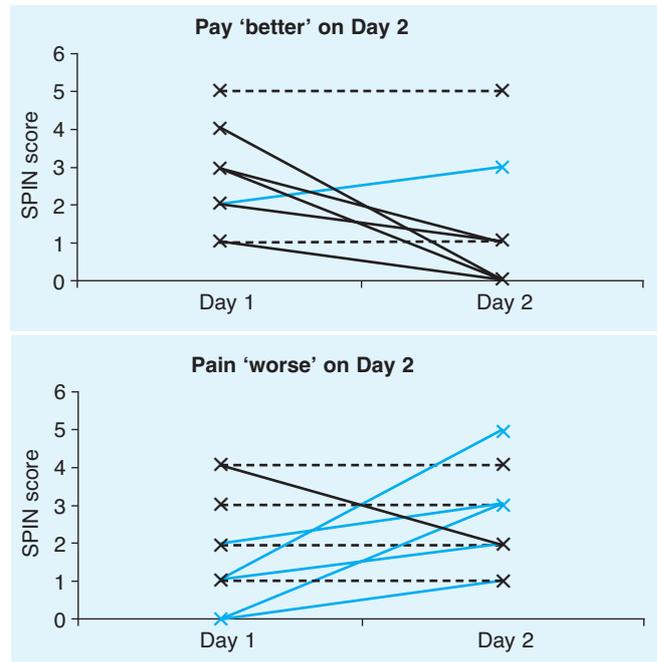


Fig 3. Change in scale of pain intensity (SPIN) score between assessments on Day 1 and Day 2. Line graphs indicate the change in SPIN scores for patients who said their pain was ‘better’ (n=11) and ‘worse’ (n=11) after 24 hours. Increasing SPIN scores are shown in blue, decreasing scores in black. Scores which remained the same are shown in black broken lines. Multiple cases are indicated by thicker lines. Those who said their pain was ‘better’ had significantly lower SPIN scores on day 2 (Wilcoxon signed rank z=-2.35 p<0.02). Although the reverse trend was seen in those whose pain was ‘worse’, this did not reach statistical significance (Wilcoxon z=-1.4 p=0.17).

levels are stable. The results should be interpreted with caution, however, because of a preponderance of zero scores – 22 patients (65%) scored 0 on both occasions.

Responsiveness to change

Eleven patients said that their pain was better and eight of these (66%) gave a lower rating (Wilcoxon signed rank $z=-2.35$ $p<0.02$). A further 11 said their pain was worse, of which only five (45%) gave a higher rating (Wilcoxon $z=-1.4$ $p=0.17$). The changes in individual SPIN scores for these two groups are illustrated in Fig 3. Although the numbers are small, the directional trends provide preliminary evidence that the SPIN may be responsive to changing pain levels in the clinical setting.

The SPIN itself was reasonably quick to administer (approximately 2–5 minutes depending on the patients cognitive/communicative ability). Of the 62 patients who were able to use both the SPIN and the NGRS, 29 did not express a preference for one scale over the other, but 23 (37%) said that they preferred the SPIN, while only 10 (16%) preferred the NGRS.

Discussion

The findings presented here suggest that in a neurorehabilitation setting, where the majority of patients had significant cognitive/communicative disabilities, the SPIN-screen could be used to screen for pain symptoms in the majority of patients. It showed a good level of concurrent validity in relation to the existing standard pain assessment tool (the NGRS). There was also some preliminary support for its repeatability, at least at the lower end of the scale, and for responsiveness to change. Although many patients were happy to use either scale, 70% of those who expressed a preference said that they preferred the SPIN.

Patients in this study who were considered able to use the SPIN could equally use the NGRS, so it is not possible to say from these data whether the SPIN-screen offers any benefit over standard visual analogue scales, other than patient preference. However, the screening procedure did positively identify a subgroup who required more detailed evaluation with facilitation (approximately one-fifth of the patients), including use of the full SPIN, upon which over half were able to make a response to pain enquiry.

The study has a number of recognised limitations including the following:

- although the assessments were undertaken by a clinically trained member of staff, the three assessors were usually not a member of the treating clinical team. The number of assessors was limited to ensure consistency in application of the tools, but this does not necessarily reflect routine clinical practice. It is possible that a member of the treating team who is more familiar with the patient might draw different conclusions about their ability to respond.
- only those who were clearly unable to use the SPIN were excluded from analysis, which therefore included scores from the nine patients who may not have fully understood

it. This was done to reflect real-life practice, but it led to lower levels of agreement than if they had been excluded.

