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The Uniform Data System for Medical Rehabilitation Report of Patients with Traumatic Spinal Cord Injury Discharged from Rehabilitation Programs in 2002 – 2010

Carl V. Granger, MD¹, Amol M. Karmarkar, PhD, OTR², James E. Graham, PhD, DC², Anne Deutsch, RN, PhD, CRRN³, Paulette Niewczyk, PhD, MPH¹, Margaret A. DiVita, MS¹, and Kenneth J. Ottenbacher, PhD, OTR²

¹The Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc., Buffalo, NY

²Division of Rehabilitation Sciences, University of Texas Medical Branch, Galveston, TX

³Rehabilitation Institute of Chicago and Department of Physical Medicine and Rehabilitation, Feinberg School of Medicine and Institute for Healthcare Studies, Feinberg School of Medicine, Northwestern University, Chicago, IL

Abstract

Objective—Provide benchmarking information from a large national sample of patients receiving inpatient rehabilitation following a traumatic spinal cord injury.

Design—Analysis of secondary data from 891 inpatient medical rehabilitation facilities in the United States that contributed traumatic spinal cord injury data to the Uniform Data System for Medical Rehabilitation (UDS_{MR}) during the period January 2002 through December 2010. Variables analyzed included demographic information (age, sex, marital status, race/ethnicity, pre-hospital living setting, discharge setting), hospitalization information (length of stay, program interruptions, payer, onset date, rehabilitation impairment group, ICD-9 codes for admitting diagnosis, comorbidities), and functional status (FIM® instrument [“FIM”] ratings at admission and discharge, FIM efficiency, FIM gain).

Results—The final sample included 47,153 patients with traumatic spinal cord injury. Overall mean length of stay = 26.2 (±23.2) days; yearly means ranged from 29.7 (±25.4) in 2002 to 22.9 (±18.9) in 2009. FIM total admission and discharge ratings also declined over the 8-year study period: admission decreased from 60.5 (± 17.4) to 55.9 (±16.3); discharge decreased from 86.1 (±23.8) to 82.4 (±23.4). Rehabilitation efficiency (FIM gain per day) remained relatively stable over time (1.6 ±1.7 points per day). The percentage of all patients discharged to the community ranged from 75.8% to 71.5% per year. Wheelchair users stayed in rehabilitation longer than persons who could walk (34.6 ±217.4 vs. 17.4 ±14.1 days) and also experienced less functional improvement (21.6 ±15.8 vs. 29.6 ±16.3 FIM points).

Conclusions—National data from persons with traumatic spinal cord injury in 2002-2010 indicate that lengths of stay declined, but efficiency in functional independence was stable to slightly increased. Over seventy percent of patients were consistently discharged to community settings following inpatient rehabilitation.

Correspondence: K. Ottenbacher, PhD, OTR, University of Texas Medical Branch, 301 University Blvd., Galveston, TX 77555-1137, Phone: 409.747.1637, Fax: 409.747.1638, kottenba@utmb.edu.

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Keywords

Benchmarking; Quality Improvement; Spinal Cord Injuries

Introduction

This article represents the fifth in the series of impairment-specific reports of multi-year data from the Uniform Data System for Medical Rehabilitation database (UDS_{MR}® database) providing national benchmarking information for key rehabilitation outcomes. This report includes information on patients with traumatic spinal cord injury who received inpatient rehabilitation services from 2002 through 2010 in facilities that subscribed to the UDS_{MR}. Previous reports presented the same information on patients receiving inpatient rehabilitation for stroke, traumatic brain injury, lower extremity joint replacement, and lower extremity fracture.¹⁻⁴ These reports of multi-year data extend the series of single-year reports containing multiple rehabilitation impairment categories published in this journal (1990 through 1999).⁵⁻¹⁴ Our goal is to display trends in rehabilitation outcomes over time while still providing thorough yearly summaries that can serve as valuable resources for rehabilitation outcomes researchers and can help guide facility-level quality improvement efforts moving forward.

Data Source

The UDS_{MR}, a not-for-profit organization affiliated with the UB Foundation Activities, Inc. at the State University of New York at Buffalo, maintains the largest non-governmental database for medical rehabilitation outcomes. Since 1987 the UDS_{MR} has collected data from rehabilitation hospitals and units, long-term care hospitals, skilled nursing facilities, as well as pediatric and outpatient rehabilitation programs. Approximately 70% of inpatient rehabilitation facilities in the United States utilize UDS_{MR} services.

This report contains information for persons discharged from inpatient medical rehabilitation services between 1/1/2002 and 12/31/2010. Data are from free-standing inpatient medical rehabilitation facilities and hospital-based rehabilitation units. No data are reported from Veterans Affairs or Department of Defense hospitals. The data are aggregated and presented using an October to September fiscal year schedule (see Variable Definitions below). Thus, in all tables and figures 2002 includes only three quarters (1/1/2002 – 9/30/2002) of the calendar year, and 2010 includes only one quarter (10/1/20010 – 12/31/2010) of the previous calendar year.

