Measuring acute rehabilitation needs in trauma: Preliminary evaluation of the Rehabilitation Complexity Scale

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ABSTRACT

Background: Injury severity, disability and care dependency are frequently used as surrogate measures for rehabilitation requirements following trauma. The true rehabilitation needs of patients may be different but there are no validated tools for the measurement of rehabilitation complexity in acute trauma care. The aim of the study was to evaluate the potential utility of the Rehabilitation Complexity Scale (RCS) version 2 in measuring acute rehabilitation needs in trauma patients.
Methods: A prospective observation study of 103 patients with traumatic injuries in a Major Trauma Centre. Rehabilitation complexity was measured using the RCS and disability was measured using the Barthel Index. Demographic information and injury characteristics were obtained from the trauma database.
Results: The RCS was closely correlated with injury severity ($r = 0.69$, $p < 0.001$) and the Barthel Index ($r = 0.91$, $p < 0.001$). However the Barthel was poor at discriminating between patients rehabilitation needs, especially for patients with higher injury severities. Of 58 patients classified as 'very dependent' by the Barthel, 21 (36%) had low or moderate rehabilitation complexity. The RCS correlated with acute hospital length of stay ($r = 0.64$, $p = < 0.001$) and patients with a low RCS were more likely to be discharged home. The Barthel which had a flooring effect (56% of patients classified as very dependent were discharged home) and lacked discrimination despite close statistical correlation.
Conclusion: The RCS outperformed the ISS and the Barthel in its ability to identify rehabilitation requirements in relation to injury severity, rehabilitation complexity, length of stay and discharge destination. The RCS is potentially a feasible and useful tool for the assessment of rehabilitation complexity in acute trauma care by providing specific measurement of patients' rehabilitation requirements. A larger longitudinal study is needed to evaluate the RCS in the assessment of patient need, service provision and trauma system performance.

Introduction

Trauma is a global disease and is amongst the leading causes of disability in the world.[1] Injured patients occupy more hospital beds than patients with heart diseases, and four times more than patients with cancer.[2] Despite this there remains no internationally agreed approach to the assessment and rehabilitation of trauma patients.[3–5] Rehabilitation needs assessment is a consid-erable challenge due to the heterogeneity of injuries.[6] The measurement of rehabilitation complexity currently relies on surrogate measures of injury severity,[7] disability[8,9] or care dependency.[10] These often poorly reflect actual therapy need and therefore have limited utility for individual patients or health services.[11–13] There is a need for a rapid and applicable rehabilitation complexity measure that is appropriate for the assessment of the acutely injured patient.

Acute rehabilitation has the potential[14,15] to reduce the development of secondary complications, adverse effects of immobility, critical care needs and overall length of stay.[13,16–18] However an undirected increase in therapy provision or intensity to all patients does not necessarily lead to improvements in outcomes.[19] Using surrogate measures to target therapy can result

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in over- or under-estimation of requirements. Patients with low injury severity scores may have high rehabilitation needs (e.g. a patient with multiple long bone fractures), or conversely a gunshot wound to the liver has high injury severity but potentially low rehabilitation needs. Patients may have significant disabilities but are not yet ready to participate in rehabilitation or may be unresponsive to interventions (e.g. patients in low awareness states or high spinal cord injuries). Conversely patients with mild disability may be very responsive to increased therapy provision (e.g. emotional or mild cognitive problems). At the trauma system level, effective rehabilitation is fundamental for clinical and cost efficiency.[20,21] However there is little research into the evaluation of rehabilitation service delivery, configuration and governance.[16,19,22] There are no studies that have investigated rehabilitation complexity in acute trauma and its relationship to injury severity and disability.[23] The lack of an appropriate tool to measure rehabilitation needs and benchmark therapy provision is a key barrier in trauma systems design and optimisation.

Objectives and study design

The objective of this study was to evaluate the potential utility of the Rehabilitation Complexity Scale (RCS) version 2 in measuring acute rehabilitation needs in trauma patients. The RCS was originally developed to provide a simple classification of rehabilitation inputs provided to describe case mix complexity and develop banded tariffs for neuro-rehabilitation in the UK.[24,25] It is currently being used in the UK to determine rehabilitation complexity of patients undergoing neurological rehabilitation and cost related to this.[12] The first aim was to assess the feasibility of administering the RCS in the acute post-injury phase. Second, we wished to evaluate whether the RCS is consistent with existing tools used to estimate rehabilitation needs. Finally we aimed to identify areas where the measurement of rehabilitation complexity provides more information to guide therapy provision than standard measures of disability. We report our experience of a prospective pilot implementation of rehabilitation complexity assessment of acutely injured patients.

