

ORIGINAL RESEARCH

International Retrospective Comparison of Inpatient Rehabilitation for Patients With Spinal Cord Dysfunction: Differences According to Etiology



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Abstract

Objectives: To describe and compare epidemiologic characteristics and clinical outcomes of patients with nontraumatic spinal cord dysfunction according to etiology.

Design: Retrospective, multicenter open-cohort case series.

Setting: Spinal rehabilitation units (SRUs) in 9 countries.

Participants: Patients (N=956; men, 60.8%; median age, 59.0y [interquartile range, 46–70.0y]; paraplegia, n=691 [72.3%]) with initial onset of spinal cord dysfunction consecutively admitted between January 1, 2008, and December 31, 2010.

Interventions: Not applicable.

Main Outcome Measures: Etiology of spinal cord dysfunction, demographic characteristics, length of stay (LOS) in rehabilitation, pattern of spinal cord dysfunction onset, discharge destination, level of spinal cord damage, and the American Spinal Injury Association Impairment Scale (AIS) grade on admission and discharge.

Results: The most common etiologies were degenerative (30.8%), malignant tumors (16.2%), infections (12.8%), ischemia (10.9%), benign tumors (8.7%), other vascular (8.5%), and other conditions (12.1%). There were major differences in epidemiologic characteristics and clinical outcomes of patients with different etiologies of spinal cord dysfunction. Paraplegia was more common in patients with a malignant tumor and vascular etiologies, while tetraplegia was more common in those with a degenerative etiology, a benign tumor, and infections. Patients with a malignant tumor tended to have the shortest LOS in the SRU, while those with a vascular etiology tended to have the longest. Except for patients with a malignant tumor, all patient groups had a significant change in their AIS grade between admission and discharge.

Conclusions: This international study of spinal cord dysfunction showed substantial variation between the different etiologies regarding demographic and clinical characteristics, including changes in AIS between admission and discharge.

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Outcome studies of patients with spinal cord dysfunction—a term preferred to nontraumatic spinal cord injury (SCI) because injury and nontraumatic are oxymoronic¹—are important because it is reported that in some countries, nontraumatic spinal cord dysfunction is more common than traumatic SCI,^{2,3} and with population aging the incidence of spinal cord dysfunction will increase substantially.² It is well known that patients with spinal cord dysfunction are usually older compared with those with traumatic SCI, have a more even sex distribution, and are more likely to have an incomplete paraplegic pattern of spinal cord damage.⁴⁻¹¹

There is a diverse range of conditions that can cause spinal cord dysfunction, including tumors, degenerative spinal conditions, vascular disorders, infections, and inflammatory disorders.⁴⁻⁹ A recent global mapping has highlighted this diversity.¹⁰ Most reports of rehabilitation outcomes after spinal cord dysfunction originate from single centers and include relatively small numbers of patients. Comparisons between these studies are limited by factors that include different inclusion criteria, definitions and outcome measures, approaches to analysis, and periods over which the studies were conducted.^{7,12} A classification of spinal cord dysfunction etiology has recently been published as part of the International Nontraumatic SCI Data Sets, which hopefully will facilitate comparisons between studies.¹³

The overall aim of this project from the International Spinal Cord Rehabilitation study group was to perform an international study comparing the outcomes for patients with spinal cord dysfunction admitted to spinal rehabilitation units (SRUs) in different countries. The specific objective of this article is to present patients' key demographic and clinical characteristics at admission and discharge according to the most common etiologies.

Methods

Setting and study design

A retrospective open-cohort case series was conducted of consecutive patients with spinal cord dysfunction admitted for initial inpatient rehabilitation in an SRU between January 1, 2008, and December 31, 2010. This was an international study with 1 SRU in each of 9 countries (Australia, Canada, Italy, India, Ireland, The Netherlands, Switzerland, United Kingdom, United States). Details of the organization of rehabilitation services and perceived barriers to admission and discharge within the International Spinal Cord Rehabilitation study group participants, including SRU inclusion criteria, have been previously reported.^{14,15}

Participants

The inclusion criteria were as follows: (1) age ≥ 18 years at admission to SRU; (2) nontraumatic spinal cord dysfunction; and (3) the first rehabilitation admission after the onset of spinal cord

dysfunction. Patients with a diagnosis of traumatic SCI, Guillain-Barré syndrome, multiple sclerosis, spina bifida, Friedreich ataxia, or a conversion syndrome were excluded. Patients in this study have previously been described in a publication that reported on their key demographic and clinical outcomes according to their country of origin.¹¹

Outcome measures

Demographic and clinical data collected included age on admission to the SRU or date of birth, sex, date of onset of spinal cord dysfunction symptoms, acute hospital length of stay (LOS), SRU LOS, discharge destination, and admission level of spinal cord dysfunction (paraplegia vs tetraplegia). The American Spinal Injury Association Impairment Scale (AIS)¹⁶ grade was collected on admission to and discharge from the SRU.

The classification of the etiology of spinal cord dysfunction and the time frame over which the presenting clinical symptoms developed were recorded, based on the International Nontraumatic SCI Data Sets.¹³ The classification of etiology was made according to the second or third level of detail used in the International Nontraumatic SCI Data Sets,¹³ with the higher level of detail used when available. In this classification system, musculoskeletal causes (eg, cervical stenosis) are categorized as “degenerative.” Because of the small number of cases in our sample in some categories of the data set classification, some case categories were collapsed to facilitate statistical analyses.¹³ All infectious causes were collapsed into an “infection” group. The hemorrhagic and other nonischemic vascular causes were collapsed into a “vascular—other” group, and all remaining cases were combined as “other.” In many cases of spinal cord dysfunction, the time frame of the onset of neurologic damage is not immediate as is typically the case with traumatic SCI. The time frame of spinal cord dysfunction symptom onset was recorded as acute (≤ 1 d), subacute (≤ 1 wk), prolonged (> 1 wk but ≤ 1 mo), and lengthy (> 1 mo).¹³

The classification of discharge destination used the categories from the international core data set,¹⁷ but with the additional separation of “hospital” into “acute hospital without returning to rehabilitation” and “other rehabilitation hospital for ongoing inpatient therapy.”

Data collection

Potential participants were identified through medical records or discharge databases at the participating SRUs. Both the principal investigator (P.W.N.) and a research assistant reviewed the completed database from each site for any inconsistencies in data and outliers. When any such inconsistencies were identified, the contributing site was contacted to recheck relevant item(s). Further details about the data collection have been reported previously.¹¹

Data analysis

Descriptive analysis was performed. Nonparametric statistics were used because all variables were nominal, ordinal, or not normally distributed. Percentages or median and interquartile range (IQR) are reported. Analyses were made using the chi-square test, Kruskal-Wallis rank sum test, or Wilcoxon signed-rank test. *P* values $< .05$ were deemed clinically significant.

List of abbreviations:

AIS American Spinal Injury Association Impairment Scale
IQR interquartile range
LOS length of stay
SCI spinal cord injury
SRU spinal rehabilitation unit

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