Data Set

The UDS_{MR}® database contains administrative data for patients receiving inpatient rehabilitation services. Demographic data include age, sex, marital status, race or ethnicity, pre-hospital living setting and discharge setting. Hospitalization and diagnostic information include length of stay, program interruptions, payer, impairment onset date, rehabilitation impairment group, and ICD-9 codes for the admitting diagnosis and comorbid conditions. Information on functional status is based on ratings from the FIM® instrument (“FIM”) for admission and discharge (see descriptions below).

The FIM instrument includes 18 items covering 6 domains (self-care, sphincter control, transfer, locomotion, communication, and social cognition). Each item is rated on a scale from 1 (complete dependence) to 7 (complete independence); higher ratings representing greater functional independence (range 18 to 126). A FIM rating is an indicator of disability, which is measured in terms of assistance required to complete a task. FIM ratings are also presented as Motor and Cognition subscales. The Motor subscale includes 13 items

assessing self-care, sphincter control, transfer, and locomotion. The Cognition subscale includes 5 items examining communication and social cognition. The reliability, validity and responsiveness of the FIM instrument have been documented by independent investigators.¹⁵⁻¹⁷

All data were collected using the FIM instrument items integrated into the *Inpatient Rehabilitation Facilities-Patient Assessment Instrument* (IRF-PAI) developed by the Centers for Medicare and Medicaid Services (CMS) as part of the prospective payment system for inpatient rehabilitation facilities.¹⁸ Changes made to the FIM protocol and rating procedures as part of the IRF-PAI have been described in documents produced by CMS¹⁹ and in other publications^{20,21} and will not be discussed in this report.

Variable Definitions

Case-mix groups (CMGs) are the patient classification system that determines the reimbursement for Medicare Part A fee-for-service inpatient rehabilitation care. Each Medicare eligible patient is assigned to a CMG at admission to rehabilitation based on his or her primary impairment or medical condition, FIM rating, and age (for select CMGs).²² There were 4 CMGs for traumatic spinal cord injury rehabilitation for the years 2002-2005 and 5 CMGs for the years 2006-2010.

CMG comorbidity tiers represent another factor that affects facility reimbursement from Medicare. Relative weightings (which are converted to payments) are stratified by tier for each CMG based on the presence of comorbidities that increase resources need and costs of the rehabilitation stay.²³ These payment adjustments for comorbidities consist of a four-tier system: Tier 1 (high cost), Tier 2 (medium cost), Tier 3 (low cost), and no Tier.²⁴

Community discharge identifies patients discharged to a community-based setting: home or an assisted living, a board and care, or a transitional living setting.

FIM efficiency refers to the average change in total FIM instrument ratings per day. It is calculated for each patient by subtracting FIM admission from FIM discharge ratings and then dividing by length of stay in days.

FIM gain is the difference between total FIM admission and total FIM discharge ratings.

Length of stay is the total number of days spent in the rehabilitation facility. Interim days spent in an acute care setting resulting in a program interruption are not included in this value. The day of discharge is also not included in this value.

Onset to admit quantifies the duration (in days) from date of injury to rehabilitation admission. In patients with traumatic spinal cord injury, the date of injury typically coincides with admission date for acute hospitalization.

Program interruption identifies patients who were temporarily (≥ 3 days) transferred to an acute care setting and then returned for additional inpatient rehabilitation services.

Year discharged refers to the date of discharge from inpatient rehabilitation in relation to the Federal fiscal year. The Federal fiscal year runs from October 1 through September 30; e.g., fiscal year 2006 includes 10/1/2005 – 9/30/2006. CMS policy changes governing inpatient rehabilitation are traditionally implemented at the beginning of the fiscal rather than the calendar year.

Inclusion Criteria

We applied five basic criteria for cases to be included in this report: 1) the patient must have been receiving initial rehabilitation services (i.e., no persons admitted for evaluation or readmissions, etc.), 2) the record could not have missing data for key benchmarking variables such as discharge setting or FIM ratings (this excludes patients who died during their rehabilitation stay), 3) the patient had to be between the ages of 7 and 105 years at admission, 4) the duration from impairment onset to rehabilitation admission could not exceed 365 days (1 year), and 5) the total length of stay could not exceed 548 days (1.5 years).

Descriptive Summary of Aggregate Data

The number of contributing facilities ranged from 620 to 698 per year over the 8-year study period. More than 60% of patients received care in hospital-based rehabilitation units with the remaining being cared for in freestanding rehabilitation hospitals over the 8-year study period (see Table 1).

Records for 47,153 patients with traumatic spinal cord injury are in the 2002-2010 UDS_{MR}[®] database. Approximately 5% of cases did not meet the inclusion criteria: 1,922 were not admitted for initial rehabilitation, 24 either died or their discharge setting was missing, 1 did not fit the desired age range, and 755 patients had reported durations from onset to admission of greater than 1 year. All descriptive statistics (means, standard deviations, counts, and percentages) represent unadjusted aggregate values from the remaining 47,153 patients meeting the inclusion criteria. Patients who died during inpatient rehabilitation were included in a single analysis to provide information on mortality rates and select patient characteristics.

