

The Rehabilitation Complexity Scale: a simple, practical tool to identify 'complex specialised' services in neurological rehabilitation

Lynne Turner-Stokes, Rebecca Disler and Heather Williams

ABSTRACT – New commissioning arrangements in the NHS require the identification of 'complex specialised' (CS) services, as distinct from more 'general' or 'district specialist' (DS) rehabilitation services, to determine differential cost-tariffs. In this cross-sectional postal survey representing 49 inpatient neurological rehabilitation services in the UK, no clear service characteristics that distinguished CS services (n=20) from DS services (n=29) could be identified. On the other hand, the Rehabilitation Complexity Scale (RCS) demonstrated clear differences between the two types of service, in terms of the complexity of case mix and of the rehabilitation inputs provided. District specialist services reported a median RCS score of 7 (interquartile range (IQR) 6–8), whereas CS services reported higher scores (median 9 (IQR 7–11)) (Mann-Whitney $z=-9.3$, $p<0.0001$). Carrying a caseload in which 50% of patients had total RCS scores ≥ 9 appeared to be a sensitive and specific indicator of a CS service. This study represents the first reported use of the RCS. Feedback regarding the utility of the tool was generally favourable, although other more detailed instruments are likely to be required to distinguish complexity at the very top end of the scale. As NHS services tackle the challenges posed by Payment by Results for management of patients with complex needs, it is suggested that this approach may have application in other fields of clinical practice.

KEY WORDS: complexity, diagnosis-related groups, postal survey, rehabilitation

Background

The Payment by Results (PbR) scheme represents a radical reform to the financial flow systems for healthcare services in the UK. Instead of funding through block contracts, all service providers will receive payment for each case treated on a single-cost tariff which is applied throughout the UK.¹ The only variation permitted for provider setting or local cost

differences is a local Market Forces Factor, which is based on provider attributes (staffing, land, buildings etc) rather than on case-related characteristics. The tariff will be based on health resource groups (HRGs) (equivalent to diagnosis-related groups in other parts of the world) which are groups of coded diagnoses and procedures that have similar resource implications. Tariff costs will be based on the average total cost of a treatment 'spell', and must cover all components (hotel costs, nursing, therapy and medical care). The system has many theoretical advantages in driving up efficiency through increased throughput of cases, although there are clear opportunities for gaming.² It is likely that the scheme will work best for high volume service areas, where the cost of individual cases will even out through the year.

Many specialties have raised concerns, however, about the more complex areas of healthcare where there is wide variation in costs.³ In these low volume/high cost service areas, one complex case more or less could lead to the financial destabilisation of a small unit, and policy commentators have noted that cost-per-case tariffs may not be a good basis for planning highly specialised services which may carry a number of roles beyond direct patient care.⁴ The Warner Report published in May 2006 provided an independent review of commissioning for specialised services.⁵ It called for alternative approaches to standard tariff-based reimbursement for services where patient activity and throughput are not the main determinants of cost. It also called for an immediate review of the National Definition Sets for Specialised Services to develop a clear set of criteria for inclusion of services under these definitions; and for the formal identification and designation of specific specialised service providers.⁶ It is not yet clear, however, how these will be identified.

Neurological rehabilitation poses a number of challenges to the introduction of PbR, which may also apply in other areas of complex intervention. Patients present with a wide range of complexity and admissions for rehabilitation can range from anything from two weeks to a year or more. Under the PbR funding scheme, trusts may be reluctant to take

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on the more complex cases unless there are arrangements in place to ensure adequate reimbursement, and this poses the threat of discrimination to an already vulnerable and needy group of patients.

The National Definition Set for Specialised Services in Brain Injury and Complex Rehabilitation, defines three levels of service in neurological rehabilitation (Fig 1):⁷

- 1 Local general (LG) rehabilitation services which are non-specialist services mainly provided at primary care trust or community team level.
- 2 District specialist (DS) services – usually a consultant-led service covering a population of 300,000–500,000.
- 3 Complex specialised (CS) services – tertiary or regional services providing for people with more complex rehabilitation needs – usually serving a population of 1–3 million.