Methods

Study design and setting

This study analysed data collected prospectively from the pilot implementation of the RCS for trauma patients admitted to the trauma service of our Major Trauma Centre during November 2009. The trauma service has a dedicated 15 bedded trauma ward, although patients may be admitted to other wards and critical care units by clinical or organisational necessity. The pilot took place over one calendar month.

Study population

Data were collected on all adult (≥16 years old) patients admitted to the trauma service and who had a minimum stay of 48 h. Demographic information and injury characteristics were obtained from the contemporaneous trauma registry including age, gender, mechanism of injury, injury severity score (ISS)[26] and length of stay.

Disability and Rehabilitation Complexity Scoring

Rehabilitation need and disability scores were administered during multi-disciplinary team meetings, ward hand-over or discharge planning meetings. The RCS score was measured on admission. The original RCS[11] was revised after preliminary testing

and the[12] was developed. The RCS measures patient rehabilitation complexity and need in terms basic care and support need (C: 0–3), nursing dependency (N: 0–3), medical need (M: 0–3), therapy (T) the number of therapy disciplines (TD: 0–3) and overall therapy intensity (TI: 0–3). A score of 0 indicates no need and a score of 3 indicates very complex needs, e.g. specialist nursing care for trachea care (N:3) or need for medical management in intensive care (M: 3). Disability was measured on admission and discharge using the Barthel Index.[27–29] The Barthel measures performance in activities of daily living and mobility; has high validity and reliability[28,30–32]; and is routinely measured by nursing staff in our hospital. Patients that were already in the hospital from the previous month were scored on the RCS and Barthel on the first day of the month; and patients that were not discharged from hospital by the end of the month were scored on the last day of the month. The RCS was categorised into 4 standard subgroups: 'Low' (1–6), 'Moderate' (7–9), 'Heavy' (10–12) and 'Very Heavy' (13–15).[33] The 100-point Barthel was used and grouped into categories[34] of disability described in the literature: 'None' (Independent – 80–100), 'Minimal' (60–79),'Partial' (40–59) and 'Very' dependent (0–39).

Data analysis

Statistical analysis was performed using GraphPad PRISM v5 (GraphPad Software Inc., San Diego, CA, USA) and Microsoft Excel 2007. Normality was assessed using normal-quantile plots and non-parametric statistics were used throughout. Proportions were analysed using chi squared or Fisher's exact tests and non-parametric data were compared using the Mann–Whitney U test. One-way analysis of variance (Kruskal–Wallis test) was used to test change across categorical data. Spearman's coefficient was used to determine the degree of correlation between variables.

Results

Over the 30-day period 178 acutely injured adult patients were admitted to the trauma service and 103 met the inclusion criteria with a length of stay of 48 h or more. 41 patients were already in hospital at the start of the study and the remainder were admitted during the course of the study. Patient demographics and injury characteristics are shown in Table 1. It took 2 min per patient to complete the full RCS assessment. Although we did not formally measure inter-rater reliability, in general multi-disciplinary therapy teams and nurses agreed on the care, nursing, medical and therapy needs of patients and the relevant RCS scores. Initially clinicians required prompting to consider all rehabilitation interventions, including equipment needs, cognitive and psycho-social limitations, and not just physical impairments. This improved during the course of the month as clinicians became more familiar with the tool. No other issues were found with the acute injury period that inhibited the administration of the RCS.

The median RCS score was 9 (IQR: 4). The distribution of RCS scores was normal with 46% of patients categorised as either 'Heavy' or 'Very Heavy' (Fig. 1A, Table 1). The RCS was closely correlated with injury severity ($r = 0.69$, $p < 0.001$). Severely injured patients (ISS > 15) had significantly higher RCS scores than patients with mild/moderate trauma (RCS: 10 vs. 7, $p < 0.001$ – Fig. 1B). However there were some notable discrepancies between injury severity and rehabilitation need. 11% of patients with mild/moderate injury (ISS ≤15) has RCS scores in the 'Heavy' or 'Very Heavy' range, whilst 33% of severely injured patients had only 'low' or 'medium' rehabilitation complexity. Conversely 25% of patients with a 'low' or 'moderate' RCS were severely injured (Table 1). Whilst the RCS is consistent with injury severity the