The sections below describe summary statistics and observed trends in the data. As noted above, prospective payment and the IRF-PAI/FIM[®] instrument were introduced in 2002. Additional modifications have been introduced in subsequent years. Thus, some of the year-to-year differences may be more a consequence of changes in classification and/or documentation processes^{20,21} than true changes in rehabilitation services or patient care/outcomes. Accordingly, caution must be used when interpreting trends.

Patient Characteristics

Table 1 displays total and yearly summary statistics for general facility and patient characteristics. The number of patients receiving inpatient rehabilitation services following traumatic spinal cord injury fluctuated between approximately 4,868 and 5,677 per year. Mean age of the entire sample was 48.9 years with a slight increase in mean ages for the yearly cohorts over time. The percentage of patients in the < 45 years group dropped substantially over the 8-year study period. This decrease was offset by increased percentages in all 3 of the other age groups, particularly the 45-64 year olds. Gender, marital status, and race / ethnicity demonstrated consistent patterns across all years; approximately 70% of each yearly cohort was male, slightly more than 40% were married, and non-Hispanic white patients made up 69-73% of each yearly cohort.

Medicare and commercial (private) insurance were the most common payer categories; each representing a little more than one-quarter of the total sample. The payer categories remained relatively stable with Medicare Managed Care showing the largest increase (1.5% to 6.8%).

Nearly 94% of patients were admitted to inpatient rehabilitation directly from acute care and this pattern was stable across all 8 years. Approximately three-quarters of all patients were

discharged to the community following rehabilitation. Figure 1 shows changes in terms of discharges to acute care and program interruptions over the period from 2002 to 2010.

Length of Stay and Functional Status

Means and standard deviations for duration from onset to admission, length of stay, and functional status (FIM total) at admission and discharge, as well as efficiency in functional improvements (average FIM change per day) are provided in Table 1. Figures 2 and 3 display trends in functional status and length of stay over time. The duration from injury onset to rehabilitation admission remained steady at around 24 days with a slight decrease in the final two years, whereas mean lengths of stay decreased by six days over time (29.6 days in 2002 to 23.2 days in 2010). FIM total admission and discharge ratings have gradually decreased over time.

Table 2 shows mean admission, discharge, and change ratings for individual items within each of the 6 functional domains of the FIM instrument. As expected, the items in the locomotion domain yielded the lowest mean ratings at both admission and discharge across all years. The locomotion and transfer domains displayed the greatest improvements (change scores) from admission to discharge among the 6 domains: on average, individual item scores improved by 2 points within both domains.

Table 3 stratifies summaries of patient age, length of stay, and functional status by dichotomous locomotion type (walking versus wheelchair). Locomotion assessments for nearly 51% of the entire sample were exclusively wheelchair based, with the remaining assessments involving walking (46%) or a combination of walking and wheelchair (3%). Overall, wheelchair users were younger, experienced much longer lengths of stay, demonstrated substantially lower motor function at admission and discharge compared to those who were able to walk during their functional assessments. The longer lengths of stay and lesser functional improvements resulted in mean Efficiency (FIM change per day) for the wheelchair group being less than 40% of the walking group: 0.8 vs. 2.3 points per day.

Figures 4-5 display mean ratings for the 13 motor and 5 cognition items across all years for admission and discharge. The figure legends present the hierarchies of average ratings for the motor and cognitive subscale items. Among the 13 motor items, transferring from a tub or shower and climbing stairs were the most difficult items for patients with traumatic spinal cord injury (see Figure 4). Mean cognition ratings on all five items suggested overall independence in cognitive functioning, although a trend of decreasing admission cognition ratings over the 8-year study period was noted (see Table 2).

Case Severity

Persons with traumatic spinal cord injury can be classified into two broad groups based on the level and completeness of the injury. Table 4 displays the distribution of impairment codes by year. Overall, approximately 35% of patients were classified with paraplegia, 39% of patients with quadriplegia, and the remaining 26% of patients as other.

Table 5 shows the distribution of the Case-Mix Groups (CMGs) by year. The number of CMGs for traumatic spinal cord injury increased from 4 to 5 starting in fiscal year 2006. The percentage of patients in the least severe (0401) CMG decreased consistently over time. CMG 0403 was the most common category over all 8 years. Figure 7 shows the percentages of patients assigned to each of the 4 possible comorbidity tier levels by year. The tier criteria have been revised slightly over the years and the figure displays the tier structure in place for that year. Two-thirds to three-quarters of patients were classified with no tier-eligible comorbidities in any given year. Approximately 7-9% of patients were included in the most severe (Tier 1) comorbidity category within any given year.

Deaths

Sixty eight (0.1%) patients died during their rehabilitation stay between 2002 and 2010. In any given year, patients who died (Table 6) were older (by 20-30 years) and less independent (15-20 FIM points) at admission compared to the larger sample of surviving patients (Table 1).