It is the latter group which have been earmarked for 'specialised commissioning', according to the Warner Report.²

The UK network of neurological rehabilitation services includes both CS and DS services. The distinction is blurred, however, because, in some areas, the DS services have developed to a level where they have many of the same facilities and can take on quite complex cases, albeit in smaller numbers than the CS services. The problem is confounded by the fact that rehabilitation is only included in the Department of Health's current health coding system (ICD 10 codes) as additional 'z codes' which are rarely reported in practice, and so almost no information exists centrally on which to base tariff costs for rehabilitation.

To date, HRGs have been developed only for inpatient services. The HRG set for rehabilitation (version 4.0) specifically excludes CS rehabilitation. According to the National Definition Set, this would exclude CS services, but not DS services, from these HRGs. The Expert Working Group for HRGs in rehabilitation therefore endorsed the current HRG set with the proviso that further work be done to develop a transparent system to determine banded tariffs for different levels of complexity, and to define CS services in terms of demonstrated service delivery at the complex end of the spectrum.

The Rehabilitation Complexity Scale (RCS) (Appendix 1) has been designed to provide a simple classification of case mix in terms of rehabilitation inputs provided. It was developed to stand alongside the new rehabilitation HRGs to provide very simple coding information with regard to complexity that could inform tariff banding in district and general rehabilitation settings. If there are differences in case mix between DS and CS services, however, one would expect it also to be sensitive to these.

The aims of this study were:

- to identify any service characteristics that distinguish inpatient CS neurorehabilitation services from DS services in the UK
- to explore utility of the RCS and to determine whether it could be used to identify differences in the case mix of the two types of service.

Methods

Study design

A cross-sectional survey of consultant members of the British Society for Rehabilitation Medicine (BSRM), the principal professional society for doctors specialising in rehabilitation medicine in the UK, was conducted by postal questionnaire.

Service characteristics of a complex specialised rehabilitation service

Proposed defining characteristics for complex specialised rehabilitation services were drawn from the National Definition Set number 7.⁷ A questionnaire was drafted to include the following:

- Definitions of the different service types were given and respondents were asked whether they considered their inpatient neurological rehabilitation service to be a CS service, a DS service or a LG service.
- Details were requested about their service, including the number of beds, staffing levels in different disciplines, and approximate length of stay (LOS). Also about any reduction in bed capacity in the last two years.
- Respondents were asked to tick service characteristics, facilities and procedures on a checklist, and to add any other features which might distinguish a CS service.

The questionnaire was approved by the BSRM Research and Clinical Standards Committee. Following piloting in 10 centres, it was sent out to all consultant members of the BSRM. Those not involved in providing neurological rehabilitation services were asked to indicate this and return the questionnaire. Where a service had more than one consultant, respondents were asked to collaborate with colleagues to provide a single response. Those working in more than one centre, however, were invited to provide a response for each service.

Exploratory use of the RCS to examine case mix differences

The RCS is a 15-point measure made up of four different subscales:

- C: basic care and support needs (range 0–3)
- N: nursing interventions (range 0–3)
- T: intensity of total therapy intervention (range 0–6)
- M: medical intervention (range 0–3).

It should be reported in a manner analogous to the Glasgow Coma Scale, eg RCS 7 (C2 N1 T3 M1).

Consultants were asked to apply the RCS in a single snapshot cross-sectional survey of their current inpatient caseload during a single week, and also to provide feedback about the scale, including: how easy it was to apply; whether or not they thought it was useful in distinguishing more complex cases; and whether they would be prepared to apply it on a regular basis to inform costing tariffs. They were also asked to provide general qualitative comment and feedback.