- it was anticipated that pain might change by the second assessment. Although repeatability was tested in the 33 patients who said their pain levels were unchanged, there was a large preponderance of zero scores (65%) and only 10 pairs of ratings were obtained in the positive section of the scale, none of them above 3. The numbers were similarly small for testing responsiveness in the group who reported that their pain had changed, and this aspect of scale performance therefore requires further evaluation. This variability in symptom experience, however, also underlines the importance of screening for pain on more than one occasion to avoid missing pain symptoms.
- the order of administration of the SPIN and the NGRS was not randomised. As noted above, this order was set deliberately as we wished to examine the patients' ability to understand the SPIN without immediate prior exposure to other visual analogue tools which could have led to a learning effect. However, this set order could have enhanced the patients' ability to understand the NGRS in some cases.

These limitations accepted, this study provides support for the applicability of SPIN-screen as a routine screening tool for the reporting of pain by patients who may have cognitive and communicative problems. It appears to offer an acceptable and valid assessment of pain severity in those able to understand it, as well as being useful to identify patients who require further more detailed evaluation through facilitated assessment techniques.

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Note

The SPIN-screen may be used freely. An electronic version is available from the corresponding author.

References

- 1 Royal College of Physicians. *National clinical guidelines for stroke*, 2nd edn. London: RCP, 2004.
- 2 National Institute for Clinical Excellence. *Multiple sclerosis: national clinical guidelines for diagnosis and management in primary and secondary care*. London: NICE, 2003.
- 3 Price CIM, Curless RH, Rodgers H. Can stroke patients use visual analogue scales? *Stroke* 1999;30:1357–61.
- 4 Turner-Stokes L, Rusconi S. Screening for ability to complete a questionnaire: a preliminary evaluation of the AbilityQ and ShoulderQ for assessing shoulder pain in stroke patients. *Clin Rehabil* 2003;17:150–7.
- 5 Herr KA, Mobily PR, Kohout FJ, Wagenaar D. Evaluation of the faces pain scale for use with the elderly. *Clin J Pain* 1998;14:29–38.

- 6 Choinière M, Amsel R. A visual analogue thermometer for measuring pain intensity. *J Pain Symptom Manage* 1996;11:299–311.
- 7 Ware LJ, Epps CD, Herr K, Packard A. Evaluation of the Revised Faces Pain Scale, Verbal Descriptor Scale, Numeric Rating Scale, and Iowa Pain Thermometer in older minority adults. *Pain Manage Nurs* 2006;7:117–25.
- 8 Taylor LJ, Harris J, Epps CD, Herr K. Psychometric evaluation of selected pain intensity scales for use with cognitively impaired and cognitively intact older adults. *Rehabil Nurs* 2005;30:55–61.
- 9 Scherder EJA, Bouma A. Visual analogue scales for pain assessment in Alzheimer's disease. *Gerontology* 2000;46:47–53.
- 10 Jackson D, Horn S, Kersten P, Turner-Stokes L. Development of a pictorial scale of pain intensity for patients with communication impairments. *Clin Med* 2006;6:580–5.
- 11 Jackson D, Horn S, Kersten P, Turner-Stokes L. A pictorial scale of pain intensity (SPIN) for patients with communication impairments. *Int J Therapy Rehabil* 2006;13:457–63.
- 12 Jackson D, Turner-Stokes L, Williams H, Das-Gupta R. Use of an integrated care pathway: A third round audit of the management of shoulder pain in neurological conditions. *J Rehabil Med* 2003;35:265–70.
- 13 Turner-Stokes L, Jackson D. Assessment of shoulder pain in hemiplegia: sensitivity of the ShoulderQ. *Disabil Rehabil* 2006;28:389–95.
- 14 Turner-Stokes L, Kalmus M, Hirani D, Clegg F. The Depression Intensity Scale Circles (DISCs): Initial evaluation of a simple assessment tool for depression in the context of brain injury. *J Neurol Neurosurg Psychiatry* 2005;76:1273–8.
- 15 Royal College of Physicians, British Geriatrics Society and British Pain Society. *The assessment of pain in older people: national guidelines*. Concise guidance to good practice series, No 8. London: RCP, 2007.
- 16 Turner-Stokes L, Nyein K, Turner-Stokes T, Gatehouse C. The UK FIM+FAM: development and evaluation. *Clin Rehabil* 1999;13:277–87.
- 17 Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159–74.