Conclusions

This report provides aggregated data from more than 47,000 patients with traumatic spinal cord injury discharged from inpatient medical rehabilitation programs in the U.S. from 2002 through 2010. Traumatic spinal cord injury has always been one of the qualifying conditions for compliance with the CMS-regulated rehabilitation facility eligibility criterion (60% rule).^{25,26} Thus, there are no dramatic year-to-year changes in the total number of patients with this impairment admitted to inpatient rehabilitation.

Nearly half of the entire sample was under the age of 45 years, but this age group was the only one that showed a relative decrease over time in terms of percentages within a given yearly cohort. Both gender and race/ethnicity demonstrated distinct differences, but these patterns were consistent over time: men outnumbered women by more than 2:1 and whites outnumbered the next largest race/ethnicity category (blacks) by approximately 4:1.

Admission and discharge functional ratings gradually declined over time, but appear to have stabilized in the last three years of the study period. This observation combined with consistent declines in lengths of stay suggest that patients with traumatic spinal cord injury were experiencing comparable functional improvements while spending less time in rehabilitation, which is reflected in the stable to increasing efficiency ratings over the 8 years covered in this report. In addition, although the percentages of patients discharged to the community steadily declined over the first six years of the study, more than 70% of all patients returned to the community following inpatient rehabilitation.

In prior reports, we included the following reminder for utilizing these benchmark data. The UDS_{MR} recommends that when facilities compare their own data to published benchmark information they should: 1) use at least a full year's data with patient discharge dates reflecting the period of interest, 2) include information on all patients within the pertinent impairment group and period under review, and 3) include statistics that show patient variability such as standard deviations. More meaningful comparisons of outcomes data across settings (e.g., facility vs. national data) require case-mix adjustment. The process of adjusting the data "levels the playing field" by removing factors (i.e., impairment severity and type, patient age) other than treatment that may influence the outcome.²⁷

Lastly, year-to-year comparisons must be interpreted with caution. Changes over time may be a consequence of CMS-related changes in PPS documentation, eligibility, and/or reimbursement processes rather than tangible differences in patient care or outcomes. The value of this report is best described as providing year-specific benchmark information for patient characteristics and outcomes, given the stability of the rules and regulations within a specified fiscal year. The information included in this report is observational and no inference can be made regarding reasons for change within individual years or over time. Quality research is needed to evaluate the comprehensive, long-term healthcare needs of patients with traumatic spinal cord injury and to better explain any changes observed in outcomes occurring during the period of study.

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Figure 1.

Percentage of program interruptions and cases discharged to acute care by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services.

Figure 2.

Mean admission and discharge FIM® total ratings by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services.

Figure 3. Mean FIM® total change and length of stay by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services.

Figure 4.

Mean ratings for individual FIM® motor items at admission to inpatient rehabilitation.

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services.

Figure 5.
Mean ratings for individual FIM® motor items at discharge from inpatient rehabilitation.
Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for
Medicare and Medicaid Services.

Figure 6.

Relative proportions of CMG comorbidity tier assignment under the prospective payment system by discharge year. Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. The CMG comorbidity tier system changed over the years.

Table 1

Facility and patient characteristics by discharge year: percentage or mean (SD).

	Total	2002	2003	2004	2005	2006	2007	2008	2009	2010
N	47,153	5,093	5,061	4,955	5,368	5,677	5,517	5,422	5,192	4,868
Facility Type										
Hospital unit	64.6%	55.5%	61.9%	64.4%	65.8%	65.3%	65.0%	67.8%	69.2%	66.0%
Freestanding	35.4%	44.5%	38.1%	35.6%	34.2%	34.7%	35.0%	32.2%	30.8%	34.0%
Age, yrs	48.9 (20.7)	47.6 (21.1)	47.3 (20.4)	47.9 (20.8)	48.0 (20.7)	48.0 (20.6)	47.8 (20.7)	49.8 (20.6)	51.5 (20.5)	52.1 (20.3)
<45	43.4%	49.2%	47.1%	46.1%	44.9%	44.1%	45.0%	40.7%	37.0%	36.0%
45-64	29.9%	26.0%	28.3%	27.8%	29.0%	31.0%	29.4%	31.6%	32.9%	33.1%
65-74	12.3%	11.2%	11.1%	11.7%	12.1%	11.1%	11.8%	13.1%	13.6%	14.8%
75+	14.5%	13.6%	13.5%	14.4%	14.0%	13.8%	13.8%	14.6%	16.4%	16.0%
Gender										
Male	70.5%	70.2%	70.3%	70.2%	69.6%	70.8%	71.2%	72.1%	69.5%	70.5%
Female	29.5%	29.8%	29.7%	29.8%	30.4%	29.2%	28.8%	27.9%	30.5%	29.5%
Married										
Yes	41.6%	41.1%	40.7%	42.4%	41.0%	41.4%	40.5%	41.0%	43.5%	42.7%
No	58.4%	58.9%	59.3%	57.6%	59.0%	58.6%	59.5%	59.0%	56.5%	57.3%
Race / ethnicity										
White	69.8%	73.1%	71.0%	70.7%	70.0%	69.9%	69.4%	67.9%	67.5%	69.3%
Black	16.0%	14.9%	15.9%	15.3%	16.1%	15.4%	15.9%	17.0%	16.7%	16.9%
Hispanic	9.7%	8.2%	9.4%	9.8%	8.9%	9.5%	8.8%	11.1%	11.1%	10.1%
Other	4.5%	3.8%	3.7%	4.3%	5.0%	5.2%	5.8%	4.0%	4.7%	3.7%
Primary insurance										
Medicare	27.4%	26.0%	26.6%	27.7%	27.6%	26.4%	26.8%	27.7%	28.7%	29.7%
Medicare managed care	3.1%	1.5%	1.6%	1.4%	1.8%	2.1%	2.4%	4.5%	6.4%	6.8%
Commercial	24.9%	27.5%	26.1%	25.7%	25.7%	25.4%	25.8%	24.0%	22.8%	20.8%
Managed care	7.6%	8.3%	8.3%	8.5%	7.5%	8.1%	8.0%	6.6%	6.5%	6.2%
Medicaid	12.1%	12.5%	11.5%	11.4%	13.0%	12.1%	11.6%	12.2%	11.9%	12.4%
Medicaid managed care	2.7%	2.1%	2.6%	2.3%	2.5%	2.4%	2.5%	3.4%	3.0%	3.5%
Other	22.2%	22.2%	23.3%	22.9%	21.9%	23.5%	22.9%	21.6%	20.6%	20.7%
Living situation (pre)										