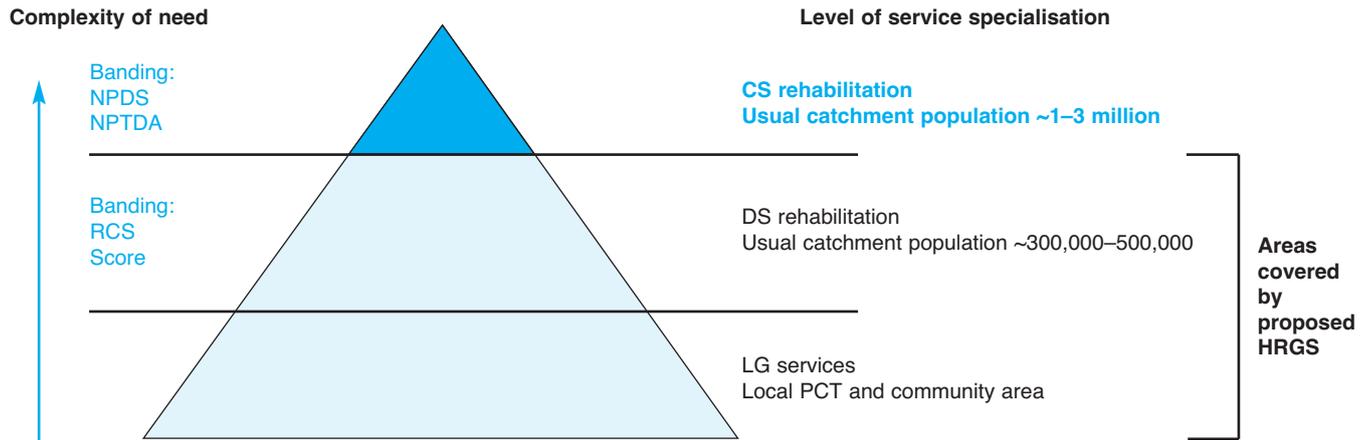


Fig 1. Banding for different levels of complexity in rehabilitation. The version 4.0 health resource groups (HRGs) exclude complex specialised (CS) rehabilitation services. Nevertheless they cover a wide range of complexity with wide cost variations. The Rehabilitation Complexity Scale (RCS) may potentially be used for banding tariffs in the low–medium complexity range, and for identifying those services which carry a highly complex caseload. More detailed tools such as the Northwick Park Dependency Score (NPDS)⁸ and Northwick Park Therapy Dependency Score (NPTDS)⁹ or equivalent, are currently in development to band tariffs for more complex cases. DS = district specialist; LG = local general; PCT = primary care trust.

Data handling and statistics

Data were entered into a spreadsheet in Microsoft Excel, and transferred to SPSS v11.5 for analysis. The DS and CS service groups were compared using chi-squared tests for dichotomous checklist variables, and Mann-Whitney U tests for ordinal and continuous variables. Qualitative comments were collated using simple content analysis to identify main themes.

Results

Fifty-eight responses were received. Nine of these were excluded as they did not provide inpatient neurological rehabilitation services (8) or provided LG services (1). Of the remaining 49, 29 described their service as DS and 20 as CS. Previous studies through the BSRM suggest that its consultant members represent about 120 different neurological rehabilitation services in the UK, so this response rate represents about 40% of that pool.

Table 1. Principal service characteristics compared between district specialist (DS) and complex specialised (CS) services.

Main service characteristics	DS services (n=29)	CS services (n=20)	Mann-Whitney	Significance
	Median (IQR)	Median (IQR)	z value	p value
Total number of beds	16 (12–20)	21 (15–31)	–1.8	0.07
Bed reductions in the last 2 years	5 (4–6) in 6 units	5 (2–7) in 4 units		
Staffing WTE:				
Total medical staff (WTE)	2.3 (1.9–3.2)	4.0 (2.0–5.7)	–2.11	0.03
Medical staff to bed ratio	0.17 (0.10–0.19)	0.14 (0.10–0.26)	–0.18	0.86
Total nursing staff (WTE)	20.0 (14.0–26.0)	28.0 (21.2–46.5)	–2.34	0.02
Nursing staff to bed ratio	1.3 (1.0–1.8)	1.5 (1.2–2.2)	–1.68	0.92
Total therapy staff (WTE)	7.0 (5.4–11.6)	14.0 (8.0–16.2)	–2.9	0.004
Therapy staff to bed ratio	0.52 (0.33–0.67)	0.67 (0.50–0.77)	–1.9	0.055
Average LOS (weeks)	9 (7–13)	12 (8–16)	–1.2	0.23
Minimum LOS (weeks)	1 (1–5)	1 (1–2)	–1.3	0.20
Maximum LOS (weeks)	38 (20–72)	52 (26–58)	–0.38	0.72

IQR = interquartile range; LOS = length of stay; WTE = whole time equivalents.

Table 2. Analysis of distinguishing features of a complex specialised (CS) rehabilitation service.

Service characteristics	DS services (%)	CS services (%)	χ^2	p value	Service characteristics	DS services (%)	CS services (%)	χ^2	p value
Staffing					Special facilities – continued				
Consultant in rehabilitation medicine	100	100	NA	1.0	Electro-assistive technology (eg environmental control systems)	55	70	2.56	0.28
Consultant in neuro-psychiatry/neuropsychology	62	79	1.35	0.24	Special seating and wheelchair systems provided	66	85	4.70	0.09
Rehabilitation-trained nurses	85	90	0.24	0.62	Assessment and demonstration of communication aids	18	16	0.27	0.87
AHPs at clinical specialist/consultant grade	37	70	5.00	0.02	Specialist programmes of treatment offered				
Working practice and staff development					Inpatient complex rehabilitation assessment	81	90	0.84	0.66
MD case notes	81	90	0.66	0.41	Coma-arousal programme	15	20	4.63	0.10
MD ward round/treatment planning	100	100	NA	1.0	Specialist spasticity management	96	90	0.84	0.65
MD goal setting	100	100	NA	1.0	Tracheopharyngeal management				
MD outcome evaluation	77	75	0.50	0.82	Group therapy programmes	48	55	1.23	0.54
Specialist staff training offered	59	85	3.64	0.06	Cognitive/behavioural rehabilitation programme	51	70	2.99	0.22
Specialist registrar training programme	59	65	0.16	0.70	Treatment under sections of the Mental Health Act 1983	18	5	2.07	0.36
Active research >4 papers per year	11	25	1.57	0.26	Sexual counselling	26	35	0.88	0.64
Regular presentation at rehabilitation conferences	33	70	6.18	0.01	Formal family support and counselling	30	60	5.62	0.06
Caseload					Complex discharge planning	85	95	1.30	0.52
More than a third of caseload need ≥ 2 for most care tasks	74	90	1.88	0.26	Back to work programmes	30	55	3.76	0.15
Take patients requiring one-to-one special nursing	74	70	0.95	0.76	Medical support and facilities				
Take patients with tracheostomy	63	80	1.59	0.21	CT imaging	84	95	1.40	0.49
Able to manage patients with aggressive behaviour	37	40	0.04	0.84	MRI	84	95	1.40	0.49
>a third of caseload require MD input from >3 disciplines	82	90	3.03	0.22	MRA	65	75	0.93	0.63
>a third of caseload require intensive input >4 hours per day	63	80	1.59	0.21	Doppler vascular studies	85	85	0.18	0.91
Special facilities					EMG	73	90	5.71	0.06
Light workshop	26	45	2.39	0.30	EEG	73	80	3.26	0.19
Heavy workshop	11	20	0.90	0.64	24-hour medical cover	78	85	0.63	0.73
Music therapy	7	0	1.62	0.44	24-hour consultant on call	74	95	3.82	0.15
Art therapy	15	20	0.43	0.81	Able to manage patients with acute intercurrent illness	52	70	2.25	0.32
Hydrotherapy	37	75	7.74	0.02	Nerve blocks	40	70	5.05	0.08
Harness-treadmill training	26	55	4.75	0.09	Botulinum toxin injections	88	95	0.35	0.84
Custom-made splints/orthotics	85	95	1.30	0.52	Perendoscopic gastrostomy insertion/removal	78	80	3.03	0.86
Patient computer facilities	66	90	6.4	0.04	Tendon release procedures	51	55	0.91	0.63
					Suprapubic catheter insertion	65	75	0.93	0.54
					Intrathecal pump insertion and maintenance	38	50	0.89	0.64
					Pressure sore grafting	38	45	0.89	0.64

AHPs = allied health professionals; CT = computed tomography; DS = district specialist; EEG = electroencephalography; EMG = electromyography; MD = multidisciplinary; MRA = magnetic resonance angiography; MRI = magnetic resonance imaging; NA = not applicable.