	Total	2002	2003	2004	2005	2006	2007	2008	2009	2010
With others	78.2%	78.2%	77.7%	78.9%	77.7%	78.3%	79.2%	77.9%	78.4%	77.9%
Alone	20.8%	21.0%	21.4%	20.5%	21.3%	20.6%	19.7%	21.0%	20.9%	21.2%
Admitted from										
Acute care	93.5%	93.8%	93.1%	93.6%	93.5%	93.7%	93.7%	93.9%	93.6%	92.9%
Community	3.5%	3.5%	3.9%	3.3%	4.0%	3.6%	3.3%	3.2%	2.9%	3.5%
LTCF*	2.2%	1.9%	2.2%	2.3%	1.7%	2.1%	2.1%	2.2%	2.6%	2.9%
Discharge setting										
Community	74.1%	75.8%	76.3%	74.9%	74.6%	73.2%	75.0%	73.0%	72.7%	71.5%
LTCF	8.0%	8.8%	7.7%	7.8%	7.7%	8.3%	7.5%	7.9%	7.7%	8.5%
Acute care	11.6%	10.2%	10.8%	11.3%	11.1%	12.4%	11.1%	12.4%	12.0%	12.8%
Rehab / subacute	5.7%	4.4%	4.6%	5.5%	6.1%	5.3%	5.8%	6.0%	6.8%	6.7%
Onset to admission, days	23.8 (40.6)	24.3 (40.6)	25.1 (43.5)	24.8 (41.3)	24.2 (40.8)	23.7 (38.7)	25.1 (43.2)	23.0 (38.4)	22.6 (40.2)	21.7 (38.3)
Length of stay, days	26.2 (23.2)	29.7 (25.4)	27.8 (26.3)	27.8 (24.7)	26.7 (23.4)	26.3 (24.3)	26.5 (24.7)	24.6 (20.4)	22.9 (18.9)	23.2 (18.3)
FIM® total admission	58.0 (16.6)	60.5 (17.4)	59.9 (17.1)	59.1 (16.8)	58.3 (16.5)	57.4 (16.4)	57.6 (15.9)	57.0 (16.4)	56.3 (16.4)	55.9 (16.3)
FIM® total discharge	83.5 (23.5)	86.1 (23.8)	84.6 (23.6)	84.1 (23.5)	83.4 (23.5)	82.6 (23.5)	83.5 (23.0)	82.7 (23.6)	82.4 (23.5)	82.4 (23.4)
Efficiency, change/day	1.6 (1.7)	1.4 (1.7)	1.5 (1.5)	1.5 (1.6)	1.5 (1.8)	1.5 (1.7)	1.6 (1.7)	1.6 (1.7)	1.7 (1.6)	1.7 (1.7)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. FIM total ratings include all 13 motor items across all years.

* LTCF = Long Term Care Facility

Table 2

Mean ratings for individual items (range 1-7) within each FIM® subscale by discharge year: mean (SD).

FIM® Subscale	Total	2002	2003	2004	2005	2006	2007	2008	2009	2010
Admission										
Self-care	2.6 (1.3)	2.7 (1.4)	2.7 (1.4)	2.7 (1.3)	2.6 (1.3)	2.6 (1.3)	2.6 (1.2)	2.6 (1.2)	2.5 (1.2)	2.5 (1.2)
Sphincter	2.3 (1.8)	2.4 (1.9)	2.3 (1.8)	2.3 (1.8)	2.3 (1.8)	2.3 (1.7)	2.2 (1.7)	2.3 (1.7)	2.3 (1.7)	2.4 (1.8)
Transfer	1.9 (1.1)	2.0 (1.2)	2.0 (1.2)	2.0 (1.2)	1.9 (1.1)	1.9 (1.1)	1.9 (1.1)	1.9 (1.1)	1.9 (1.1)	1.8 (1.1)
Locomotion	1.6 (0.9)	1.7 (1.0)	1.7 (1.0)	1.7 (1.0)	1.6 (0.9)	1.6 (0.9)	1.6 (0.9)	1.6 (0.9)	1.6 (0.9)	1.6 (0.9)
Communication	6.0 (1.3)	6.3 (1.2)	6.2 (1.2)	6.1 (1.2)	6.0 (1.2)	6.0 (1.3)	6.0 (1.2)	5.8 (1.3)	5.7 (1.3)	5.7 (1.3)
Social Cognition	5.6 (1.4)	5.9 (1.4)	5.8 (1.3)	5.7 (1.3)	5.6 (1.4)	5.6 (1.4)	5.6 (1.3)	5.5 (1.4)	5.4 (1.4)	5.3 (1.4)
Discharge										
Self-care	4.3 (1.7)	4.5 (1.8)	4.4 (1.8)	4.4 (1.8)	4.3 (1.8)	4.3 (1.7)	4.4 (1.7)	4.3 (1.7)	4.3 (1.7)	4.3 (1.7)
Sphincter	3.8 (2.2)	4.0 (2.3)	3.8 (2.3)	3.8 (2.2)	3.8 (2.2)	3.7 (2.2)	3.7 (2.2)	3.7 (2.2)	3.7 (2.2)	3.7 (2.2)
Transfer	3.8 (1.9)	4.0 (1.9)	3.9 (1.9)	3.9 (1.9)	3.8 (1.9)	3.7 (1.9)	3.8 (1.9)	3.8 (1.9)	3.8 (1.8)	3.8 (1.9)
Locomotion	3.5 (1.5)	3.6 (1.5)	3.5 (1.5)	3.5 (1.5)	3.5 (1.5)	3.5 (1.5)	3.5 (1.5)	3.5 (1.5)	3.5 (1.5)	3.5 (1.6)
Communication	6.4 (1.0)	6.6 (0.9)	6.5 (0.9)	6.5 (0.9)	6.4 (1.0)	6.4 (1.0)	6.4 (0.9)	6.4 (1.0)	6.3 (1.0)	6.3 (1.0)
Social Cognition	6.2 (1.1)	6.3 (1.1)	6.3 (1.1)	6.2 (1.1)	6.2 (1.1)	6.1 (1.1)	6.2 (1.1)	6.1 (1.1)	6.1 (1.2)	6.1 (1.1)
Change										
Self-care	1.7 (1.2)	1.7 (1.2)	1.7 (1.2)	1.7 (1.3)	1.7 (1.3)	1.7 (1.3)	1.8 (1.3)	1.8 (1.3)	1.8 (1.2)	1.8 (1.2)
Sphincter	1.5 (1.9)	1.6 (1.9)	1.5 (1.9)	1.5 (1.9)	1.5 (1.8)	1.5 (1.8)	1.5 (1.9)	1.4 (1.8)	1.4 (1.8)	1.4 (1.8)
Transfer	2.0 (1.5)	2.0 (1.6)	1.9 (1.6)	1.9 (1.5)	1.9 (1.5)	1.9 (1.5)	1.9 (1.5)	2.1 (1.5)	2.1 (1.5)	2.2 (1.5)
Locomotion	2.0 (1.5)	1.9 (1.5)	1.9 (1.5)	1.8 (1.5)	1.9 (1.5)	1.9 (1.5)	1.9 (1.5)	2.3 (1.5)	2.4 (1.5)	2.4 (1.5)
Communication	0.5 (0.9)	0.3 (0.8)	0.3 (0.9)	0.4 (0.8)	0.4 (0.9)	0.4 (0.9)	0.5 (0.9)	0.5 (1.0)	0.6 (1.0)	0.6 (1.0)
Social Cognition	0.6 (1.0)	0.5 (0.9)	0.5 (0.9)	0.5 (0.9)	0.6 (0.9)	0.6 (1.0)	0.6 (0.9)	0.6 (1.0)	0.7 (1.0)	0.7 (1.0)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Cell values represent mean ratings for individual FIM items within the particular subscale.

Table 3
Patient characteristics according to mode of locomotion assessment by discharge year: mean (SD).