Table 3. Comparison of Rehabilitation Complexity Scale (RCS) scores between the district specialist (DS) services and complex specialised (CS) services.

Parameter	DS services (n=358)		CS services (n=297)		Mann-Whitney	Significance
	Median (IQR)	Range	Median (IQR)	Range	z value	p value
Care score	1 (1–2)	0–3	2 (1–2)	0–3	–2.24	p=0.025
Nursing score	2 (1–2)	0–3	2 (2–3)	0–3	–4.61	p<0.0001
Therapy score	2 (2–3)	0–6	4 (3–5)	0–6	–11.77	p<0.0001
Medical score	1 (1–2)	0–3	2 (1–2)	0–3	–6.66	p<0.0001
Total RCS score	7 (6–8)	1–13	9 (7–11)	1–15	–9.30	p<0.0001
Average LOS (weeks)	8 (4–13)	0–14	10 (6–16)	0–16	–2.85	p=0.004

IQR = interquartile range; LOS = length of stay.

Characteristics of the service

Principal characteristics of the two service categories are listed in Table 1. Although the CS services had higher staff numbers in absolute terms, when related to the slightly higher number of beds, there were no significant differences. Similarly, a trend towards longer lengths of stay in the CS services did not reach significance. Ten units reported bed closures in the last two years totalling 50 beds in all and representing a mean of 22% of the bed pool, but up to 33% in some units. District specialist and CS appeared to be equally affected.

Analysis of the checklists to reveal distinguishing features of a CS service is shown in Table 2. In view of the multiple tests involved, the level of probability adopted for statistical significance was $p < 0.01$.

Not surprisingly given the sample population, all had input

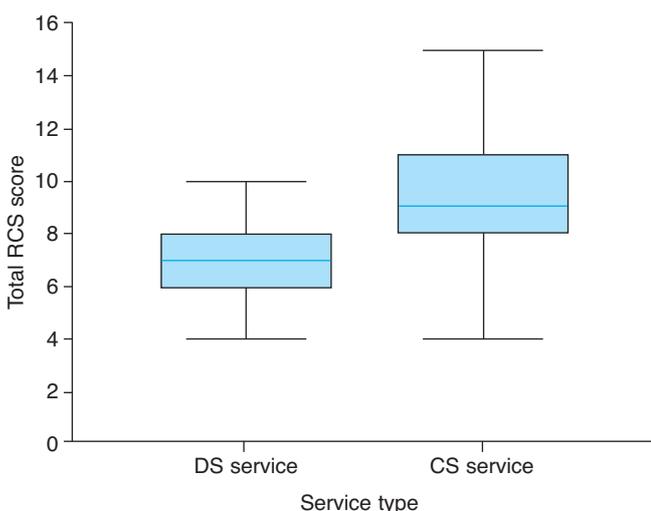


Fig 2. Comparative distribution of total Rehabilitation Complexity Scale (RCS) scores between district specialist (DS) and complex specialised (CS) rehabilitation services. The total RCS scores demonstrate a clear difference in the complexity of case mix between DS (n=358) and CS (n=297) services.

from consultants specialising in rehabilitation medicine, but there were no major differences in rehabilitation process. All used multidisciplinary (MD) goal setting and ward rounds, and similar proportions used MD case notes and outcome measurement in routine practice. Both types of service typically reported that more than a third of their caseload required input from ≥ 4 disciplines, and most were offering therapy input for > 4 hours per day. Complex specialised units were marginally more likely to have consultant/specialist grade allied health professionals (70% v 37%), and to present regularly at rehabilitation conferences (70% v 33%), but these did not reach the adjusted level of significance ($p < 0.01$).

In addition, there were few differences in the range of procedures or facilities offered. In this study, CS units were marginally more likely to offer hydrotherapy (75% v 37%) and patient computer facilities (90% v 66%), but ability to offer tracheopharyngeal management (70% v 26%, χ^2 10.2, df 2 $p = 0.006$) was the only feature significantly associated with a CS service.

Use of the RCS to determine differences in case-mix

Forty-five centres returned cross-sectional RCS data for between 5 and 47 cases, totalling 677 scores. The median total RCS score for the whole population was 8 (IQR 6–10), with data presented across the whole range of 1–15. In all, 358 RCS scores were returned from DS services, and 297 from CS services. Table 3 shows a comparison of RCS scores between the DS and CS services and the comparative distribution of total RCS scores is illustrated in Fig 2.

There was a clear statistically significant difference between the DS services and CS services. Although cases crossed the full range in both types of service, only 12% of cases in the DS services had RCS scores of ≥ 10 , compared with 42% in the CS services. In this series, the criterion of '50% of the caseload having a total RCS scores of ≥ 9 ' identified CS services with 88% sensitivity, 89% specificity, 92% positive predictive value and 83% negative predictive value.

Feedback regarding utility of the RCS

Feedback about the RCS from the 49 centres was generally positive. In all, 76% reported that it was very easy or fairly easy to complete, and only one said it was 'fairly hard'; 55% thought it distinguished complex cases and 81% said that they would be willing to record this for all inpatients on a regular basis if it were used as the basis for banded tariffs. Only 4% said they would not be prepared to use the scale.

Many qualitative comments were also received – not all of them related to the score itself. A brief summary of content analysis was as follows:

- six respondents provided spontaneously positive comments ('A very sensible approach to tackle such a difficult problem'; 'Very useful – just what is needed')
- fifteen (mainly from CS services) commented that it did not provide enough detail in nursing (5), medical (4) or therapy (6) needs, especially at the top end of the scale. On the other hand, one respondent (from a DS service) said, 'Please don't make it any more complicated!'
- eight expressed concern that, at least as used in this context, the RCS score was dictated by delivery rather than need ('I think 8/9 scores would be 10 or more if we had more therapists. MD team agree'; 'We scored according to what was provided. Patients would have benefited from more')
- four stressed that rehabilitation complexity alone could not replace LOS as a cost-determining factor
- four commented on the timing of measurement, noting that individuals' need for intervention changes over time, so ideally the score needs to be applied on a repeated basis.

Discussion

These results demonstrate that there are no clearly defined service characteristics that can be used to distinguish a CS rehabilitation service from a DS service *per se*. On the other hand, the RCS demonstrated very clear differences in the complexity of case mix and of the rehabilitation inputs provided. From the data presented here, it would appear that carrying a caseload in which 50% of patients have a total RCS score ≥ 9 is a reasonably sensitive and specific indicator of a CS service. Respondents generally found the scale easy to use, and gave positive feedback regarding its usefulness in this context. Although it was developed in the context of neurological rehabilitation, the RCS may also have application in other areas of rehabilitation, and possibly also in other areas of MD clinical practice, such as palliative care or care of the elderly.

The most frequent comment, mainly coming from consultants in CS services, was that the RCS did not provide sufficient detail in the content or extent of input. In this context it is important to note that the scale was designed primarily to provide a simple classification of rehabilitation needs in the context of DS services (Fig 1). At the most complex end of the spectrum, more detailed evaluation will be needed to determine those low

volume/high cost cases which lie outside these HRGs and meet the requirements for CS rehabilitation. In neurorehabilitation settings, the Northwick Park nursing Dependency Scale⁸ and the Northwick Park Therapy Dependency Assessment⁹ have been developed specifically to provide this greater level of detail. It is also recognised within the HRG Expert Working Group that equivalent instruments will need to be developed for other specialist areas of rehabilitation.

Respondents also commented that the RCS as applied here measured the inputs delivered, as opposed to those needed. This is appropriate if the scale is used to provide information to inform tariff costs, which are based on actual service delivery. It would certainly be inappropriate to reward services for keeping complex patients in a local service which is not able to meet their needs, instead of referring them to the relevant CS service. On the other hand, the RCS could potentially be applied both to describe the level of input provided, and that required, in order to make the case for funding a referral – or indeed on a population basis to argue for appropriate local resources.