Mode	Total	2002	2003	2004	2005	2006	2007	2008	2009	2010
Age, yrs										
Walking	55.7 (20.2)	54.2 (21.1)	54.6 (20.4)	55.2 (20.6)	55.2 (20.4)	54.8 (20.1)	55.6 (20.1)	55.7 (20.3)	57.4 (19.8)	57.7 (19.3)
Wheelchair	42.3 (19.0)	41.1 (19.1)	40.4 (18.0)	41.1 (18.6)	41.0 (18.5)	41.8 (19.1)	41.0 (18.8)	44.0 (19.3)	44.9 (19.2)	46.0 (19.6)
Length of stay, days										
Walking	17.4 (14.1)	19.3 (16.4)	17.4 (15.0)	18.3 (16.0)	17.5 (14.8)	17.1 (13.1)	16.9 (13.7)	17.1 (13.4)	16.6 (12.3)	16.8 (11.9)
Wheelchair	34.6 (26.9)	39.7 (28.4)	37.5 (30.5)	36.5 (27.9)	35.7 (26.5)	34.6 (28.6)	34.9 (28.9)	31.9 (23.2)	30.0 (22.2)	30.0 (21.2)
FIM® total admission										
Walking	64.3 (17.1)	67.6 (17.6)	67.3 (17.2)	66.1 (17.1)	64.9 (17.1)	63.7 (17.0)	63.9 (16.3)	63.0 (17.1)	61.9 (16.7)	61.1 (16.6)
Wheelchair	51.9 (13.6)	53.8 (14.4)	53.1 (13.8)	52.7 (13.6)	51.9 (13.2)	51.7 (13.5)	52.0 (13.3)	51.1 (13.2)	50.0 (13.6)	50.3 (14.0)
FIM® motor admission										
Walking	35.6 (14.1)	37.3 (15.0)	37.5 (14.6)	36.7 (14.4)	36.0 (14.0)	35.1 (13.9)	35.3 (13.7)	35.0 (13.8)	34.4 (13.5)	33.8 (13.6)
Wheelchair	23.1 (10.3)	23.9 (11.4)	23.4 (10.8)	23.3 (10.5)	22.8 (10.1)	23.0 (10.1)	23.1 (10.1)	22.9 (9.8)	22.4 (9.8)	22.9 (10.3)
FIM® cognition admission										
Walking	28.7 (6.3)	30.3 (6.0)	29.8 (5.9)	29.4 (6.0)	28.9 (6.3)	28.7 (6.3)	28.7 (6.0)	28.0 (6.5)	27.5 (6.6)	27.3 (6.3)
Wheelchair	28.8 (6.4)	29.9 (6.2)	29.7 (6.1)	29.3 (6.0)	29.1 (6.3)	28.6 (6.4)	28.9 (6.2)	28.2 (6.3)	27.6 (6.7)	27.4 (6.8)
FIM® total discharge										
Walking	93.9 (19.9)	96.0 (20.4)	95.3 (19.2)	95.0 (18.9)	93.5 (20.4)	93.2 (20.0)	94.2 (19.2)	93.5 (20.3)	92.7 (19.8)	92.3 (20.2)
Wheelchair	73.4 (22.3)	76.5 (22.9)	74.5 (22.8)	74.0 (22.7)	73.7 (22.2)	73.0 (22.2)	74.2 (21.9)	72.1 (21.9)	70.9 (21.8)	71.9 (21.8)
FIM® motor discharge										
Walking	62.7 (17.0)	64.1 (17.7)	63.6 (16.6)	63.4 (16.4)	62.2 (17.4)	62.0 (17.0)	62.9 (16.5)	62.5 (17.1)	61.9 (16.8)	61.6 (17.2)
Wheelchair	42.0 (20.0)	44.3 (20.8)	42.6 (20.6)	42.3 (20.5)	42.0 (20.1)	41.7 (19.8)	42.6 (19.8)	41.2 (19.3)	40.0 (19.1)	40.9 (19.3)
FIM® cognition discharge										
Walking	31.3 (5.0)	32.0 (4.9)	31.7 (4.7)	31.6 (4.7)	31.3 (5.1)	31.2 (5.0)	31.3 (4.7)	31.0 (5.2)	30.9 (5.1)	30.7 (5.2)
Wheelchair	31.4 (5.1)	32.2 (4.9)	31.8 (5.0)	31.7 (5.0)	31.7 (4.9)	31.3 (5.3)	31.5 (4.9)	30.9 (5.2)	30.8 (5.5)	31.0 (5.2)
FIM® total change										
Walking	29.6 (16.3)	28.4 (16.2)	28.1 (16.2)	28.9 (16.2)	28.6 (16.1)	29.5 (16.7)	30.2 (15.8)	30.5 (16.5)	30.8 (16)	31.2 (16.2)
Wheelchair	21.6 (15.8)	22.7 (16.2)	21.4 (16.1)	21.3 (15.9)	21.7 (15.9)	21.3 (15.8)	22.2 (15.9)	21.1 (15.7)	20.8 (15.2)	21.6 (15.3)
FIM® motor change										
Walking	27.0 (14.8)	26.4 (15.1)	26.1 (14.8)	26.7 (14.9)	26.2 (14.8)	27.0 (15.0)	27.6 (14.5)	27.4 (14.8)	27.5 (14.3)	27.8 (14.5)
Wheelchair	18.8 (14.8)	19.5 (15.1)	19.2 (15.2)	19.0 (15.1)	19.1 (15.0)	18.7 (14.8)	19.5 (14.9)	18.3 (14.5)	17.6 (14.1)	18.0 (14.2)
FIM® cognition change										
Walking	2.6 (4.2)	1.8 (3.7)	1.9 (3.9)	2.2 (3.8)	2.4 (3.9)	2.5 (4.4)	2.6 (4.2)	3.0 (4.4)	3.3 (4.5)	3.4 (4.6)
Wheelchair	2.7 (4.5)	2.2 (4.3)	2.2 (4.2)	2.4 (4.2)	2.6 (4.5)	2.6 (4.4)	2.7 (4.5)	2.7 (4.6)	3.2 (4.9)	3.5 (5.0)
Efficiency, change/day										
Walking	2.3 (1.9)	2.1 (2.1)	2.2 (1.8)	2.2 (1.8)	2.3 (2.1)	2.3 (1.9)	2.4 (1.8)	2.4 (2.0)	2.4 (1.7)	2.4 (1.8)
Wheelchair	0.8 (1.0)	0.8 (0.8)	0.8 (0.8)	0.8 (1.0)	0.8 (1.0)	0.8 (1.1)	0.9 (1.1)	0.8 (1.0)	0.9 (1.1)	1.0 (1.1)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Wheelchair = locomotion assessments that included wheelchair only. Walking = locomotion assessments involving walking or a combination of walking and wheelchair.

Table 4

Impairment categories by discharge year: percentage.

	Total	2002	2003	2004	2005	2006	2007	2008	2009	2010
Trauma Paraplegia unspecified	7.0%	7.8%	7.0%	6.6%	6.8%	6.7%	6.4%	7.5%	7.0%	6.9%
Trauma Paraplegia incomplete	14.7%	15.1%	14.2%	14.1%	14.8%	14.5%	15.6%	14.5%	15.0%	14.0%
Trauma Paraplegia complete	13.7%	14.5%	14.2%	13.8%	13.2%	14.7%	15.6%	13.1%	11.7%	12.2%
Trauma Quadriplegia unspecified	4.5%	4.3%	3.9%	4.1%	4.4%	4.8%	4.0%	4.7%	4.6%	5.3%
Trauma Quadriplegia incomplete C1-4	10.9%	9.4%	10.8%	9.7%	10.8%	11.2%	10.9%	10.8%	12.2%	11.8%
Trauma Quadriplegia incomplete C5-8	14.0%	14.0%	14.2%	14.4%	14.9%	14.1%	13.6%	13.8%	13.2%	13.9%
Trauma Quadriplegia complete C1-4	3.4%	3.5%	3.6%	4.2%	3.5%	4.0%	3.5%	2.8%	2.6%	2.6%
Trauma Quadriplegia complete C5-8	5.7%	6.8%	6.5%	6.3%	6.2%	5.7%	5.9%	4.8%	4.4%	4.3%
Trauma spinal cord other	26.3%	24.5%	25.5%	26.7%	25.3%	24.3%	24.5%	27.9%	29.4%	28.9%

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services.

Table 5

Case-mix groups (CMG) by discharge year: percentage.

	2002	2003	2004	2005	2006	2007	2008	2009	2010
401	9.9%	8.7%	7.3%	6.7%	3.7%	3.6%	3.6%	3.5%	3.3%
402	21.1%	21.9%	21.6%	21.8%	23.3%	23.0%	23.2%	22.9%	21.9%
403	38.6%	39.1%	40.4%	39.8%	40.0%	41.0%	40.5%	39.7%	41.2%
404	30.3%	30.3%	30.7%	31.7%	7.8%	8.2%	9.7%	10.2%	11.4%
405					25.3%	24.1%	23.1%	23.6%	22.1%

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. The formula for calculating CMGs and the number CMG categories was changed in fiscal year 2006.

Table 6

Characteristics of patients who died during inpatient rehabilitation by year of death: mean (SD).

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Died, N	10	3	10	7	6	9	5	14	4
Died, %	0.2%	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	0.3%	0.1%
Age, yrs	69.4 (19.6)	72 (20.9)	68.1 (20.7)	60.2 (19.5)	67.0 (20.9)	62.3 (18.9)	70.8 (19.3)	70.6 (13.1)	80.0 (8.2)
FIM@ total admission	43.9 (21.2)	48.0 (12.3)	40.7 (15.5)	45.0 (19.7)	43.6 (11.7)	44.8 (11.2)	26.8 (7.0)	45.9 (17.7)	33.0 (7.7)
Onset to admission, days	10.5 (6.2)	15.6 (10.3)	12.0 (7.0)	57.8 (87)	14.3 (13.1)	17.1 (13.8)	13.4 (12.8)	8.5 (5.1)	15.8 (13.0)
Length of stay, days	6.3 (4.4)	5.6 (3.1)	10.8 (5.7)	27.5 (33.8)	19.3 (29.7)	28.6 (58.2)	8.6 (5.7)	13.1 (6.1)	8.0 (9.5)

Yearly summaries represent fiscal year periods (Oct 1 through Sep 30) from the Centers for Medicare and Medicaid Services. Note: % is calculated from the total sample with complete data, including both survivors and non-survivors: N = 47,221.