A recognised limitation of this study is that the respondent pool represents only about 40% of the total service pool in the UK. This may partly reflect the fact that the participation involved, not only filling in a questionnaire, but actually collecting live data – and on a fairly tight timescale. On the other hand, the responses came from a wide geographic spread covering both urban and rural areas, and a preliminary analysis of the first 36 drew similar conclusions, suggesting that the data had largely reached saturation. The RCS itself has yet to be subjected to full psychometric evaluation, but preliminary testing against the previously mentioned dependency scales suggests a good level of concurrent validity.¹⁰

In this study, CS services were identified on the basis of the responders' report, and in the absence of any previous benchmarking system, it is possible that not all of these would qualify on closer inspection. It is clearly not appropriate, however, to say that a unit does or does not qualify for the status of a CS service on the basis of a single snapshot of data and more targeted work is required to determine precise criteria, and also whether there are different cut-off points for different categories of rehabilitation service, for example units catering for the walking wounded category of brain-injured patient, as opposed to post-acute neurorehabilitation. It is a matter of considerable concern, however, that 10 units reported a reduction in their inpatient bed base for specialist/specialised neurological rehabilitation of up to 30% over the last two years. These services are potentially vulnerable under the new funding streams, and are vital to maintain through-flow of patients back to the community to relieve pressure on the acute neurosciences services. This underlines the importance of developing suitable banded tariff systems for reimbursement within the PBR scheme in order to avoid further attrition in a service area which is already underprovided.

Acknowledgements

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Conflict of interest

Professor Turner-Stokes is the originator of the RCS, but has no financial interest in the tool, which is freely available.

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Appendix 1. The Rehabilitation Complexity Scale.

Patient identification

Name: Hospital No: Date of score:...../...../.....

For each subscale, circle highest level applicable

Basic care and support needs

Describes the approximate level of intervention for basic self-care

- C 0 Largely **independent** in basic care activities
- C 1 Requires **help from 1 person** for most basic care needs
- C 2 Requires **help from 2 people** for most basic care needs
- C 3 Requires **help from >2 people** for basic care needs
OR Requires constant 1:1 **supervision**

Skilled nursing needs

Describes the level of intervention from qualified or skilled rehabilitation nursing staff

- N 0 No needs for skilled nursing
- N 1 Requires intervention from a **qualified nurse** (eg for monitoring, medication, dressings etc)
- N 2 Requires intervention from **trained rehabilitation nursing staff**
- N 3 Requires **highly specialist nursing care** (eg for tracheostomy, behavioural management etc)

Therapy intervention

Describes the approximate level of input that is given from therapy disciplines

- State number of different therapy disciplines involved:
≤2 3 4 ≥5 (Circle)
- T 0 No therapy intervention (eg awaiting discharge)
 - T 1 Total therapy intervention ≤4 hours per week (or <1 hr/day)
 - T 2 Total therapy intervention 4–9 hours per week (or approx 1–2 hrs/day)
 - T 3 Total therapy intervention 10–15 hours per week (or approx 2–3 hrs/day)
 - T 4 Total therapy intervention 16–20 hours per week (or approx 3–4 hrs/day)
 - T 5 Total therapy intervention 21–25 hours per week (or approx 4–5 hrs/day)
 - T 6 Total therapy intervention >25 hours per week (or >5 hrs/day)

Medical intervention

Describes the approximate level of medical care environment required for medical/surgical management

- M 0 **No active medical intervention** (Could be managed by GP on basis of occasional visits)
- M 1 **Basic investigation/monitoring/treatment** (Requiring non-acute hospital care, could be delivered in a community hospital with day time medical cover)
- M 2 **Specialist medical intervention** (Requiring inpatient hospital care in DGH or specialist hospital setting)
- M 3 **Acutely sick or potentially unstable medical condition** (Requiring 24-hour on-site acute medical cover)

Total C: N: T: M: Summed score: /15

C = care; DGH = district general hospital; GP = general practitioner; M = medical; N = nursing; T = therapy.